

# HUNTER VALLEY OPERATIONS

## 2023 ANNUAL ENVIRONMENTAL REVIEW

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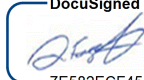


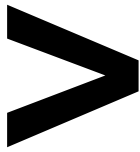


**HUNTER VALLEY**  
OPERATIONS

# REPORT | 2023 ANNUAL ENVIRONMENTAL REVIEW

## TITLE BLOCK

Name of Operations	Hunter Valley Operations
Name of Operator	HV Operations Pty Ltd
Development Consent / Project Approval	DA 450-10-2003 / PA 06_0261
Name of holder of development consent/project approval	HV Operations Pty Ltd
Mining Lease Number	Contained within Table 3-2 of this report
Name of Mining Lease Holder	Contained within Table 3-2 of this report
Water Licence Number	Contained within Table 3-4 of this report
Name of Water Licence Holder	Contained within Table 3-4 of this report
<p>I, David Foster, certify that this audit report is a true and accurate record of the compliance status of Hunter Valley Operations for the period 01/01/2023 to 31/12/2023 and that I am authorised to make this statement on behalf of Hunter Valley Operations.</p> <p><i>Note:</i></p> <p>a) <i>The Annual Review is an 'environmental audit' for the purposes of section 122B (2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.</i></p> <p>b) <i>The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).</i></p>	
Name of Authorised Reporting Officer	David Foster
Title of Authorised Reporting Officer	General Manager
Signature of Authorised Reporting Officer	<p>DocuSigned by:</p>  <p>7E582ECF45D1476...</p>
Date	28-Mar-24   12:14 AEDT



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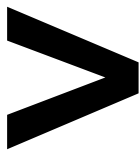
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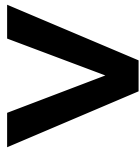
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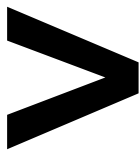
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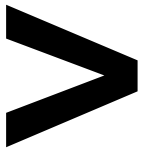
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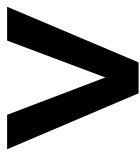


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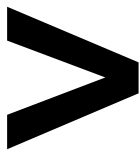
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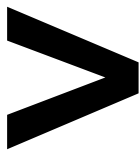
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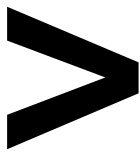
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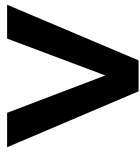
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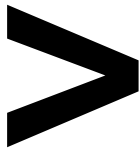
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## EXECUTIVE SUMMARY

This Annual Environmental Review (Annual Review) reports on the environmental performance of Hunter Valley Operations (HVO) during the 2023 calendar year and satisfies the requirements of HVO’s Development Consents. The structure of the 2023 Annual Review intends to align with the *NSW Government Post - approval requirements for State significant mining developments – Annual Review Guideline* (October 2015).

### Operations Summary

HVO extracted 15.27 million tonnes of run-of-mine (ROM) coal during 2023 against an approved ROM extraction rate of 42 million tonnes per annum (mtpa). The Coal Handling Preparation Plant (CHPP) produced 10.39 million tonnes of saleable coal.

### Noise

A total of 120 noise measurements were recorded in the attended noise compliance monitoring programme in 2023. No noise exceedances were recorded against HVO’s criteria.

HVO continued to operate a real-time noise monitoring network which alerts operations to potential noise exceedances. A total of 1146<sup>1</sup> internal noise alarms were received and responded to and as a result 118 hours of equipment downtime was recorded for the management of noise during 2023.

### Blasting

A total of 236 blast events were initiated, 119 from HVO South and 117 from HVO North. HVO complied with all blasting related overpressure and vibration development consent and licence criteria during 2023.

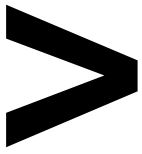
HVO employs a blast fume management protocol to mitigate generation of post blast fume emissions. There was one blast in the Mitchell Pit on 9 September 2023 that produced blast fume ranked Level 4B. Manufacturing of Ammonium Nitrate Emulsion was undertaken on site as approved by PA 06\_0261 (the ‘HVO South Approval’). A modification to the HVO South Approval was approved in February 2023 to allow for increased storage of Ammonium Nitrate and associated precursor chemicals on site. The Ammonium Nitrate storage compound was constructed and commenced operation.

### Air Quality

Twelve reportable exceedances were recorded against HVO’s air quality criteria in 2023. Only three of these had a contribution from HVO that was significant enough to be considered non-compliant. These included two short term PM10 exceedances at Cheshunt East and one annual average exceedance of Total Suspended Particulates at Warkworth.

HVO continued to implement operational controls to manage dust emissions in accordance with its Air Quality Management Plan during 2023 including response to internal air quality alerts. During the reporting period, HVO responded to 3150 air quality alerts and recorded 7013 hours of operational downtime to

<sup>1</sup> Noise alarm triggers are based on internally set noise criteria. Alarms received include noise exceedances from other mines and non-mine sources.



manage dust in response to real time monitoring alerts and visual inspections. An improvement programme commenced for West Pit to further mitigate dust emissions including reintroduction of chemical dust suppressants and conducting dust TARP refresher training with the workforce. Aerial seeding was conducted over an approximate area of 399.5 ha to reduce dust from wind erosion of mine stockpiles.

Heritage

Two compliance inspections were conducted under the provision of the HVO South ACHMP and one inspection was conducted under the HVO North Heritage Management Plan (HMP). The inspections found that all sites have been managed in conformance with the ACHMP/HMP requirements. Sites requiring maintenance and upgrades to site barricading, fencing and vegetative sediment controls were identified. Barricade upgrade and maintenance will be included as part of the works planning for 2024.

Under the provisions of both the HVO South and HVO North Aboriginal Cultural Heritage Management Plans (ACHMP), field based due diligence assessments were undertaken at seven locations across HVO in 2023. No additional artefacts were identified through these assessments. Salvage and investigation works of a remnant artefact scatter that formed part of AHIMs site 37-2-0047 were completed during 2023. An AHIP application for Wilton/Mitchell pit area was submitted to Heritage NSW on 4 December 2023 following consultation with Registered Aboriginal Parties (AHIP#5219).

Detailed survey and condition reports were completed for the Archerfield, Wandewoi and Carrington Stud homesteads as part of a planned improvement project for buildings with heritage significance.

There were no incidents, nor any unauthorised disturbance caused to heritage sites at HVO during 2023.

Water

A total of 459mm of rainfall was recorded at HVO Corporate Meteorological (Met) Station in 2023 producing an estimated 3,232 ML of runoff. No water was pumped from the Hunter River during 2023. HVO did not discharge any water under the Hunter River Salinity Trading Scheme (HRSTS).

Surface and ground water monitoring activities continued in 2023 in accordance with the HVO Water Management Plan (WMP), the HVO Surface Water Monitoring Program (SWMP) and the HVO Ground Water Monitoring Program (GWMP).

Operational improvements were undertaken with a new sediment dam (Dam 30W) excavated ahead of mining in Mitchell Pit to manage runoff water from new disturbance areas. A new water transfer pipeline was completed and commissioned to increase transfer rates between West and North Pit water infrastructure.

HVO progressed its Water Containment Pollution Reduction Programme (PRP). Practical completion was reached for Load Point area upgrades including increased water storage, pipeline protection and pumping systems. Excavation commenced in mine water Dam 15N to increase water storage capacity.

Controls identified through the PRP to mitigate seepage from the North Void Tailings Facility Analysis continued with management of water levels on the surface and continued monitoring of groundwater. Groundwater monitoring results indicate that current management practices are effective in minimising seepage from the facility. Additional engineering was undertaken to inform construction method for a proposed barrier wall.

Rehabilitation and Land Management

Rehabilitation at HVO was undertaken in accordance with commitments made in the Rehabilitation Management Plan (RMP) as required by the standard conditions for Mining Leases.





A total of 156.4 ha of rehabilitation was completed to “Ecosystem Establishment” phase during 2023 including 57.7 ha of new rehabilitation and 98.67 ha of “Growth Medium Development” phase rehabilitation. The total rehabilitation footprint is consistent with commitments for progressive rehabilitation establishment.

Rehabilitation areas monitored were assessed to be generally trending well. Initial TARP triggers relating to erosion and species composition have been activated and will inform response actions during the forward period.

Rehabilitation maintenance works aligned with previous NSW Resources Regulator Section 240 Notice commitments and continued to be implemented. Key activities included progression of 98.67 ha of historic Growth Medium Development phase rehabilitation to native vegetation, weed control within areas of concern, and preparation works for ongoing progression of areas to final vegetation covers.

A number of baiting programmes were carried out on a seasonal basis and at a frequency designed to disrupt pest species such as wild pigs, wild dogs, feral cats, foxes, hares and rabbit’s breeding/colonisation cycles. A variety of methodologies were employed including baiting, trapping and ground-based shooting.

A total of 120 baits were taken by dogs, 56 by foxes and 45 by feral pigs using the ‘Hoggone’ baiting method. 31 feral pigs were trapped, 33 feral pigs were shot.

Biodiversity areas were managed in accordance with approved management plans and restoration strategies. Management activities included ecological monitoring, seed collection, removal of redundant fencing and pest and weed controls. Monitoring of the Carrington Billabong indicated a decrease in tree condition compared to 2022 data which is thought to be due to a combination of ecological factors including a soil pathogen and insect attack. This will be further investigated in 2024.

### Community

A total of nine community complaints were received in 2023 related to dust, blasting, lighting and unsafe driving practises. Four CCC meetings were held during the reporting period to discuss operations, projects, mine activities and the proposed continuation project.

HVO provided approximately \$162,000 to local not-for-profit organisations and projects throughout the year, including its continued partnership with Jerrys Plains Public School Ready4School (pre-school) programme.

Several methods were used to keep the community informed of operational, project and proposed continuation activities. This included community information sessions at Maison Dieu and Jerrys Plains, Community Newsletters and the HVO website.



## 1 | STATEMENT OF COMPLIANCE

**Table 1-1** is a Statement of Compliance against the relevant approvals. **Table 1-2** provides a brief summary of the non-compliances against development consents and a reference to where these are addressed within this Annual Review. **Table 1-3** shows the compliance status descriptions relating to **Table 1-2**.

Table 1-1: Statement of Compliance

Were all conditions of the relevant approvals complied with?	
PA 06_0261 (HVO South)	No
DA 450-10-2003 (HVO North)	No

Table 1-2: Non-Compliances

Relevant Approval	Condition Number	Condition Description	Compliance Status	Where Addressed in Annual Review
DA 450-10-2003	Schedule 3 Condition 4A	Cheshunt East PM10 Exceedance 6 March 2023	Non-compliant (low)	Section 11
DA 450-10-2003	Schedule 3 Condition 4A	Cheshunt East PM10 Exceedance 20 September 2023	Non-compliant (low)	Section 11
PA 06_0261	Schedule 3 Condition 19	Warkworth TSP Annual Average Exceedance	Non-compliant (low)	Section 11

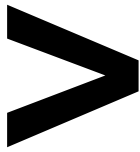


Table 1-3: Compliance Status Key for Table 1-2

Risk Level	Colour Code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: Potential for serious environmental consequences, but is unlikely to occur; or Potential for moderate environmental consequences, but is unlikely to occur
Low	Non-compliant	Non-compliance with: Potential for moderate environmental consequences, but is unlikely to occur or Potential for low environmental consequences, but is unlikely to occur
Administrative Non-Compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g., submitting a report to government later than required under approval conditions)

## 2 | INTRODUCTION

### 2.1 | DOCUMENT PURPOSE

This Annual Review is written to satisfy the requirements of the Development Consents and conditions of mining leases held by Hunter Valley Operations (HVO) for events which occurred during the 2023 calendar year (the reporting period). The Annual Review has been written in accordance with the *Post-approval requirements for State significant mining developments – Annual Review Guideline* (NSW Government, October 2015).

This report is distributed to:

- NSW Department of Planning, Housing and Infrastructure (DPHI);
- NSW Resource Regulator (RR);
- NSW Environment Protection Authority (EPA);
- Department of Climate Change, Energy, the Environment and Water—Water (DCCEEW – Water);
- Singleton Shire Council;
- Muswellbrook Shire Council; and
- HVO Community Consultative Committee (CCC).

### 2.2 | BACKGROUND

HVO is situated in the Upper Hunter Valley between Singleton and Muswellbrook, approximately 24 km northwest of Singleton, and approximately 100 km northwest of Newcastle. The Hunter River geographically divides HVO into HVO North (DA 450-10-2003) and HVO South (PA 06\_0261), however they are integrated operationally with personnel, equipment and materials utilised as required. This improves operational efficiency, rationalisation of infrastructure and resource utilisation.

HVO is a jointly controlled operation through a Joint Venture (JV) between Glencore (49%) and Yancoal (51%).

The regional context and layout of the HVO pits and facilities are shown in **Figure 2-1** and **Figure 2-2** respectively.

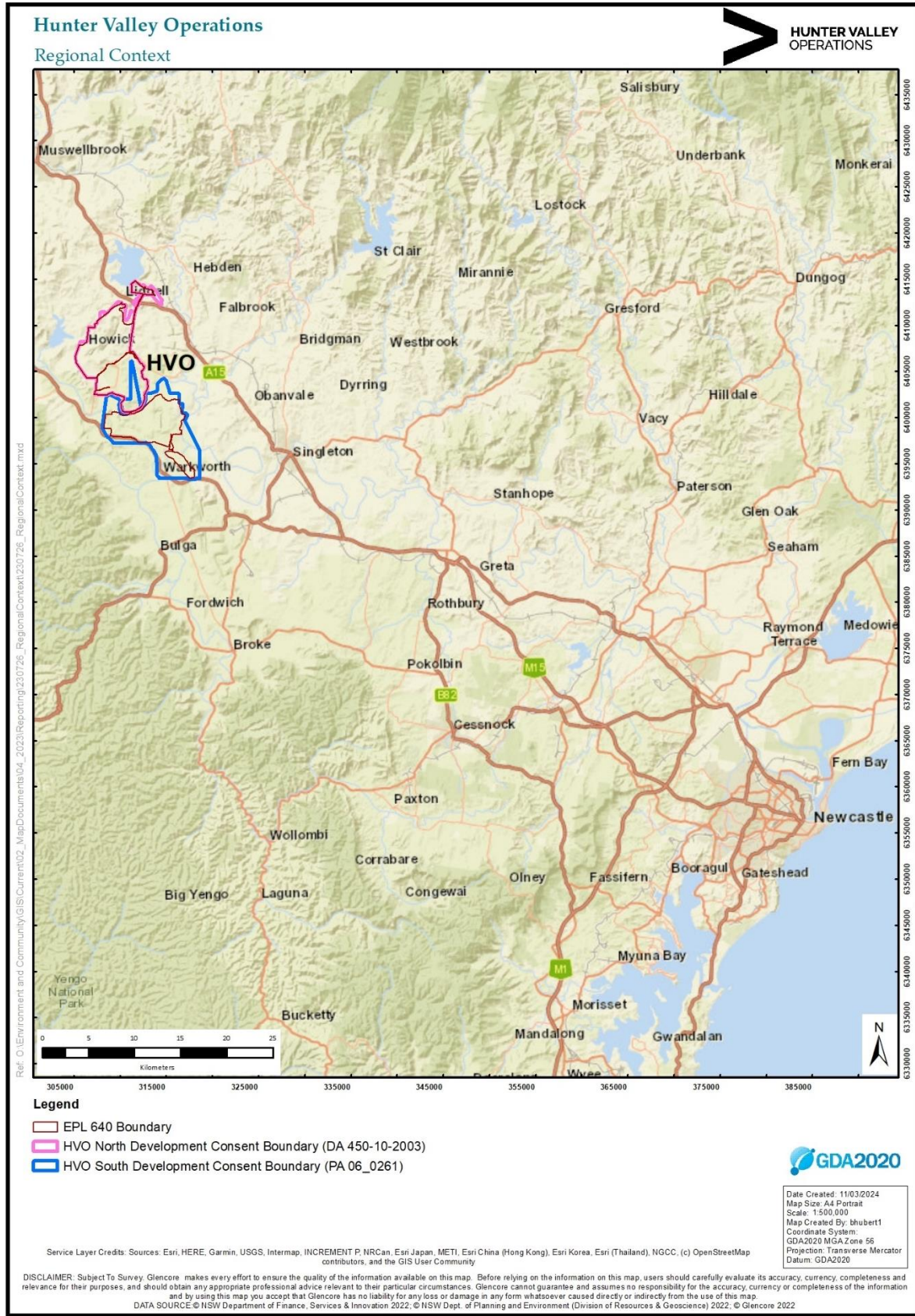
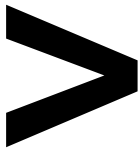


Figure 2-1: Regional Context

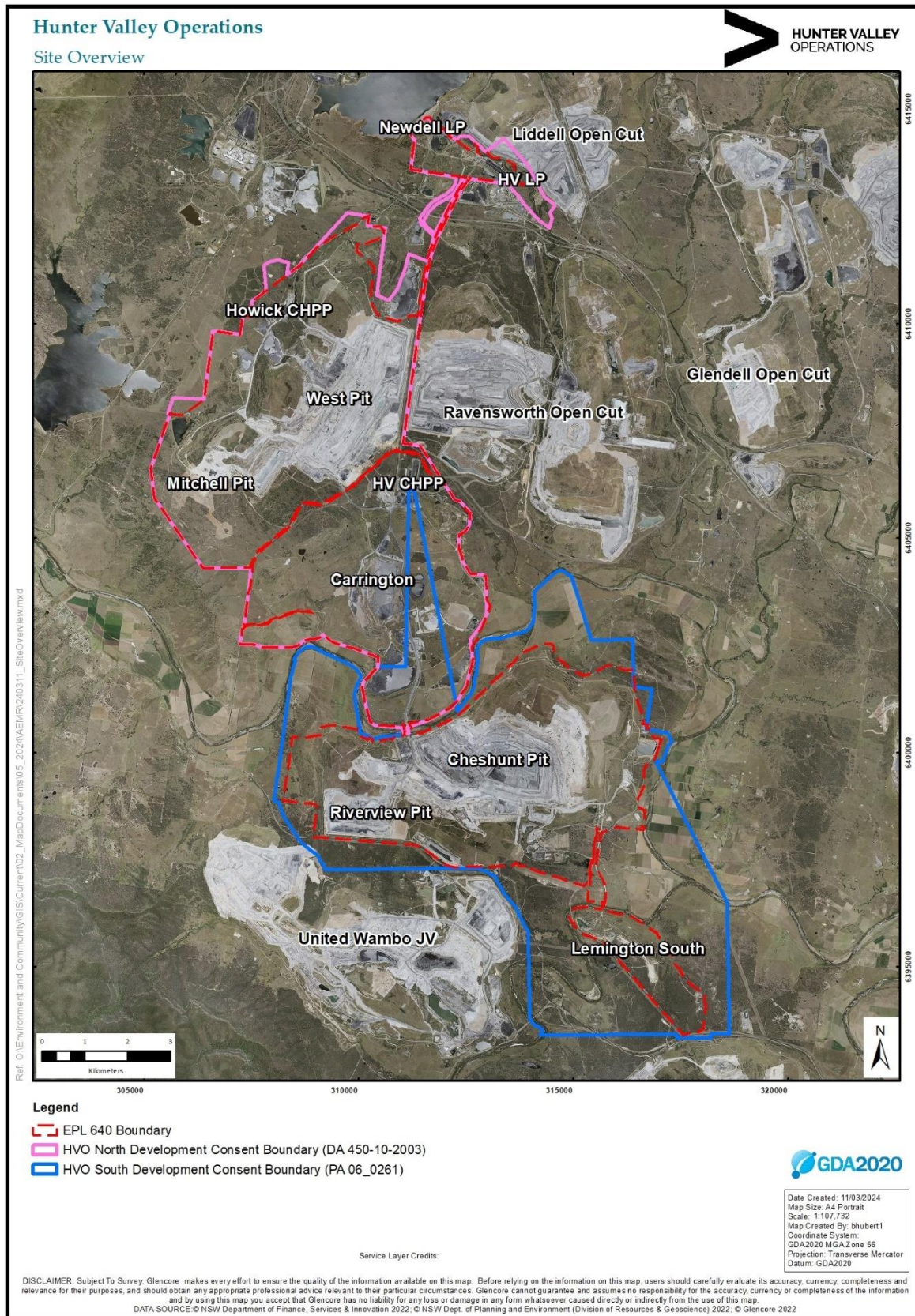
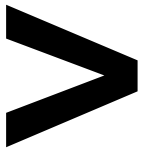


Figure 2-2: Hunter Valley Operations Site Overview

<b>Number:</b>	HVOOC-748212775-6	<b>Status:</b>	[Document Status (Office)]	<b>Effective:</b>	[Effective Date]	<b>Page 22 of 237</b>
<b>Owner:</b>	[Owner (Office)]	<b>Version:</b>	[Document Version (Office)]	<b>Review:</b>	[Planned Review Date]	



### 2.3 | MINE CONTACTS

Key mine contacts are listed in **Table 2-1**.

*Table 2-1: Mine Contacts*

Contact	Role	Phone	Email
David Foster	General Manager	1800 888 733	david.foster@hvo.com.au
Andrew Speechly	Environment & Community Manager		andrew.speechly@hvo.com.au



### 3 | OBJECTIVES

#### 3.1 | APPROVALS, LEASES AND LICENCES

##### 3.1.1 | CURRENT APPROVALS

The status of HVO development consents, licences and relevant approvals are listed in:

**Table 3-1:** HVO Major Approvals

**Table 3-2:** Summary of Mining Tenements

**Table 3-3:** HVO Licences and Permits

**Table 3-4:** Water Related Approvals

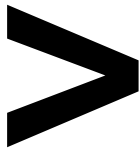
**Table 3-5:** Surface Water Access Licences 2022/23 Water Year

**Table 3-6:** Groundwater Access Licences

*Table 3-1: HVO Major Approvals*

Approval Number	Description	Issue Date	Expiry Date
HVO North DA 450-10-2003 MOD 7	HVO West Pit Extension & Minor Modifications (2003); and associated modifications. MOD 7 approved July 2017. Covers West Pit (approved production limit of 12mtpa), Carrington Pit (approved production limit of 10mtpa), HVCHPP (approved processing limit of 20mtpa) and WCHPP (approved processing limit of 6mtpa).	28/07/2017	12/06/2025
HVO South PA 06_0261 MOD 8	Hunter Valley Operations – South Coal Project & associated modifications: MOD8 Approved 6 February 2023 Permits construction of an Ammonium Nitrate Storage Compound.  MOD7 Approved 27 May 2022 Permits storage of water in Lemington Underground Workings.  MOD 6 Approved 26 November 2021 Permits onsite Manufacturing of Ammonium Nitrate Emulsion.  MOD 5 approved February 2018. The modification covered: the progression of mining to the base of the Bayswater seam from Cheshunt Pit into Riverview Pit, and to the base of the Vaux seam in South Lemington Pit 2.	06/02/2023	24/03/2030





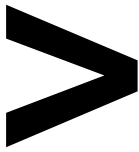
Approval Number	Description	Issue Date	Expiry Date
	<ul style="list-style-type: none"> <li>- increased overburden emplacement height in some areas to 240m AHD and incorporation of micro-relief</li> <li>- extraction rate increase from 16Mtpa to 20Mtpa of ROM coal at peak production and increased processing rate from 16Mtpa to 20Mtpa of ROM coal across HVO coal preparation plants.</li> </ul>		
EPBC 2016/7640	Hunter Valley Operations – State approved mining Hunter Valley NSW	10/10/2016	31/12/2030

Table 3-2: Summary of Mining Tenements

Title	Mining Tenement	Titleholder	Purpose	Grant Date	Expiry Date	Status
AL 32	Assessment Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	04/11/2020	03/11/2026	Granted
AL 33	Assessment Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	04/11/2020	03/11/2026	Granted
AL 34	Assessment Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	04/11/2020	03/11/2026	Granted
AUTH 72	Authorisation	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	08/03/1977	08/03/2027	Granted
EL 5291	Exploration Licence	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	28/04/1997	28/04/2029	Granted
EL 5292	Exploration Licence	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	28/04/1997	27/04/2028	Granted
EL 5417	Exploration Licence	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	23/12/1997	23/12/2024	Granted
EL 5418	Exploration Licence	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	23/12/1997	23/12/2028	Granted
EL 5606	Exploration Licence	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	11/08/1999	11/08/2029	Granted
EL 8175	Exploration Licence	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	23/09/2013	23/09/2026	Granted
EL 8821	Exploration Licence	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	13/02/2019	13/02/2025	Granted



Title	Mining Tenement	Titleholder	Purpose	Grant Date	Expiry Date	Status
(Part) CCL 708	Various Sub leases	Liddell Tenements Pty Ltd	Prospecting and Mining Coal	17/05/1990	17/05/2044	Granted
CCL 714	Consolidated Coal Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	23/05/1990	30/08/2030	Granted
CCL 755	Consolidated Coal Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	24/01/1990	05/03/2030	Granted
CL 327	Coal Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	06/03/1989	06/03/2031	Granted
CL 359	Coal Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	21/05/1990	21/05/2032	Granted
CL 360	Coal Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	29/05/1990	29/05/2032	Granted
CL 398	Coal Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	04/06/1992	04/06/2034	Granted
CL 584	Coal Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	01/01/1982	31/12/2044	Granted
CML 4	Consolidated Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	02/03/1993	03/06/2033	Granted
ML 1324	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	19/08/1993	19/08/2035	Granted
ML 1337	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	01/02/1994	01/02/2034	Granted
ML 1359	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	01/11/1994	1/11/2036	Granted
ML 1406	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	27/02/1997	10/02/2027	Granted
ML 1428	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	15/04/1998	14/04/2040	Granted
ML 1465	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	21/02/2000	21/02/2042	Granted
ML 1474	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	24/11/2000	23/11/2042	Granted



Title	Mining Tenement	Titleholder	Purpose	Grant Date	Expiry Date	Status
ML 1482	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	19/03/2001	19/03/2040	Granted
ML 1500	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	21/12/2001	20/12/2043	Granted
ML 1526	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	03/12/2002	02/12/2044	Granted
ML 1560	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	28/01/2005	27/01/2026	Granted
ML 1589	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	02/11/2006	01/11/2027	Granted
ML 1622	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	22/10/2010	10/03/2027	Granted
ML 1634	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	31/07/2009	31/07/2030	Granted
ML 1682	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	16/12/2012	15/12/2033	Granted
ML 1704	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	05/12/2014	05/12/2035	Granted
ML 1705	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	17/12/2014	17/12/2035	Granted
ML 1706	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	09/12/2014	09/12/2035	Granted
ML 1707	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	09/12/2014	09/12/2035	Granted
ML 1710	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting and Mining Coal	22/12/2016	10/03/2027	Granted
ML 1732	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	06/04/2016	06/04/2037	Granted
ML 1734	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	06/04/2016	06/04/2037	Granted
ML 1748	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	05/12/2016	04/12/2037	Granted



Title	Mining Tenement	Titleholder	Purpose	Grant Date	Expiry Date	Status
ML 1753	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	19/04/2017	19/04/2038	Granted
ML 1810	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	04/11/2020	04/11/2041	Granted
ML 1811	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	04/11/2020	04/11/2041	Granted
ML 1840	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	03/11/2022	03/11/2043	Granted
ML 1841	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	3/11/2022	03/11/2043	Granted
ML 1849	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	16/05/2023	16/05/2044	Granted
ML 1867	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	16/11/2023	16/11/2044	Granted
ML 1869	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	15/12/2023	15/12/2044	Granted
ML 1870	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities (Mining Purposes)	15/12/2023	15/12/2044	Granted
ML 1871	Mining Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Ancillary Mining Activities	15/12/2023	15/12/2044	Granted
AL 32	Assessment Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	04/11/2020	03/11/2026	Granted
AL 33	Assessment Lease	Coal & Allied Pty Ltd and Anotero Pty Ltd	Prospecting	04/11/2020	03/11/2026	Granted

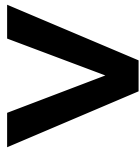
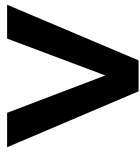


Table 3-3: HVO Licences and Permits

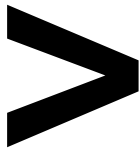
Type	Licence Number	Description	Authority	Expiry Date
Environment Protection Licence	EPL640	Environment Protection Licence	EPA	N/A
Licence to Store Explosives	XSTR200117	Licence to Store	SafeWork	02/05/2026
Radiation Licence	RML5085293	Radiation Management Licence	EPA	14/11/2024
Aboriginal Heritage Permit	C0001890	Care Agreement	NSW DCCEEW	03/06/2036
	C0002193	Aboriginal Heritage Impact Permit	NSW DCCEEW	06/12/2026
	5219	Aboriginal Heritage Impact Permit	NSW DCCEEW	12/06/2025
Road Closure Permit	1543350	Road Occupancy Licenses– Golden Highway	RMS	30/06/2024
	N/A	Road Closure Approval - Lemington Road	Singleton Council	30/06/2024

Table 3-4: Water Related Approvals

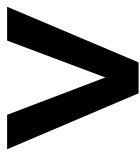
Licence Number	Type of Licence	Purpose	Legislation	Description	Expiry Date
20BL030566	Bore	Well	Part 5 Water Act 1912	East Open Cut	Perpetuity
20BL141584	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Carrington Work Licence	Perpetuity
20BL166637	Bore	Monitoring Bore	Part 5 Water Act 1912	No Current Bores	Perpetuity
20BL168820	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Bores: CGW39, CGW45a, CGW46, CGW47, CGW47a, CGW48, CGW49, P50/38.5, CGW56, 4036C, 4035P, 4032P, 4034P, 4033P, 4053P, 4052P, 4051C, 4040P, 4038C, 4037P  Destroyed: CGW7, CGW50, CGW57, CGW58, CGW59, CGW60, CGW61, CGW62, CGW63	Perpetuity
20BL169241	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Bores: DM1, HF3, HF7  Destroyed: DM2	Perpetuity



Licence Number	Type of Licence	Purpose	Legislation	Description	Expiry Date
20BL169641	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Bores: CGW5, CGW51A, CGW52, CGW53, CGW54, CGW55A, CGW53A, CGW52A, CGW54A, CGW6, CFW55, CFW57, CFW57A, CFW59, and CFW55R.  Destroyed: CGW1, CGW2, CGW3, CGW5, CGW8, CGW9, CGW10, CGW12, CGW13, CGW14, CGW30, CGW33, CGW34, CGW35, CGW36, CGW37, CGW38, CGW40, CGW41, CGW42, CGW43, CGW44, CFW56, CFW56A, CFW58	Perpetuity
20BL170496	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ10 (CHPZ 2A), BZ11 (CHPZ 3A), BZ18 (CHPZ 10A), BZ20 (CHPZ 12A), BZ21 (CHPZ 13D), BZ21A (CHPZ 13A), BZ20A (CHPZ 12D), BZ11A (CHPZ 3D)  Destroyed: AP50/47.5, AQ52, AV50/56.5, AS50/62.5, AR55, Bunc 3, BZ25 (Bunc 12), BZ23 (Bunc 14), BZ24 (Bunc 13),	Perpetuity
20BL170497	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ15 (CHPZ 7A), BZ16 (CHPZ 8D), BZ17 (CHPZ 9A), BZ19 (CHPZ 11A), BZ16A (CHPZ 8A), Bunc 46D  Destroyed: Bunc 39 (Shallow & Deep), Bunc 44D	Perpetuity
20BL170498	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ12 (CHPZ 4A), BZ13 (CHPZ 5A), BZ14, BZ9 (CHPZ 1A), BC1, BC1a, BZ8-1, BZ8-2, BZ8-3, HG1, HG2, HG2a, HG3, S4, S6, BZ22 (CHPZ14D), BZ22A (CHPZ 14A), BZ5-1, BZ5-2  Destroyed: S2, S3, S9, S11	Perpetuity
20BL171423	Bore	Monitoring Bore	Part 5 Water Act 1912	E1.5	Perpetuity
20BL171424	Bore	Monitoring Bore	Part 5 Water Act 1912	Destroyed: GW9711	Perpetuity
20BL171425	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: GW9701, GW9710	Perpetuity
20BL171426	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: GW9702  Destroyed: D2(WH236)	Perpetuity
20BL171427	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: C335, C630 (BFS)	Perpetuity
20BL171428	Bore	Monitoring Bore	Part 5 Water Act 1912	D807	Perpetuity
20BL171429	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: B925 (BFS), C122 (BFS), C122 (WDH)	Perpetuity
20BL171430	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: C613 (BFS), C809 (GM/WDH)	Perpetuity

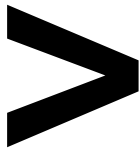


Licence Number	Type of Licence	Purpose	Legislation	Description	Expiry Date
20BL171431	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: B631 (BFS), B631 (WDH)	Perpetuity
20BL171432	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: C130 (AFSH1), C130 (ALL), C130(BFS), C130 (WDH)	Perpetuity
20BL171433	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bore B334 (BFS)	Perpetuity
20BL171434	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: C317 (BFS), C317 (WDH)	Perpetuity
20BL171435	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ3-1, BZ3-2, BZ3-3	Perpetuity
20BL171436	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ4A(1), BZ4A(2), BZ4B	Perpetuity
20BL171437	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: WG1, WG2, WG3	Perpetuity
20BL171439	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: BRN, E012	Perpetuity
20BL171492	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: C1(WJ039), GW9704, North, GWAR981	Perpetuity
20BL171681	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: Bunc 45A, Bunc 45D	Perpetuity
20BL171725	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: B425 (WDH), BRS, C621 (BFS), C919 (ALL), D317 (BFS), D317(ALL), D317(WDH) Destroyed: D420, D425, D621, PB02	Perpetuity
20BL171726	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: SR002, SR003, SR004, SR005, SR006, SR007	Perpetuity
20BL171727	Bore	Monitoring Bore	Part 5 Water Act 1912	SR001	Perpetuity
20BL171728	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ2B, BZ1-1, BZ1-2, BZ1-3, BZ2-1, BZ2-2	Perpetuity
20BL171762	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: C817, D010 (BFS), D214 (BFS), D406 (BFS) (AFS), D510 (BFS), PB01 (ALL), D510 (AFS), D010 (GM), D010 (WDH), D406 (BFS) (AFS), D612 (AFS), D612 (BFS)	Perpetuity
20BL171851	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North/South – Bores: HV2, PZ1CH200, PZ2CH400, PZ3CH800, 4118P, 4119P	Perpetuity
20BL171852	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – PZ4CH1380	Perpetuity
20BL171853	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – DM3	Perpetuity
20BL171854	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Bores: DM5, PZ6CH2450	Perpetuity



Licence Number	Type of Licence	Purpose	Legislation	Description	Expiry Date
20BL171855	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – PZ5CH1800	Perpetuity
20BL171856	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Bores: HV6, HV3, DM6, HV2 (2), 4113P, 4114P, 4116P, 4117P	Perpetuity
20BL171857	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: HV4, HV4 (2) (GA3), GA3,	Perpetuity
20BL171858	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – DM4	Perpetuity
20BL171895	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO West – Destroyed: NPZ4	Perpetuity
20BL171896	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO West – NPZ2	Perpetuity
20BL171897	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO West – Bores: NPZ1 Destroyed: NPZ5	Perpetuity
20BL171898	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO West – NPZ3	Perpetuity
20BL173062	Bore	Monitoring Bore	Part 5 Water Act 1912	RC14	Perpetuity
20BL173065	Bore	Monitoring Bore	Part 5 Water Act 1912	HQ11	Perpetuity
20BL173063	Bore	Monitoring Bore	Part 5 Water Act 1912	RC07, RC08	Perpetuity
20BL173064	Bore	Monitoring Bore	Part 5 Water Act 1912	RC06	Perpetuity
20BL173069	Bore	Monitoring Bore	Part 5 Water Act 1912	RC11	Perpetuity
20CA201247	Works Approval	Pumping Plant	Water Management Act 2000	Associated with WAL965	Perpetuity
20CA212713	Works Approval	Pumping Plant	Water Management Act 2000	Associated with WAL36190	30/05/2025
20FW213280	Flood Work Approval	Levee	Water Management Act 2000	HVO North Carrington Levee 5	21/09/2027
20FW213281 Formerly 20CW802613	Flood Work Approval	Levee	Water Management Act 2000	HVO South – Barry Levee	21/09/2027
20FW213277 Formerly 20CW802603	Flood Work Approval	Block Dam	Water Management Act 2000	HVO South – Hobden Gully Levee	21/09/2027
20FW213278 Formerly 20CW802604	Flood Work Approval	Levee	Water Management Act 2000	HVO North – North Pit Levee 3	21/09/2027

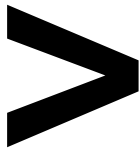




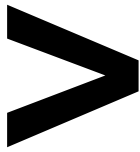
Licence Number	Type of Licence	Purpose	Legislation	Description	Expiry Date
20WA210991 (see WAL 18307) Formerly 20SL050903	Stream Diversion	Stream Diversion	Water Management Act 2000	HVO West – Parnells Creek Dam	09/01/2033
20WA211427 Formerly 20SL061290	Stream Diversion	Cutting (Diversion Drain)	Section 10 Water Act 1912	Pikes Gully Creek Stream Diversion	07/09/2033
20WA210985 (see WAL 18327) 20SL042746	Diversion Works	Industrial	Water Management Act 2000	HV Loading Point Pump Bayswater Creek	08/09/2032
20WA211428 20SL061594	Stream Diversion	Cutting (Diversion Drain)	Water Management Act 2000	HVO North – Carrington Stream Diversion	31/07/2032
20WA201238 (see WAL 962)	Diversion Works	Pumping Plant	Water Management Act 2000	HVCPP River Pump	16/03/2028
20WA201257 (see WAL 970)	Diversion Works	Pumping Plant	Water Management Act 2000	HVO South – LCPP River Pump	Perpetuity
20WA201338 (see WAL 1006)	Diversion Works	Pumping Plant	Water Management Act 2000	HVO South – LCPP River Pump	Perpetuity
20WA201501 (see WAL 1070)	Diversion Works	Pumping Plant	Water Management Act 2000	HVO South – LCPP River Pump	Perpetuity
20WA201685 (see WAL 13387)	Diversion Works	Pumping Plant	Water Management Act 2000	HVO West – "Lake Liddell" Licence	Perpetuity
20FW213274	Flood Work Approval	Levee	Water Management Act 2000	Riverview	26/10/2028

Table 3-5: Surface Water Access Licences 2022/23 Water Year

Licence Number	Description	Water Source	Water Sharing Plan	Water Source Management Zone	Entitlement (ML)	Passive Take / Inflows (ML)	Active Pumping (ML)	Total Take (ML)
WAL 867	Comleroi, farming & irrigation	Hunter River	Hunter Regulated River WSP	Zone 2a (Hunter River From Glennies Creek Junction To Wollombi Brook Junction)	486	0	0	0



Licence Number	Description	Water Source	Water Sharing Plan	Water Source Management Zone	Entitlement (ML)	Passive Take / Inflows (ML)	Active Pumping (ML)	Total Take (ML)
WAL 962	HVO North – HVCPP River Pump – Water Access Licence	Hunter River	Hunter Regulated River WSP	Zone 1b (Hunter River From Goulburn River Junction To Glennies Creek Junction)	3,165	0	0	0
WAL 969	HVO South – Former Riverview pump	Hunter River	Hunter Regulated River WSP	Zone 1b (Hunter River From Goulburn River Junction To Glennies Creek Junction)	39	0	0	0
WAL 970	HVO South – LCPP River Pump – Water Access Licence	Hunter River	Hunter Regulated River WSP	Zone 2a (Hunter River From Glennies Creek Junction To Wollombi Brook Junction)	500	0	0	0
WAL 1006	HVO South – LCPP River Pump – Water Access Licence	Hunter River	Hunter Regulated River WSP	Zone 2a (Hunter River From Glennies Creek Junction To Wollombi Brook Junction)	500	27	0	27
WAL 1070	HVO South - LCPP River Pump – Water Access Licence	Hunter River	Hunter Regulated River WSP	Zone 2a (Hunter River From Glennies Creek Junction To Wollombi Brook Junction)	500	0	0	0
WAL 13387	Macquarie Generation Hunter River Pump Station	Hunter River	Hunter Regulated River WSP	Zone 1b (Hunter River From Goulburn River Junction To Glennies Creek Junction)	20	0	0	0
WAL 13391	HVO North – Alluvial Rehabilitation Irrigation.	Hunter River	Hunter Regulated River WSP	Zone 1b (Hunter River From Goulburn River Junction To Glennies Creek Junction)	420 (525 ML with transfers)	0	0	0
WAL 18127	Carrington BB1	Hunter River Alluvium	Hunter Unregulated and Alluvial Water Sources WSP	Hunter Regulated River Alluvial Water Source – Upstream Glennies Creek management zone	383	361	0	361



Licence Number	Description	Water Source	Water Sharing Plan	Water Source Management Zone	Entitlement (ML)	Passive Take / Inflows (ML)	Active Pumping (ML)	Total Take (ML)
WAL 18158	Ollenberry	Hunter River Alluvium	Hunter Unregulated and Alluvial Water Sources WSP	Hunter Regulated River Alluvial Water Source – Upstream Glennies Creek management zone	65	0	0	0
WAL 18307	HVO West – Parnells Creek Dam (Diversion Works Bywash)	Unregulated River	Hunter Unregulated and Alluvial Water Sources WSP	Jerrys Water Source; Jerrys Management Zone	500	30	0	30
WAL 18327	HV Loading Point Pump Bayswater Creek (Diversion Works)	Unregulated River	Hunter Unregulated and Alluvial Water Sources WSP	Jerrys Water Source; Jerrys Management Zone	150	0	0	0
WAL 23889	Greenleek	Wollombi Brook	Hunter Unregulated and Alluvial Water Sources WSP	Lower Wollombi Brook Water Source	144	0	0	0
WAL 36190	HVO North, old farm bore	Hunter River Alluvium	Hunter Unregulated and Alluvial Water Sources WSP	Hunter Regulated River Alluvial Water Source – Jerrys Management Zone	120	0	0	0
WAL 41527	HVO North (Carrington Pit)	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP (commenced 1/7/16)	Permian Coal Seams	700	0	0	0
WAL 41533	HVO North – Pit Excavation	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP (commenced 1/7/16)	Permian Coal Seams	20	0	0	0

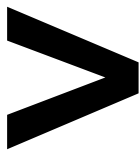


Table 3-6: Groundwater Access Licences

Licence Number	Description	Water Source	Water Sharing Plan (WSP)	Water Source – Management Zone	Entitlement (ML)	Passive Take / Inflows (ML)	Active Pumping (ML)	Total (ML)
WAL 39798	Lemington Underground (LUG) Bore	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP (commenced 1/7/16)	Permian Coal Seams	1,800	0	547	547
WAL 40462	HVO Pit Excavations / Alluvial Lands Bores (x4)	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP (commenced 1/7/16)	Permian Coal Seams	2,400	751	0	751
WAL 40463	HVO Pit Excavations / Alluvial Lands Bores (x4)	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP (commenced 1/7/16)	Permian Coal Seams	180	180	0	180
WAL 40466	HVO Pit Excavations / Alluvial Lands Bores (x4)	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP (commenced 1/7/16)	Permian Coal Seams	460	460	0	460
WAL 41527	HVO North – Carrington Pit	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP (commenced 1/7/16) Previously Water Act 1912	Permian Coal Seams	700	700	0	700



**3.1.2 | MANAGEMENT PLANS, PROGRAMS, STRATEGIES**

HVO is required by the site approvals to develop and submit a range of environmental management plans for approval prior to implementation. Approved management plans are made publicly available on the HVO website (<https://hvo.com.au/>).

Many updated plans have been submitted to DPHI. Some plans remain under review and will be submitted to DPHI in 2024. The status of management plans is shown in **Table 3-7** and **Table 3-8**.

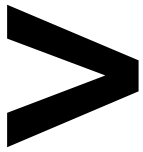
*Table 3-7: Management Plans Required for HVO North*

Management Plan	Date Approved	Date of Latest Version Submitted to DPHI
Agricultural Lands Reinstatement Management Plan*	20/06/2022	11/08/2023
Fine Reject Management Strategy	19/01/2023	-
HVO Air Quality and Greenhouse Gas Management Plan	12/09/2019	11/08/2023
HVO Blast Management Plan	03/04/2019	29/08/2023
HVO Bushfire Management Plan	N/A	N/A
HVO Environmental Management Strategy	08/01/2019	29/08/2023
HVO Noise Management Plan	16/12/2021	29/08/2023
HVO North Heritage Management Plan	09/02/2020	11/08/2023
HVO River Red Gum Rehabilitation & Restoration Strategy	19/05/2022	11/08/2023
HVO Water Management Plan	16/10/2018	29/08/2023
Final Void Management Plan	16/05/2022	-
Rehabilitation Management Plan and Forward Program**	N/A	N/A

\*The Agricultural Lands Reinstatement Management Plan states that the agricultural reinstatement activities and monitoring results will be reported in the HVO Annual Environment Review (Annual Review). However, work has not yet commenced hence no monitoring or reporting against the management plan specific to the Carrington West Wing project is provided in this report.

\*\*The Rehabilitation Management Plan and Forward Program is prepared in accordance with the provisions under the Mining Act 1992 and is not approved by DPHI.

N/A: Plan does not require approval by DPHI.



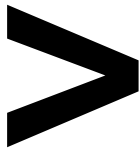
*Table 3-8: Management Plans Required for HVO South*

<b>Management Plan</b>	<b>Date Approved</b>	<b>Date of Latest Version Submitted to DPHI</b>
HVGC Amenity Management Plan	22/01/2013 (revision submitted 28/12/2021)	11/08/2023
HVO Air Quality and Greenhouse Gas Management Plan	12/09/2019	11/08/2023
HVO Biodiversity Offset Strategy	23/10/2017	-
HVO Blast Management Plan	03/04/2019	29/08/2023
HVO Bushfire Management Plan	N/A	N/A
HVO Environmental Management Strategy	08/01/2019	29/08/2023
HVO Integrated Biodiversity Management Plan	02/08/2018	11/08/2023
HVO Noise Management Plan	16/12/2021	29/08/2023
HVO River Red Gum Rehabilitation & Restoration Strategy	19/05/2022	11/08/2023
HVO South Aboriginal Cultural Heritage Management Plan	09/02/2020	11/08/2023
HVO Water Management Plan	16/10/2018	29/08/2023
Rehabilitation Management Plan and Forward Program**	N/A	N/A
Biodiversity Management Plan (offsets component)	26/06/2017- Goulburn River Biodiversity Area Management Plan***	-

\*\* The Rehabilitation Management Plan and Forward Program is prepared in accordance with the provisions under the Mining Act 1992 and is not approved by DPHI.

\*\*\* Is a component of a management plan managed by Mt Thorley Warkworth (MTW)

N/A: Plan does not require approval by DPHI.



## 4 | OPERATIONS SUMMARY

### 4.1 | MINING

Areas to be mined are geologically modelled, a mine plan is formed, and the relevant mining locations are surveyed prior to mining. The mining process is illustrated in **Figure 4-1**. There are no active underground workings at HVO.

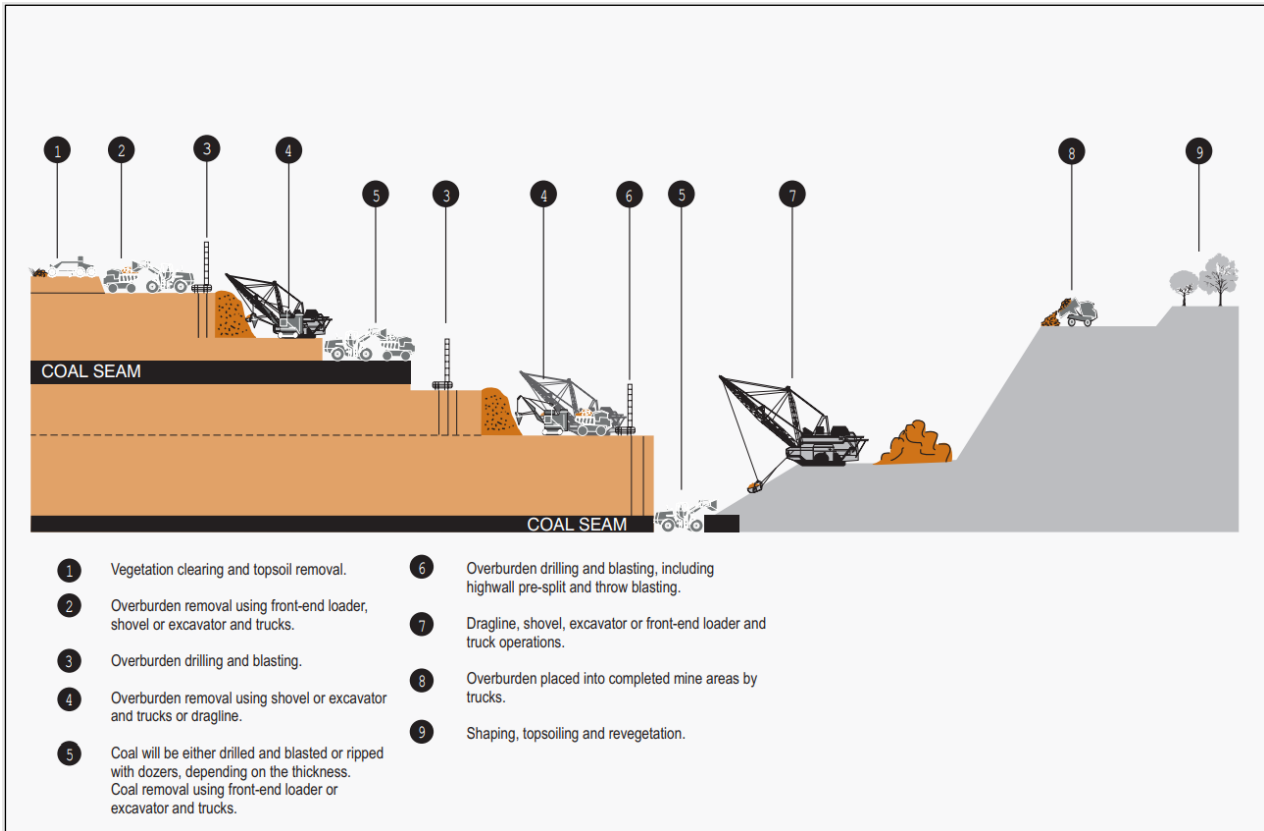


Figure 4-1: Open Cut Mining Schematic

HVO’s last dragline ceased operation in 2023, with material movement being replaced by truck and excavators. Mining progress deviated slightly from the schedule of the RMP as a result of normal variations in productivity and utilisation.

The mining equipment employed to carry out mining operations at HVO in 2022 and 2023 is detailed in **Table 4-1** along with the fleet forecast for 2024.



Table 4-1: HVO Equipment Used 2022-2023

Equipment Type	Number Used in 2022	Number Used in 2023	Forecast Numbers in 2024
Scrapers	2	2	2
Drills	8	9	9
Draglines	2	1	0
Shovels	3	3	3
Excavators	11	12	12
Trucks	86	99	99
Loaders	6	5	5
Service Trucks	4	6	6
Track Dozers	31	30	30
Rubber Tyre Dozers	4	4	4
Graders	11	12	12
Water Trucks	10	10	10
Floats	1	2	2
Cable Reeler	1	1	1
Cable Tractors	5	5	5
<b>Total</b>	<b>185</b>	<b>201</b>	<b>200</b>

**4.1.1 | MINERAL PROCESSING**

HVO generally operates two CHPPs – Hunter Valley and Howick. During 2023 coal was transported to the Hunter Valley CHPP where it was crushed to size and processed to remove impurities. Processing produces saleable coal, along with coarse and fine reject materials. Coarse rejects are disposed of in-pit and fine rejects are placed in a tailings dam in accordance with the RMP. Hunter Valley CHPP has storage facilities for processed (saleable) and raw (unprocessed) coal. The capacity of Hunter Valley CHPP and Howick CHPPs are listed in **Table 4-2**. Howick CHPP was not utilised during 2023 and upgrade works were undertaken.

No material changes or additions were made to Hunter Valley CHPP during the reporting period. Howick CHPP improvements will be outlined in the 2024 Annual Review.



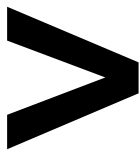


Table 4-2: Stockpile Capacities

Location	Raw Stockpile (t)	Saleable Stockpile (t)
Hunter Valley CHPP	200,000	330,000
Howick CHPP	80,000	30,000
Newdell Load Point	0	400,000

Processed, or product coal is transported to one of the two loading points via conveyor belt or road, detailed in **Table 4-3**. The coal from Hunter Valley CHPP (HVCHPP) is transported to the Hunter Valley Load Point (HVLP) by means of overland conveyor whereas coal from Howick CHPP is typically trucked to Newdell Load Point (NLP). After the coal has reached either HVLP or the NLP it is transported to the Port of Newcastle by rail.

Table 4-3: Methods of Coal Transportation

Transport Category	Quantity (Mt)
Coal transported from the site via trains	10.4
Amount of coal received from Hunter Valley Operations South of the Hunter River	6.9
Amount of coal hauled by road to the Hunter Valley Loading Point	Nil
Coal hauled by road to the Newdell Load Point	Nil
Amount of coal hauled by road from the Newdell Loading Point to the Ravensworth Coal Terminal	Nil
Amount of coal hauled by road from the Hunter Valley Loading Point to the Ravensworth Coal Terminal	Nil
Number of coal haulage truck movements generated by the development. (Includes -coal hauled to stockpile, coal hauled to bins, coal hauled from stockpile to bins)	135,551 (truck movements)

### 4.1.2 | PRODUCTION STATISTICS

Project approvals allow for the extraction of up to 22 million ROM tonnes from operations north of the Hunter River and 20 million ROM tonnes from operations south of the Hunter River. A summary of production and waste at HVO during 2023 in comparison to previous years and approval limits is provided in **Table 4-4**.

Product coal includes low-ash, semi-soft and steaming coals.



Table 4-4: Production Statistics and Correlating Project Approval Limits

	Approved Limit (PA 06_0261 and DA 450-10-2003)	Reporting Period 2022	Reporting Period 2023	Forecast for 2024
Prime Waste (Mbcm)	-	71.44	94.72	110.03
ROM Coal (Mtpa) (mined)	42	11.94	15.28	17.26
- HVO South	20	7.55	8.63	7.75
- West Pit	12	4.38	6.66	9.51
- Carrington Pit	10	0	0	0
Coarse Reject (Mt)	-	2.31	2.69	3.5
Fine Reject-Tailings (Mt)	-	1.38	1.36	1.29
Product (Mtpa)	-	9.63	10.52	12.77
ROM Coal Processed	26	13.68	13.77	17.34
- Hunter Valley CHPP	20	12.42	13.77	16.26
- Howick CHPP	6	1.26	0	1.08

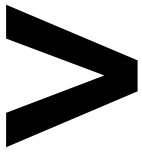
### 4.1.3 | SUMMARY OF CHANGES

The below changes occurred in 2023:

- Production numbers throughout 2023 increased compared to 2022 due to mine plan and improved weather conditions. Mining in 2022 was impacted by higher than average rainfall and flooding.
- Mining in the Carrington West Wing location has not yet commenced. As of the time of reporting, mining in this area is not planned to commence during 2024.
- Only one dragline was in use during 2023.
- The Howick CHPP was not in use during 2023.
- Tailings emplacement continued in the Carrington tailings storage facility in 2023.

### 4.2 | FORECAST OPERATIONS FOR NEXT REPORTING PERIOD

Table 4-5 outlines the forecast operations for the next reporting period.



*Table 4-5: Production Operations Forecast*

<b>Material</b>	<b>Unit</b>	<b>2023 (Forecast)</b>	<b>2023 (Actual)</b>	<b>2024 Forecast</b>	<b>2025 Forecast</b>
Stripped Topsoil	kbcm	89.86	89.75	172.0	93.0
Rock / Overburden	Mbcm	99.16	99.41	112.50	108.99
ROM Coal	Mt	15.28	15.28	17.26	19.73
Reject Material	Mt	4.14	4.05	4.49	4.70
Product	Mt	10.39	10.52	12.77	15.02

## 5 | ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

DPHI responded to HVO on 19 June 2023 accepting the 2022 HVO Annual Review. DPHI did not require any changes to the 2022 Annual Review, however a request for future Annual Reviews was made, as detailed in **Table 5-1**.

*Table 5-1: Actions Recommended in Previous Annual Review and Action Taken*

<b>Action Requested by DPHI</b>	<b>Action Taken By HVO</b>
The Department requests that future Annual Reviews include a comprehensive list of Air Quality data miscapture reporting. No table was presented in the AR 2022 detailing HVAS TSP data miscaptures	Miscaptures are detailed in Section 6.4.



## 6 | ENVIRONMENTAL PERFORMANCE

### 6.1 | METEOROLOGICAL DATA

The collection of meteorological (weather) data is carried out to assist in day-to-day operational decisions, planning, environmental management and to maintain a historic record. The meteorological stations record:

- wind speed
- wind direction
- temperature
- humidity
- solar radiation
- rainfall

HVO operates two real-time meteorological stations; the HVO Corporate Meteorological Station and the Cheshunt Meteorological Station. The locations of these monitors are shown in **Figure 6-2**. Daily average data is publicly available via the Monthly Environmental Monitoring Reports published on the HVO website.

Total annual rainfall for 2023 was 459.0mm (recorded at the HVO Corporate Meteorological Station) compared to 1047.2mm in 2022 and 910.2mm in 2021. (**Figure 6-1**).

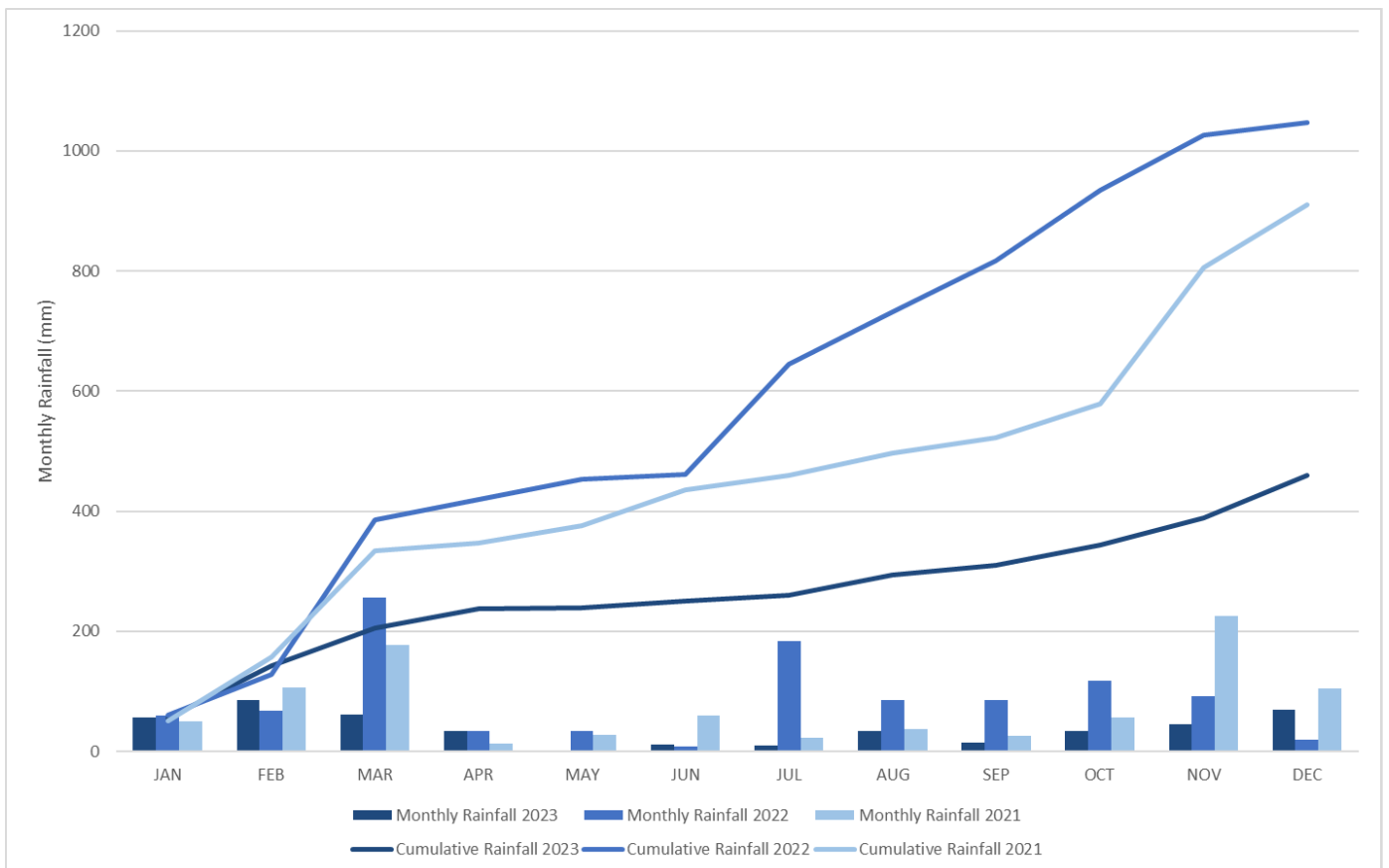


Figure 6-1: HVO Corporate Meteorological Station 2021 – 2023 Rainfall Data



## 6.2 | NOISE

### 6.2.1 | NOISE MANAGEMENT

Mining activities at HVO are managed to minimise adverse noise impacts and to maintain compliance with permissible noise limits at nearby private residences. A combination of proactive and reactive noise controls are employed to ensure effective management of noise. Noise controls are as detailed in the HVO Noise Management Plan (NMP).

### 6.2.2 | SOUND ATTENUATION OF HEAVY EQUIPMENT

All haul trucks at HVO have been fitted with sound attenuation kits. New equipment brought to site arrives sound attenuated or is scheduled for retrofitting prior to operation.

Onsite sound power level testing was completed on thirty (30) heavy vehicles during 2023. HVO acquired thirty-four (34) new heavy vehicles during 2023, all of which achieved compliance in accordance with site power testing requirements. Routine sound power level testing will be completed according to a schedule to ensure compliance throughout 2024.

### 6.2.3 | REAL TIME NOISE MANAGEMENT

HVO operates a network of directional real-time noise monitors to measure and manage noise emissions and to minimise community impact.

The real-time system generates alarms when elevated noise is measured, triggering the implementation of reactive controls to reduce noise levels. HVO received and responded to 1146 noise alarms during 2023. Noise alarm triggers are based on internally set noise criteria. Alarms received include noise exceedances from other mines and non-mine sources. HVO recorded over 118 hours of equipment downtime for the management of noise during 2023. The location of real-time noise monitoring locations as per the approved NMP are shown in **Figure 6-2**. The Barnowl monitor at Moses Crossing experienced intermittent outages which have become more prevalent due to deteriorating software and hardware. A replacement monitor will be installed in 2024 and in the interim HVO will look to share United Wambo JV's monitor to manage operational noise in this area.

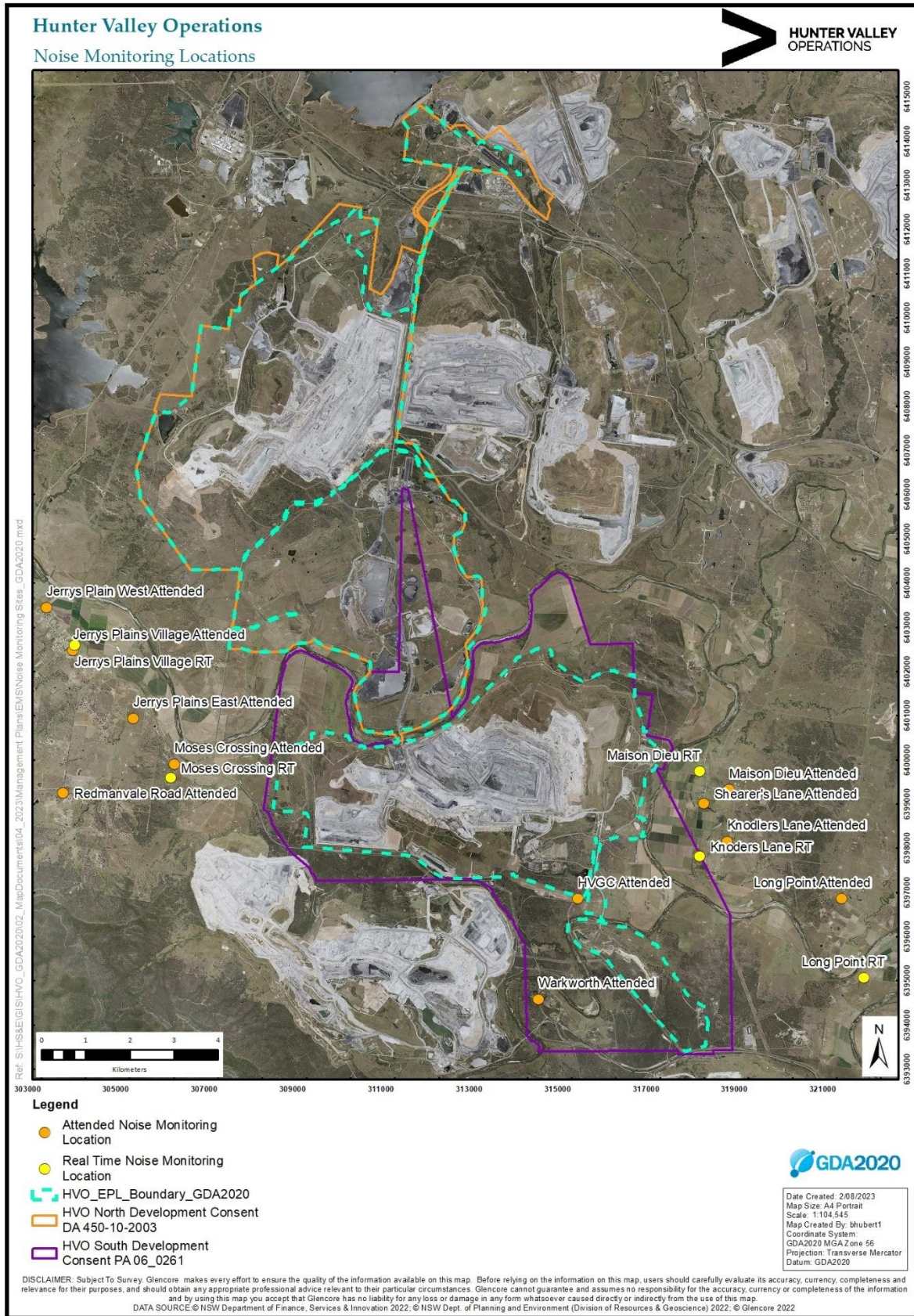


Figure 6-2: HVO Attended and Real Time Noise Monitoring Locations



Attended monitoring during 2023 was compared to real time noise monitoring results where a comparison could be made (e.g., where HVO was audible) in order to validate real time noise monitoring systems. Where comparisons were able to be made, results indicated that the real time monitoring system generally recorded higher attended noise measurements than attended monitoring. Comparisons were not able to be made for a majority of measurements due to low/inaudible noise from HVO than attended noise measurements.

Details of this assessment is provided in **Table 6-1**.

Table 6-1: Comparison of Attended and Real Time Noise Monitoring During 2023

Monitoring Location	Number of attended noise measurements where comparison could be made <sup>1</sup>		Real time measurements that aligned <sup>2</sup> with attended measurements		Real time measurements with positive variance > 3dB(A) of attended measurements		Real time measurements with a negative variance >3dB(A) of attended measurements	
	South	North	South	North	South	North	South	North
MaisonDieu	1	0	0	-	1	-	0	-
Knodlers Lane	3	0	2	-	1	-	0	-
Long Point	1	0	0	-	0	-	1	-
Kilburnie South	1	3	0	2	1	1	0	0
Jerrys Plains Village	1	6	1	2	4	0	0	0

Notes:

<sup>1</sup> Includes measurements under all meteorological conditions

<sup>2</sup> Aligned indicates measurements were within 3dB (A) of each other or measurement results <25dB indicated that source contribution was in audible or not measurable.

### 6.2.4 | OPERATIONAL NOISE PERFORMANCE

HVO engages a suitably qualified and experienced acoustic consultant to undertake routine attended noise compliance monitoring at nearby private residences to assess compliance with the relevant Project Approval and EPL noise criteria, in accordance with the HVO NMP. Monitoring is undertaken at a frequency of one night per month and an additional one night per quarter as required by the HVO North Approval. This monitoring is undertaken to evaluate and assess noise impacts under a range of meteorological conditions throughout the year.

A total of 120 measurements were recorded during 2023. Each measurement involves an assessment of HVO mine noise against the various  $L_{Aeq, 15\text{minute}}$  and  $L_{A1,1\text{min}}$  noise criteria in place under the HVO North and South Approvals. Full details for all noise assessments completed can be found in HVO Monthly Environmental Monitoring Reports published on the HVO website.

HVO was compliant with relevant noise criteria for all measurements recorded in 2023.

Comparison between the 2023  $L_{Aeq}$  attended noise monitoring results (maximum HVO contribution levels measured under applicable meteorological conditions) and previous years are shown in **Table 6-2**.

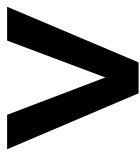


Table 6-2: Comparison of 2023 Noise Monitoring Results Against Previous Years

Year	Number of Measurements	Number of measurements which exceeded allowable noise (under applicable)	Number of non-compliances
2023	120	0	0
2022	120	0	0
2021	121	1	0
2020	110	0	0
2019	101	1	0
2018	105	3	0
2017	100	1*	0
2016	109	2*	0

\* The now superseded NSW Industrial Noise Policy (INP) allowed for the measured result to be less than or equal to 2 dB above the applicable noise limit without constituting a non-compliance. Note: Where the measured result is greater than 2dB above the applicable noise limit, the site has 75 minutes to reduce noise levels below applicable noise limits before constituting a non-compliance. As of late October 2017, the NSW INP was superseded by the Noise Policy for Industry (Npfi), with the requirements of this policy implemented in late 2017.

### 6.2.5 | COMPARISON WITH PREDICTIONS

Comparisons against the predicted noise levels in the Noise Impact Assessment (NIA) for HVO North prepared in October 2010 to support Modification 3 of the HVO North DA (450-10-2003). Noise predictions contained within the NIA do not correspond with specific meteorological conditions. Attended noise monitoring results have been compared directly to Year 5, mitigated, total noise predictions in the NIA for Carrington & West Pit under all meteorological conditions where noise criteria were applicable. This comparison is shown in **Table 6-3**.

Table 6-3: Comparison of 2023 Attended Noise Monitoring Against EIS Predictions

Location	Units	EIS Prediction	2023 max measured LAeq 15 min (under applicable met conditions)
Shearers Lane	dB(A)	27	Inaudible
Kilburnie South	dB(A)	37	33
Jerrys Plains	dB(A)	41	37
Jerrys Plains East	dB(A)	39	36
Jerrys Plains West	dB(A)	41	33

Comparison of measured results against the modelled predictions demonstrates noise levels lower than predicted at all monitoring locations.

Comparisons against the predicted noise levels in the HVO South Modification 5 Environmental Assessment have been made against Stage 2 modelling scenario (indicative of activities carried out during 2021), (Table 6.10 of Appendix E– Hunter Valley Operations South Modification 5 Approval Environmental Assessment Report Volume 2). The comparison (**Table 6-4**) indicates that noise during 2023 was equal to or lower than predicted levels for all receptors.



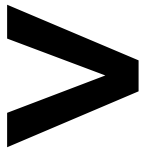


Table 6-4: Comparison of 2023 Monitoring Against HVO South (Stage 2 HVO South Modification 5 EA – 2017)

Location	Units	EIS Prediction (INP)	2023 max measured LAeq 15 min (under applicable met conditions)
Knodlers Lane	dB(A)	40	32
Maison Dieu	dB(A)	40	33
Shearers Lane	dB(A)	41	41
Kilburnie South	dB(A)	39	33
Jerrys Plains	dB(A)	34	32
Jerrys Plains East	dB(A)	36	35
Jerrys Plains West	dB(A)	32	27
Long Point	dB(A)	37	30



6.3 | BLASTING

6.3.1 | BLASTING MANAGEMENT

HVO operates a blast monitoring network to assess and evaluate blast vibration and overpressure impacts against the HVO North and HVO South Consent Criteria. There was 100% blast data capture for all blast monitors in 2023.

Monitors are located at or in close proximity to nearby privately owned residences as shown in Figure 2 in Appendix D of the HVO Blast Management Plan (HVO, 2019). The monitors function as regulatory compliance monitors. These monitors are located at:

- Jerrys Plains Village
- Warkworth
- Maison Dieu
- Moses Crossing
- Knodlers Lane

See **Figure 6-3** for the blast monitoring locations.

6.3.2 | BLASTING PERFORMANCE

236 blast events were initiated at HVO during the reporting period. 119 blasts were fired at HVO South, and 117 at HVO North. HVO complied with all blasting related consent and licence conditions. Air blast overpressure and ground vibration results for all blasts fired during the reporting period are presented in **Figure 6-4** to **Figure 6-8**.

There was one blast that recorded overpressure of 115.54 dB(L) at Jerrys Plains, however the percentage of blasts over 115 dB(L) was below the 5% of the total number of blasts criteria. There were no exceedances of the 5 mm/s ground vibration criteria at any residence on privately-owned land.

Blasting occurred only between the hours of 7am and 6pm Monday to Saturday and no blasting was carried out on Sundays or Public Holidays. No more than 3 blasts were fired per day and the maximum number of blasts fired during any week was nine (9), which is less than the maximum weekly blasting frequencies as specified in both project approvals.

HVO closed Lemington Road on 42 occasions for an average of 9.5 minutes, and the Golden Highway on 14 occasions for an average of 9.3 minutes. In addition, on two occasions the closure of Lemington Road and Golden Highway was initiated however was cancelled due to changes in operational requirements.

In accordance with PA 06\_0261, long term blast monitoring data has been reviewed to identify any trends in the monitoring data over the life of the project. Both ground vibration and overpressure monitoring results have remained generally consistent since monitoring commenced, with no increasing trends developing in the data. Notably in 2023 there was only one exceedance of 115 dB(L) air blast overpressure criteria.

See **Table 6-5** and **Table 6-6** for a review of long-term blasting data for both ground vibration and overpressure.

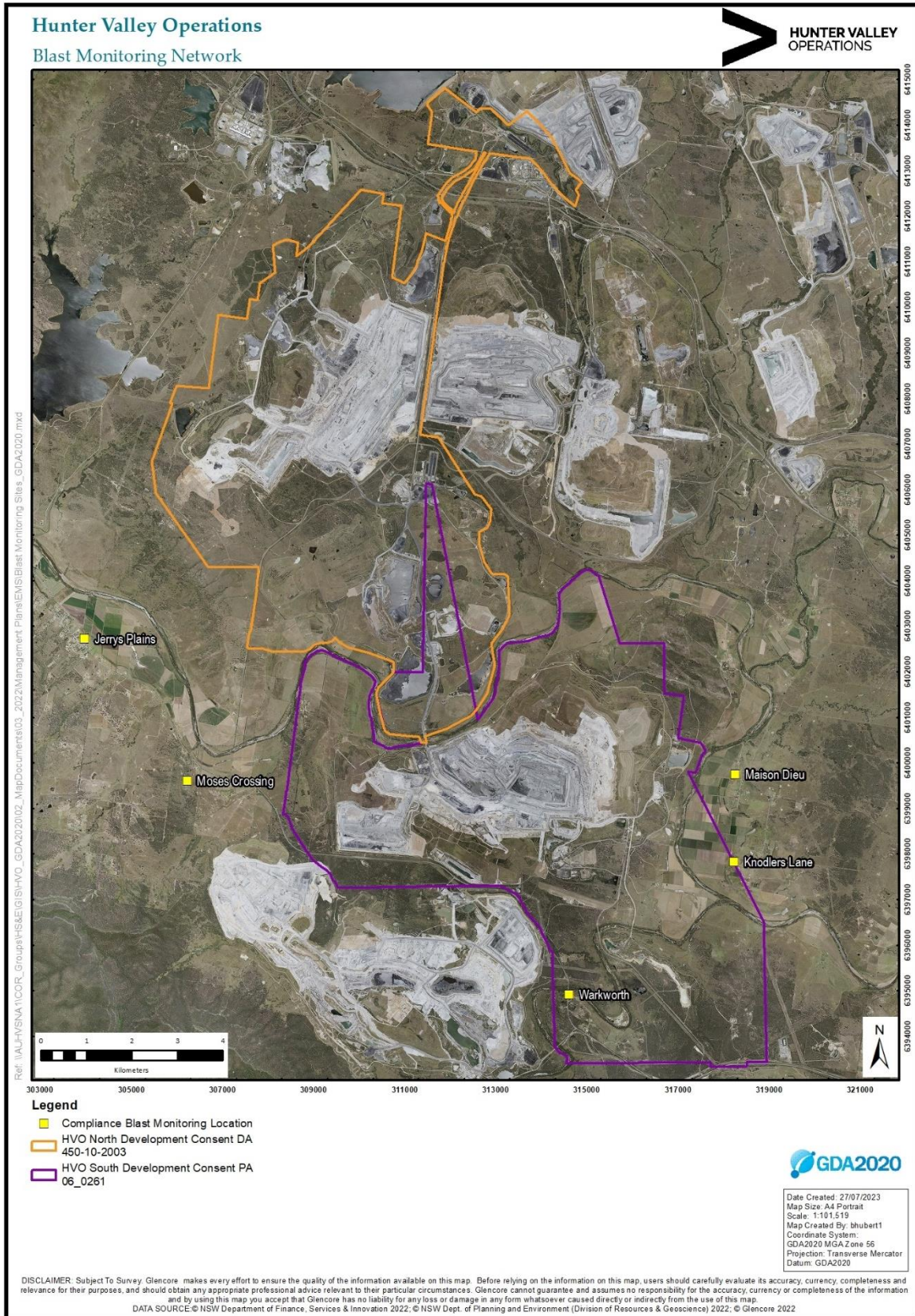
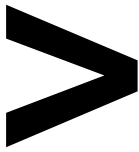


Figure 6-3: HVO Blast Monitoring Network

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<b>Owner:</b>	[Owner (Office)]	<b>Version:</b>	[Document Version (Office)]	<b>Review:</b>	[Planned Review Date]	



# REPORT | 2023 ANNUAL ENVIRONMENTAL REVIEW

Table 6-5: Recent Blasting Data Trends for HVO North

Monitoring Location	2021		2022		2023	
	Percentage of blasts over 115dB(L) (%)	Percentage of blasts >5mm/s (%)	Percentage of blasts over 115dB(L) (%)	Percentage of blasts >5mm/s (%)	Percentage of blasts over 115dB(L) (%)	Percentage of blasts >5mm/s (%)
Moses Crossing	0	0	0	0	0	0
Jerrys Plains	0	0	0	0	0	0
Warkworth	0	0	0	0	0	0
Maison Dieu	0	0	0	0	0	0
Knodlers Lane	0	0	0	0	0	0

Table 6-6: Recent Blasing Data Trends for HVO South

Monitoring Location	2021		2022		2023	
	Percentage of blasts over 115dB(L) (%)	Percentage of blasts >5mm/s (%)	Percentage of blasts over 115dB(L) (%)	Percentage of blasts >5mm/s (%)	Percentage of blasts over 115dB(L) (%)	Percentage of blasts >5mm/s (%)
Moses Crossing	0	0	0	0	0	0
Jerrys Plains	0	0	0	0	0.4	0
Warkworth	0	0	0	0	0	0
Maison Dieu	0	0	0	0	0	0
Knodlers Lane	0	0	0.8	0	0	0

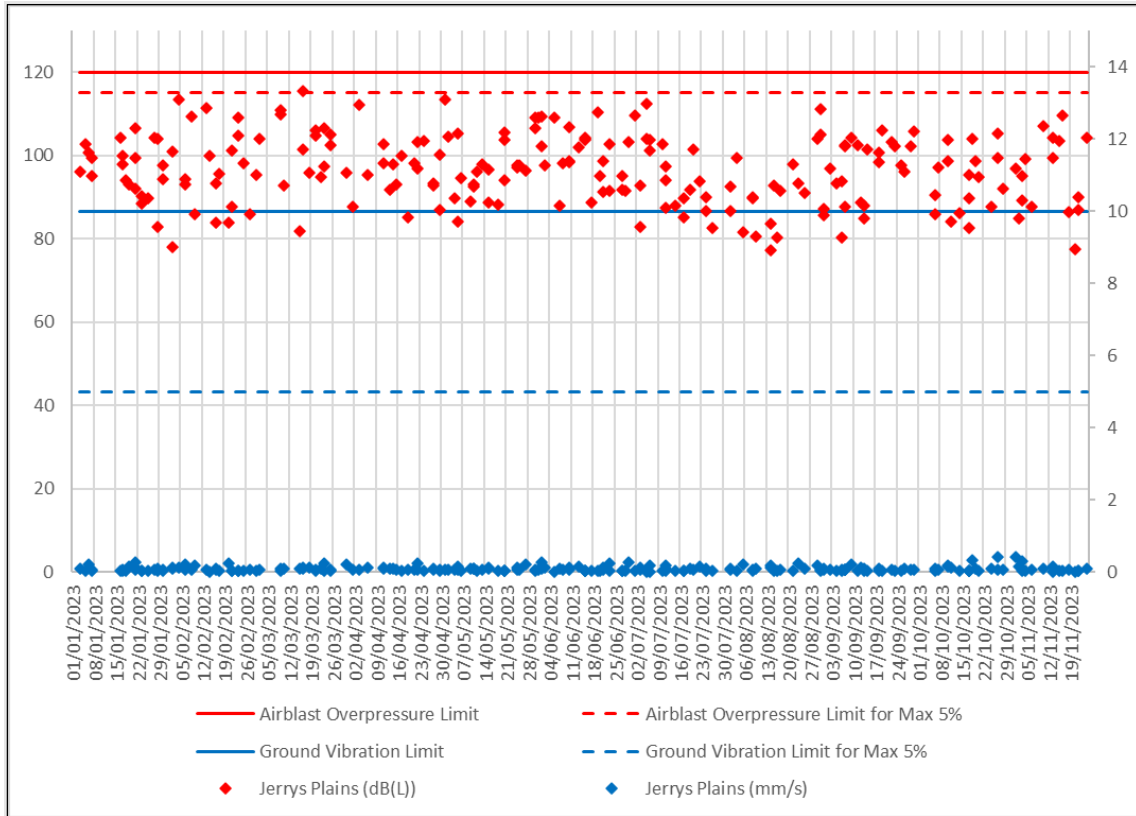
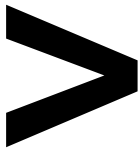


Figure 6-4: Jerrys Plains Blast Monitoring Results 2023

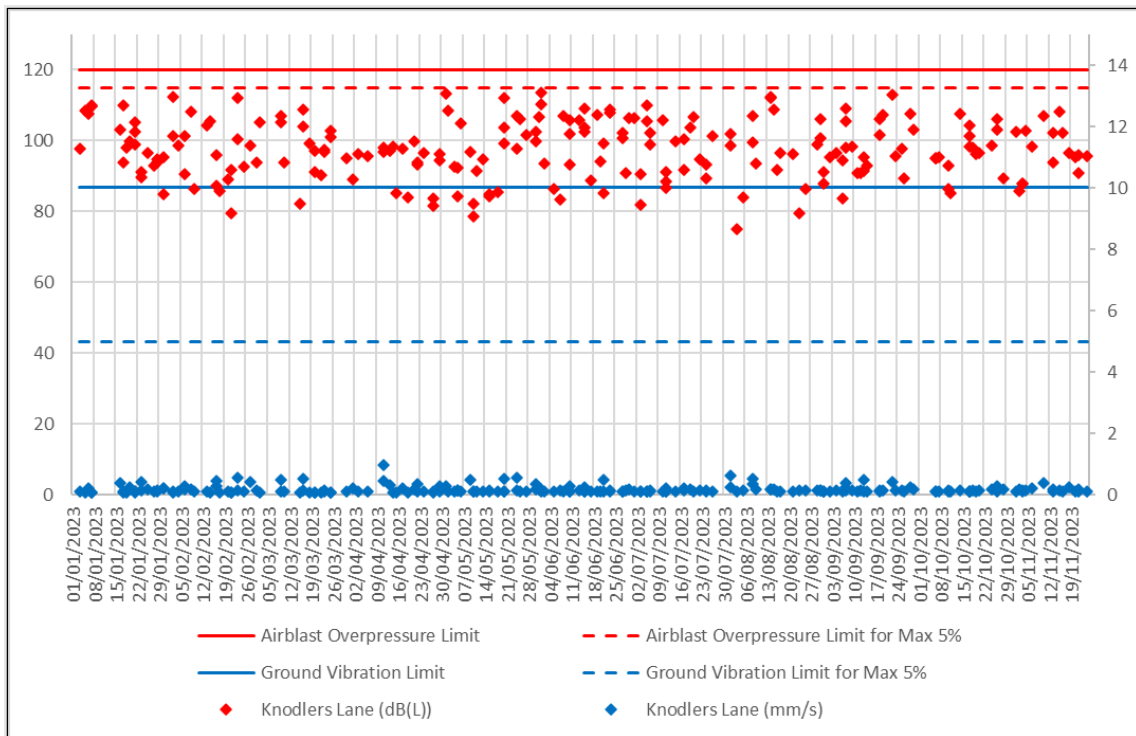


Figure 6-5: Knodlers Lane Blast Monitoring Results 2023

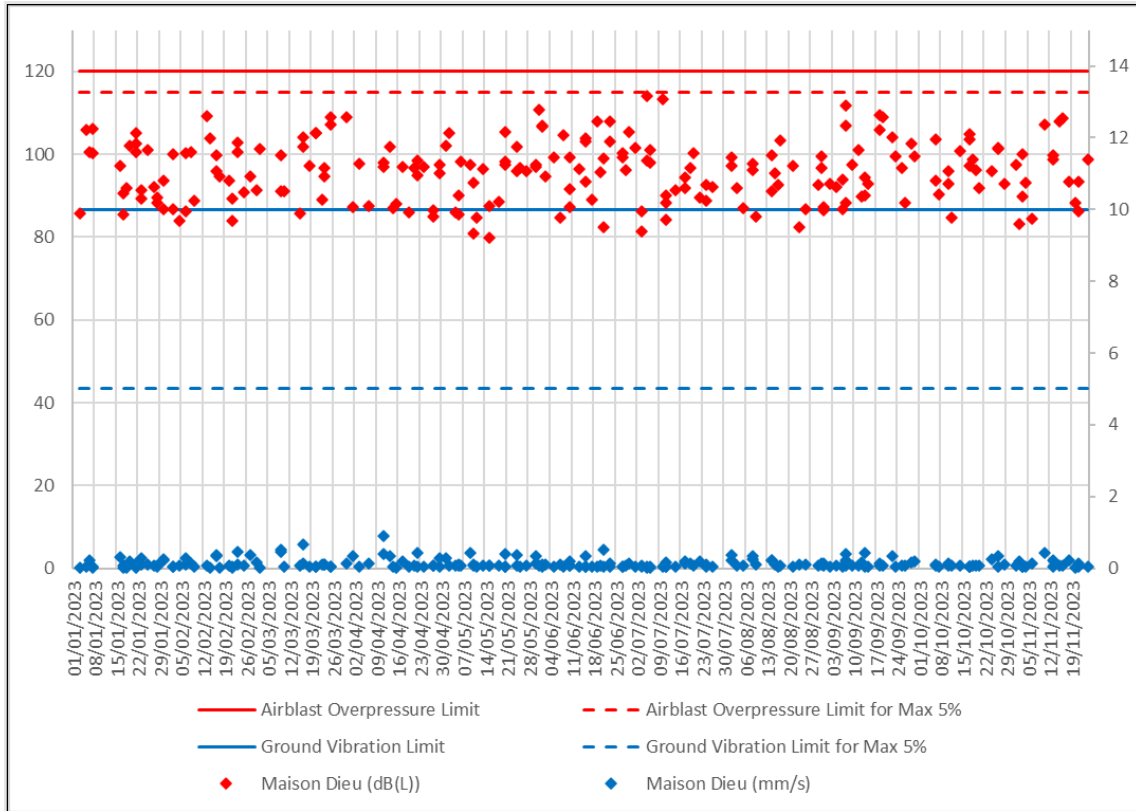


Figure 6-6: Maison Dieu Blast Monitoring Results 2023

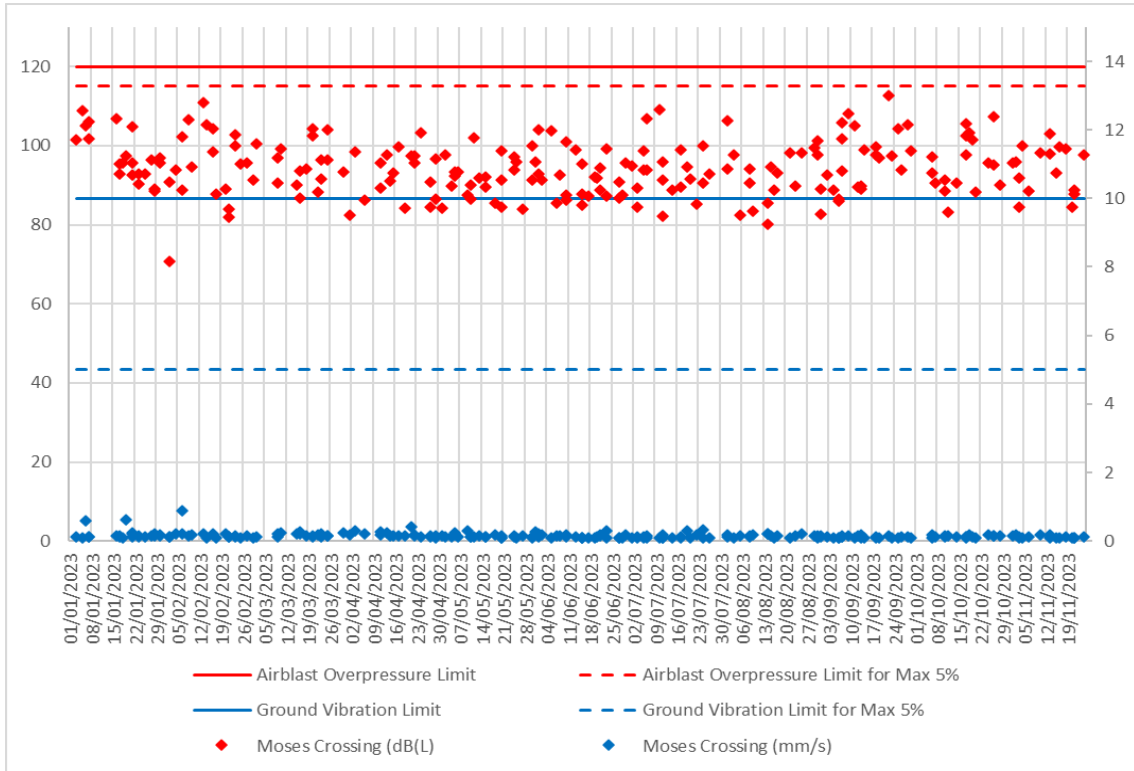
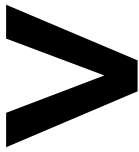


Figure 6-7: Moses Crossing Blast Monitoring Results 2023

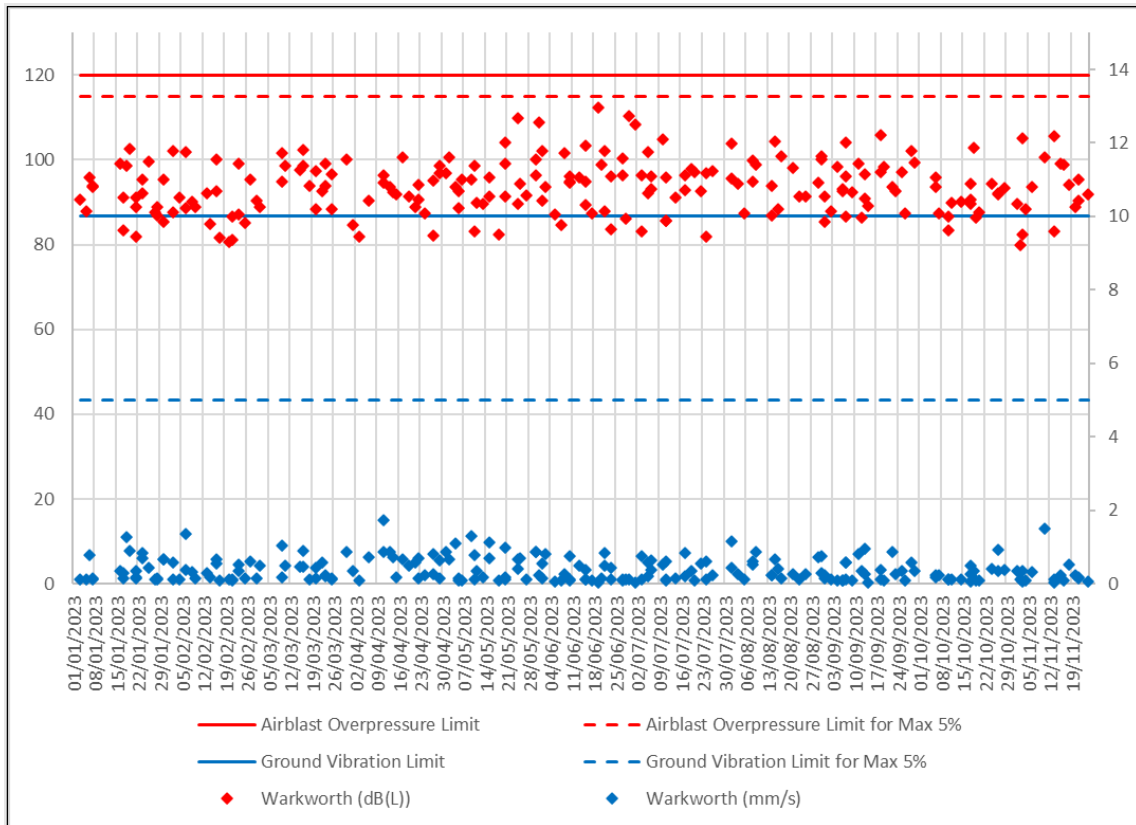
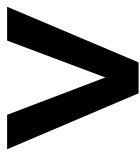


Figure 6-8: Warkworth Blast Monitoring Results 2023

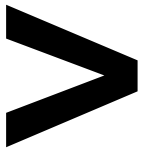
### 6.3.3 | BLAST FUME MANAGEMENT

Blasting operations at HVO are undertaken in accordance with the HVO Post Blast Fume Generation Mitigation and Management Plan. The plan outlines the practices to be utilised to reduce the risk of generation of post blast fume and reduce potential offsite impact from any fume which may be produced. This includes specialised blasting design, appropriate product selection, on-bench water management, implementation of fume management zones and use of existing blasting permissions to identify likely path of any fume which may be produced and restrictions on firing.

All blasts are observed for fume and any fume produced is ranked according to the Australian Explosive Industry & Safety Group (AEISG) Scale.

Fume rankings for shots fired during 2023 and comparison to previous years is provided in **Table 6-7**. There was a marginal increase in Category 3 and 4 blast fume events in 2023 compared to 2022. This included a blast in the Mitchell Pit on 9 September 2023 that produced blast fume ranked Level 4B. While this is not considered to be a significant departure from the trend, an investigation has been ongoing to identify any causes that could be rectified. Overall number of fume events was consistent with 2022.





*Table 6-7: Visible Blast Fume Ranking According to the AEISG Colour Scale*

<b>AEISG Ranking</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
0	214	202	160	170	212	218
1	19	39	22	45	52	43
2	16	15	27	27	30	23
3	4	4	0	3	4	6
4	0	0	0	1	0	1
5	0	0	0	0	0	0
<b>Total*</b>	<b>253</b>	<b>260</b>	<b>209</b>	<b>246</b>	<b>298</b>	<b>291</b>

\* Where a number of individual blasts were fired as a blast event, fume was assessed for each individual blast pattern rather than for the event as a whole.



## 6.4 | AIR QUALITY

### 6.4.1 | AIR QUALITY MANAGEMENT

Air quality management initiatives are implemented at HVO to ensure that:

- Air quality impacts on surrounding residents are minimised;
- All statutory requirements are adhered to; and
- Local community and regulators are kept informed through prompt and effective response to issues and complaints.

Air quality control mechanisms employed at HVO are described in detail in the *Hunter Valley Operations Air Quality and Greenhouse Gas Management Plan (AQGGMP)*, publicly available via the HVO website.

HVO continued to implement operational controls to manage dust emissions in accordance with the AQGGMP. An improvement programme commenced for West Pit to further mitigate dust emissions including reintroduction of chemical dust suppressants, trialling mobile irrigation systems, improving the standard of dust inspections and conducting dust TARP training with the workforce.

### 6.4.2 | AIR QUALITY MONITORING

Air quality monitoring at HVO is undertaken in accordance with the HVO Air Quality Monitoring Program (AQMP). An extensive network of monitoring equipment is utilised to assess performance against the relevant conditions of HVO’s approvals. Air quality monitoring locations are shown in **Figure 6-9**. Air quality monitoring data is made publicly available through the HVO Monthly Environmental Monitoring Report, available on the HVO website.

### 6.4.3 | AIR QUALITY PERFORMANCE

#### 6.4.3.1 | REAL TIME AIR QUALITY MANAGEMENT

HVO’s real time air quality monitoring stations continuously log information and transmit data to a central database, generating alarms when particulate matter levels exceed internal trigger limits to guide the operational management of air quality on site.

A total of 3,150 real time alarms for air quality and meteorological conditions were received and acknowledged during 2023, which is an increase from 551 alarms recorded during 2022. This increase is likely due to the decrease in wet weather days recorded across site in 2023.

In response, 7,013 hours of equipment downtime was recorded due to air quality management. A detailed breakdown of air quality related equipment stoppages (per month, per equipment type) presented in **Figure 6-10**. Note that these delays are instances where operations were completely stopped and does not include occasions where operations were changed/modified but not stopped (e.g. changed from exposed dump to in-pit dump).

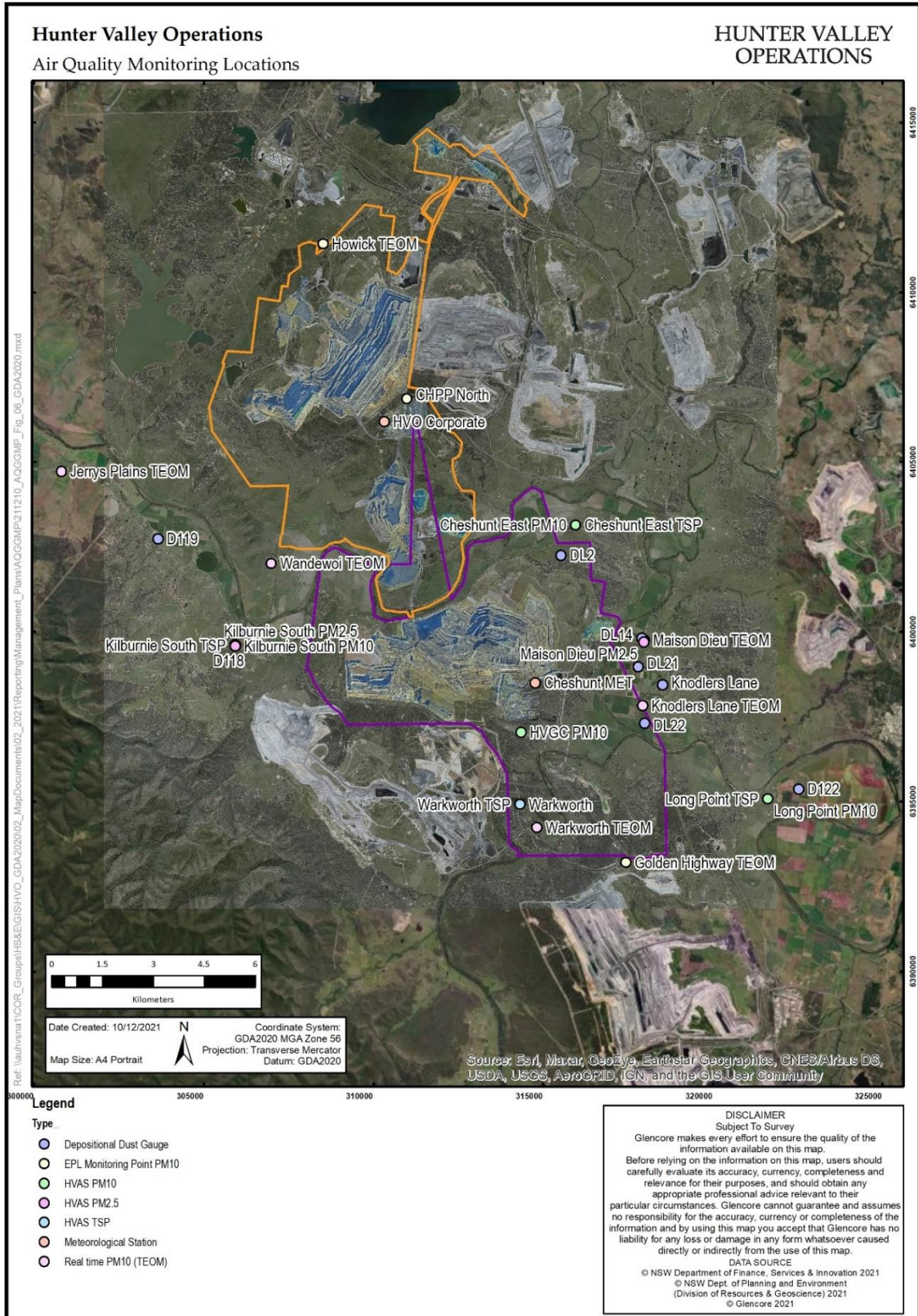
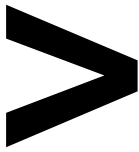


Figure 6-9: Air Quality Monitoring Locations

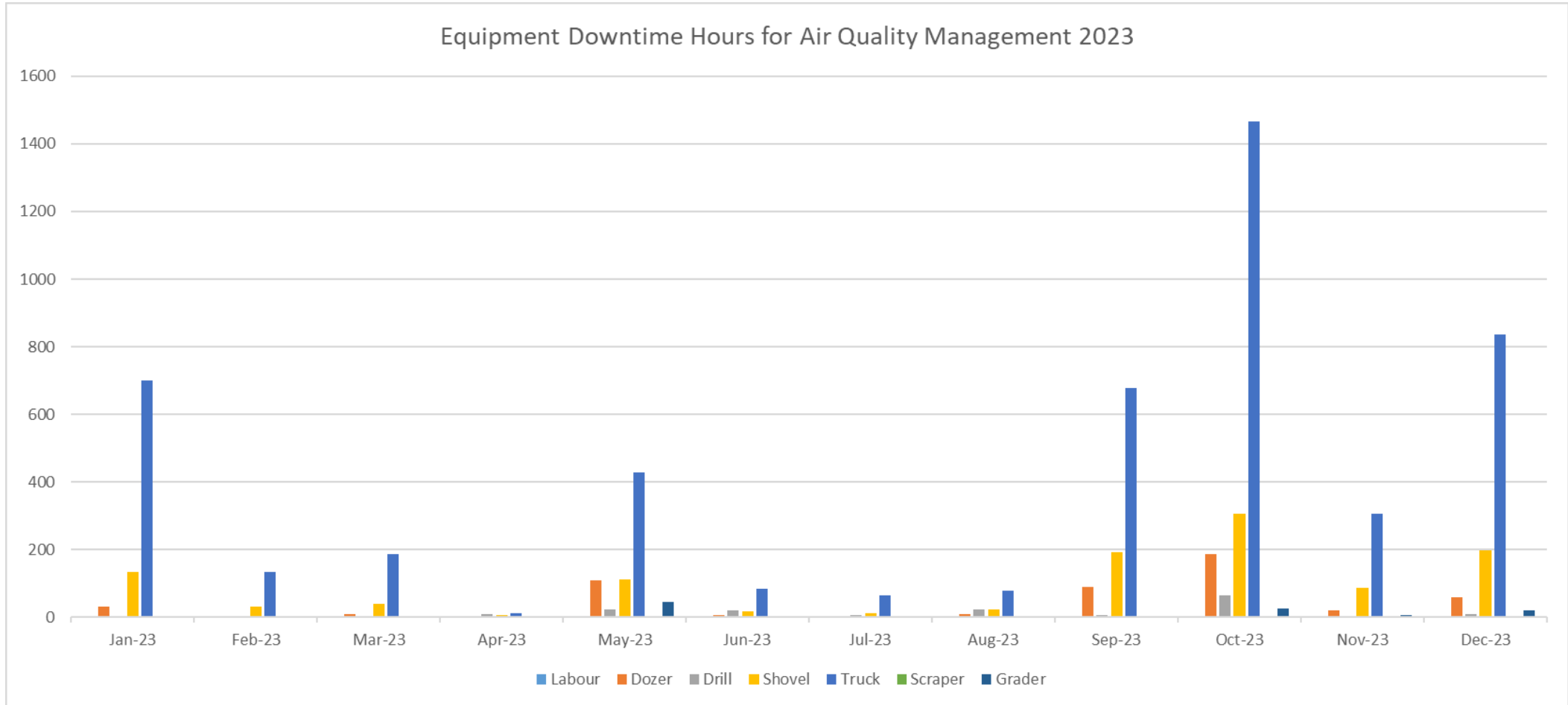
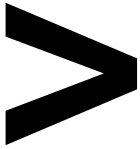


Figure 6-10: Equipment Downtime Hours for Air Quality Management 2023



Data availability from HVO’s real time air quality monitoring stations is presented in **Table 6-8**. There was high data availability across the network with common reasons for data mis-captures being data-logger and air pump issues.

*Table 6-8: Real Time PM<sub>10</sub> Air Quality Monitoring Data Availability 2023*

<b>Monitoring Location</b>	<b>2023 Data Availability</b>
Warkworth	97.8%
Knodlers Lane	98.9%
Maison Dieu	96.7%
Howick	97.3%
CHPP North	96.2%
Wandewoi	97.8%
Golden Highway	96.2%
Jerrys Plains	99.2%

*Note: Data availability calculated across 2023 is based on availability of a 24-hour average result. Greater than 75% data capture is required to record a 24hr average result.*

**6.4.3.2 | TEMPORARY STABILISATION**

Aerial Seeding was undertaken on 13 July 2023 by fixed wing aircraft to provide temporary cover to areas exposed to wind generated dust and erosion at HVO. Waste dumps and exposed areas were selected for seeding if they were not planned to be disturbed within six months. A total area of 399.5 ha was seeded which included waste dumps ahead of mining re-disturbance (**Figure 6-11**). All areas were seeded using an exotic pasture and legume mix suitable for autumn sowing. A starter fertiliser was mixed with the seed prior to loading to provide sufficient nutrients for plant growth.

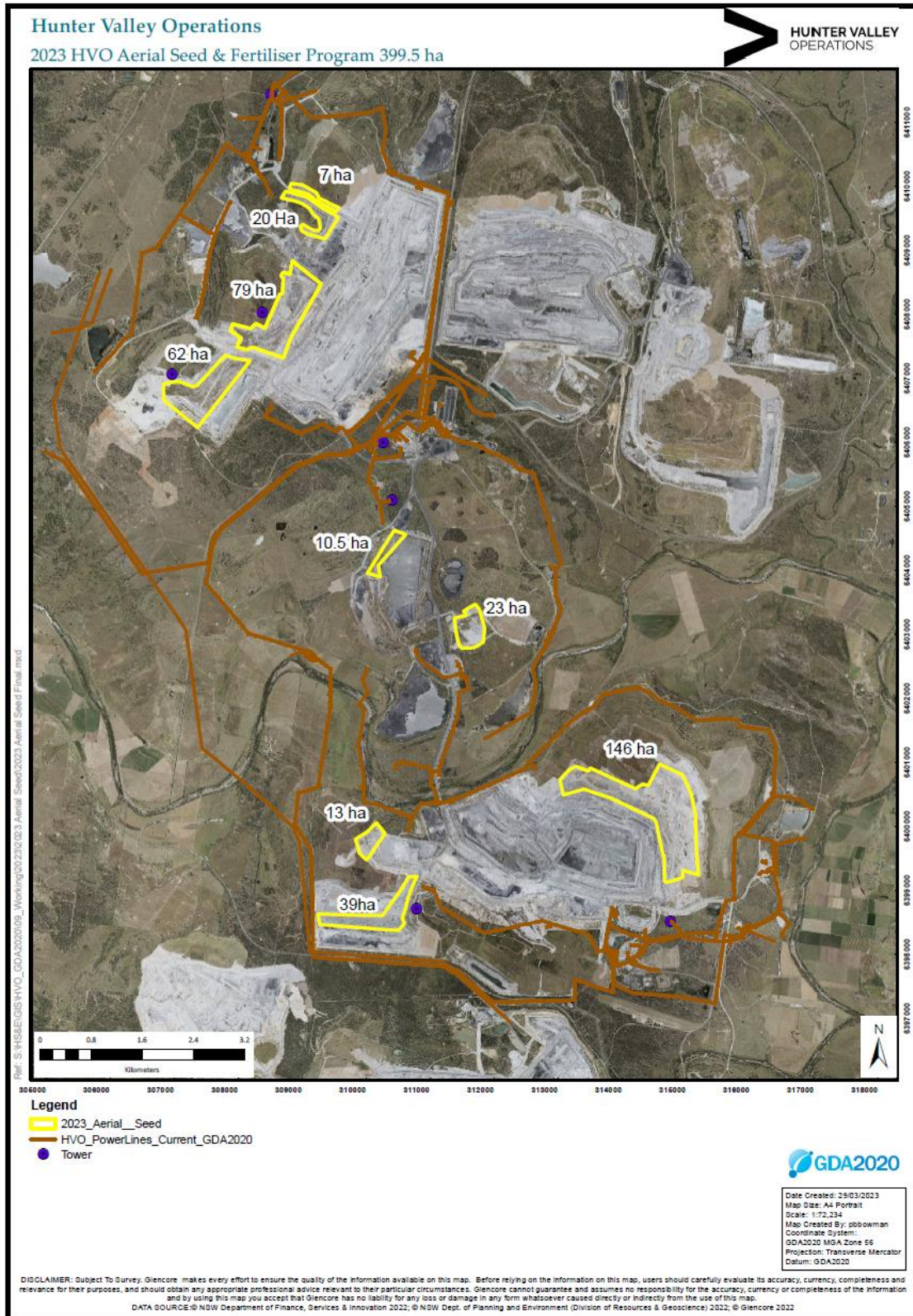


Figure 6-11: Areas Aerial Seeded in 2023 – HVO North (West Pit, Carrington Pit) and HVO South



**6.4.3.3 | DEPOSITIONAL DUST**

Depositional dust is monitored at nine locations in accordance with the AQGGMP. The annual average insoluble matter deposition rates in 2023 compared with the depositional dust impact assessment criterion and previous years' data are shown in **Figure 6-12**.

Depositional dust samples are collected monthly. Where field observations denote a sample as contaminated (typically with insects, bird droppings or vegetation), the results are excluded from annual average compliance assessment.

The DL30 and Warkworth monitoring locations exceeded the annual average insoluble matter deposition rate criteria of 4 g/m<sup>2</sup>/month (HVO North only) during 2023. However, all results were below the maximum insoluble solids incremental increase criterion of 2 g/m<sup>2</sup>/month and hence compliant with criteria (**Figure 6-13**).

An external specialist investigation (See **Appendix A**) determined the exceedance to be due to local sources of dust in close proximity to the monitor. The elevated levels at DL30 and Warkworth were assessed to estimate the maximum contribution from HVO North to the annual results. The HVO North maximum contribution to the incremental increase at DL30 was 0.4 g/m<sup>2</sup>/month, and 0.1 g/m<sup>2</sup>/month at Warkworth. These maximum concentrations were not deemed to have caused the exceedances (**Table 6-9**). The monitors are located in close proximity to HVO South, on the opposite side of HVO North. Given the significant separation distances between HVO North and these monitors, HVO North's contribution to these monitoring sites would always be low and likely indiscernible from background concentrations and the influences of other mines. Therefore, HVO North could only reasonably have a tangible impact at its nearest monitors which include D118 and D119. These monitors recorded annual average deposited dust levels below both the incremental and cumulative criteria.

*Table 6-9: Dust Deposition Annual Average Assessment*

<b>Date</b>	<b>Site</b>	<b>Measured Annual Average Dust Deposition (g/m<sup>2</sup>/month)</b>	<b>Annual Average Dust Deposition Criteria (g/m<sup>2</sup>/month)</b>	<b>HVO's Contribution to Dust Deposition (g/m<sup>2</sup>/month)</b>	<b>Discussion</b>
2023	DL30	4.8	4	0.4	An external consultant was engaged to investigate the exceedance, which determined that HVO North could have only provided a minor contribution to the exceedance which is attributable to local sources of dust near the monitor.
2023	Warkworth	9.6	4	0.1	An external consultant was engaged to investigate the exceedance, which determined that HVO North could have only provided a minor contribution to the exceedance which is attributable to local sources of dust near the monitor.

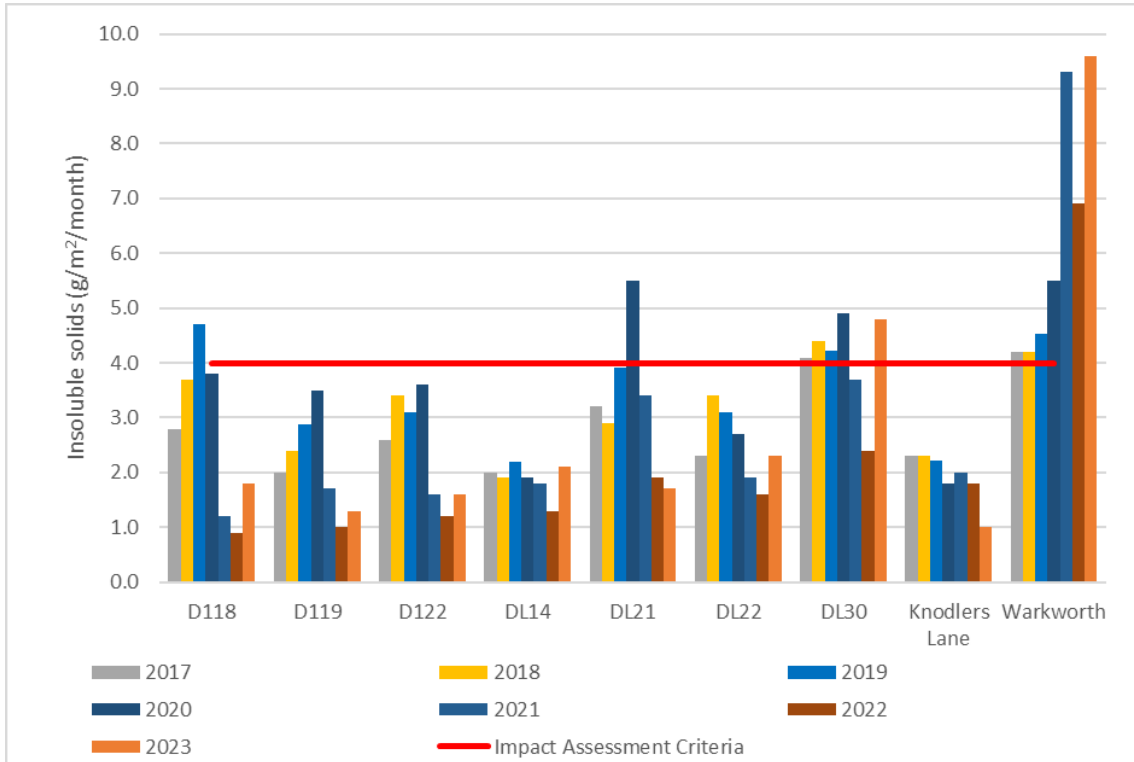
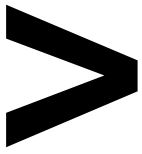


Figure 6-12: Annual Average Insoluble Matter Deposition Rates 2017-2023

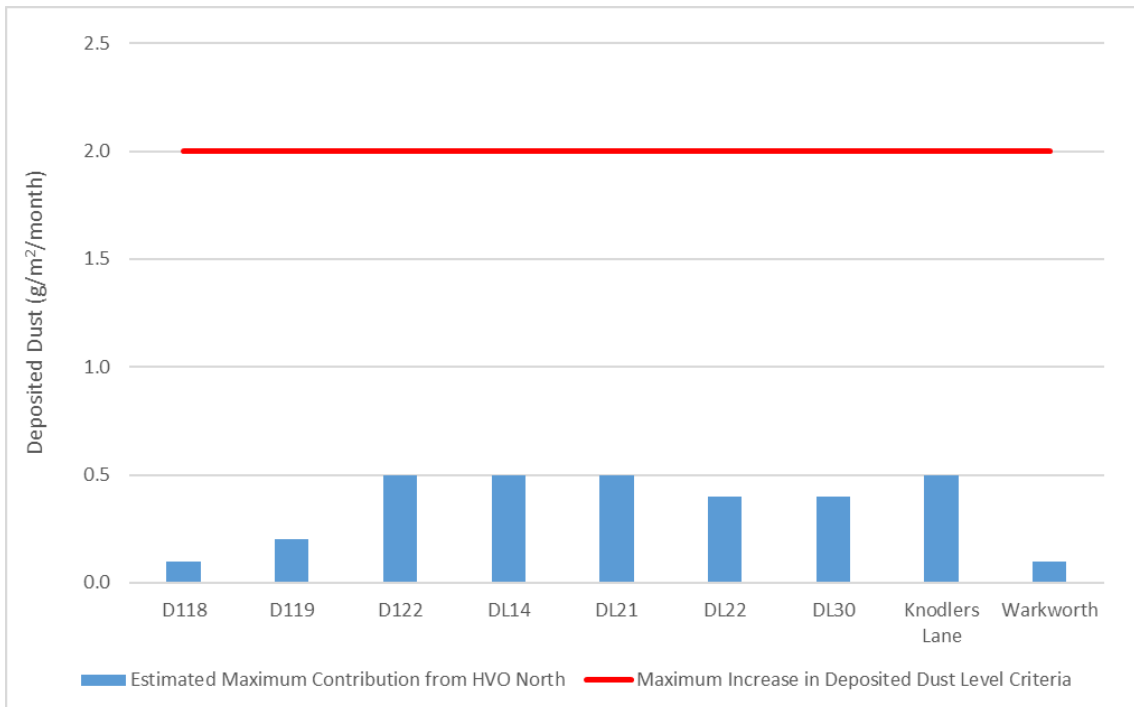
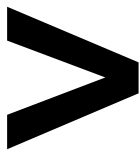


Figure 6-13: Maximum Allowable Increase in Deposited Dust Level 2023





6.4.3.4 | TOTAL SUSPENDED PARTICULATES (TSP)

TSP is monitored using High Volume Air Samplers (HVAS) at six locations in accordance with the AQGGMP.

Annual average TSP concentrations recorded in 2023 compared with the long-term impact assessment criterion and data from previous years are shown in **Figure 6-14**. TSP results in 2023 are considered to be similar to levels recorded from 2018 to 2020 with the exception of Warkworth which recorded 130.8  $\mu\text{g}/\text{m}^3$  compared to a criteria of 90  $\mu\text{g}/\text{m}^3$ .

Contributions at the TSP monitors were estimated to be the 24-hour concentrations minus an estimated background level on the corresponding day. The background level is considered to be the level which excludes the contribution from HVO but may include the influence of other sources, including other mines, localised sources, or regional sources of background dust. For the Warkworth monitor, which is often downwind of HVO South and a neighbouring mine concurrently, the daily contribution is considered to include both mines. In order to determine the contribution from HVO South alone, the combined mining increment was scaled by the proportion of time the monitor was downwind of HVO South relative to the total time the monitor was downwind of both mines during each 24-hour period.

Further methodology for determining HVO contribution is presented in Section 2.7.1 of **Appendix A**. This investigation method has determined the maximum possible contribution of HVO South to the Warkworth annual average to be 51.9  $\mu\text{g}/\text{m}^3$ .

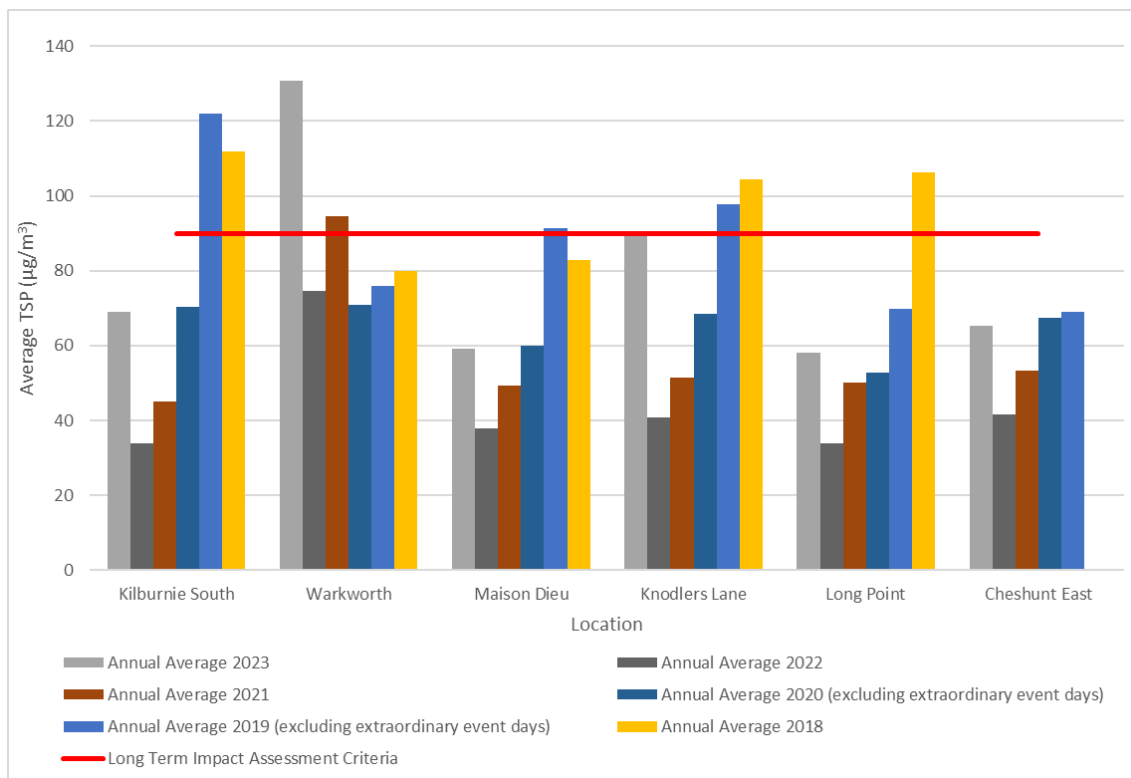


Figure 6-14: Annual Average TSP Concentrations 2017 to 2023 (Excludes Extraordinary Events)



Table 6-10: 2023 TSP HVAS Exceedance Investigation

Date	Site	Measured Annual Average TSP Level (µg/m <sup>3</sup> )	HVO Annual Average TSP Criteria (µg/m <sup>3</sup> )	Estimated HVO Maximum Contribution to TSP Level (µg/m <sup>3</sup> )	Discussion
2023	Warkworth	130.8	90 (HVO South)	51.9	Investigated by external consultant based on wind direction. HVO contribution >30 % therefore considered non-compliant. Refer to Appendix A.

Nine (9) TSP measurements were not able to be collected on the scheduled sampling date (based on a sampling frequency of every six days). Details of these miscaptures are provided in **Table 6-11**.

Table 6-11: TSP HVAS 24hr Miscaptures

HVAS Location	Date	Reason for Miscapture
Maison Dieu TSP	29/01/2023	Motor drive error or major blockage, HVAS did not run for sufficient time
Maison Dieu TSP	22/02/2023	Motor drive error or major blockage, HVAS did not run for sufficient time
Warkworth TSP	12/03/2023	HVAS did not run for sufficient time due to a power trip
Warkworth TSP	18/03/2023	HVAS did not run for sufficient time due to a power trip
Cheshunt East TSP	30/03/2023	No power at HVAS due to circuit breaker trip. HVAS ran short, breaker reset
Warkworth TSP	11/04/2023	HVAS did not run for sufficient time due to a power trip
Warkworth TSP	18/04/2023	HVAS did not run for sufficient time due to a power trip
Kilburnie South TSP	23/04/2023	Motor drive error or major blockage, HVAS did not run for sufficient time
Kilburnie South TSP	05/05/2023	Motor drive error or major blockage, HVAS did not run for sufficient time

#### 6.4.3.5 | PARTICULATE MATTER <10µM (PM<sub>10</sub>)

Particulate Matter <10 µm<sup>3</sup> (PM<sub>10</sub>) is monitored using High Volume Air Samplers (HVAS) and Real Time Tapered Element Oscillating Microbalance (TEOM) monitors. Monitoring is used to assess against short term (24 hour) and annual average air quality criteria.



6.4.3.5.1 | **PARTICULATE MATTER <math><10\mu M (PM\_{10}) - SHORT TERM (24-HOUR AVERAGE) IMPACT ASSESSMENT CRITERIA**

Short Term (24-hour average) PM<sub>10</sub> concentrations from HVO North and South were measured using HVAS and TEOM monitors and assessed against the relevant criteria as per the AQGGMP. For TEOM monitors, this is calculated daily using measured hourly average data. The HVAS samples are taken over a 24-hour period every sixth day. Short term (24-hour average) results recorded by HVO's TEOM compliance monitoring network during 2023 is presented in **Table 6-12**. The data presented includes total measured results including contribution from all particulate sources.

Two PM<sub>10</sub> measurements at the Kilburnie South HVAS were not able to be collected on the scheduled sampling date (based on a sampling frequency of every six days). Details of these miscaptures are provided in **Table 6-12**.

Table 6-12: PM<sub>10</sub> HVAS 24hr Miscaptures

HVAS Location	Date	Reason for Miscapture
Cheshunt East	04/02/2023	Trip of circuit breaker.
Cheshunt East	06/03/2023	Trip of circuit breaker.
Kilburnie South PM10	23/04/2023	Motor drive error or major blockage, Both HVAS ran short or not at all
Kilburnie South PM10	05/05/2023	Motor drive error or major blockage, Both HVAS ran short or not at all

In 2023 there were no exceedances recorded against the HVO South Consent due to site contributions being below the incremental air quality criterion (HVO South contribution alone). Six air quality exceedances were recorded against the HVO North Consent based on the total contribution criteria (HVO North contribution plus all other sources). Outcomes of the exceedance assessments are provided in **Table 6-13**. Four (4) exceedances required notification to DPHI as the HVO contribution was greater than 0. Refer to **Section 11** for further information on these notifications. A complete record of HVO's assessment of measured exceedances is included in Appendix A.

Table 6-13: 2023 PM<sub>10</sub> 24hr Exceedance Investigation

Date	Site	Measured 24-Hour Average PM <sub>10</sub> Level (µg/m <sup>3</sup> )	HVO 24-Hour Average PM <sub>10</sub> Criteria (µg/m <sup>3</sup> )	Estimated HVO Maximum Incremental Contribution to PM <sub>10</sub> Level (µg/m <sup>3</sup> )	Discussion
04/02/2023	Kilburnie South (HVAS)	56.6	50	0	Based on wind direction HVO North could not have contributed to the PM10 concentration.
06/03/2023	Cheshunt East (HVAS)	61.1	50	20.3	Investigated based on wind direction, site contribution ~30% and therefore considered non-compliant



<b>Date</b>	<b>Site</b>	<b>Measured 24-Hour Average PM<sub>10</sub> Level (µg/m<sup>3</sup>)</b>	<b>HVO 24-Hour Average PM<sub>10</sub> Criteria (µg/m<sup>3</sup>)</b>	<b>Estimated HVO Maximum Incremental Contribution to PM<sub>10</sub> Level (µg/m<sup>3</sup>)</b>	<b>Discussion</b>
20/09/2023	Cheshunt East (HVAS)	86.4	50	44.9	Investigated based on wind direction, site contribution >30% and therefore considered non-compliant
26/09/2023	Cheshunt East (HVAS)	50.3	50	15.5	Investigated based on wind direction, site contribution not significant.
02/10/2023	Kilburnie South (HVAS)	51.6	50	0.0	Based on wind direction HVO North could not have contributed to the PM10 concentration.
02/10/2023	Jerrys Plains (TEOM)	63.6	50	9.0	Investigated based on wind direction, site contribution not significant.

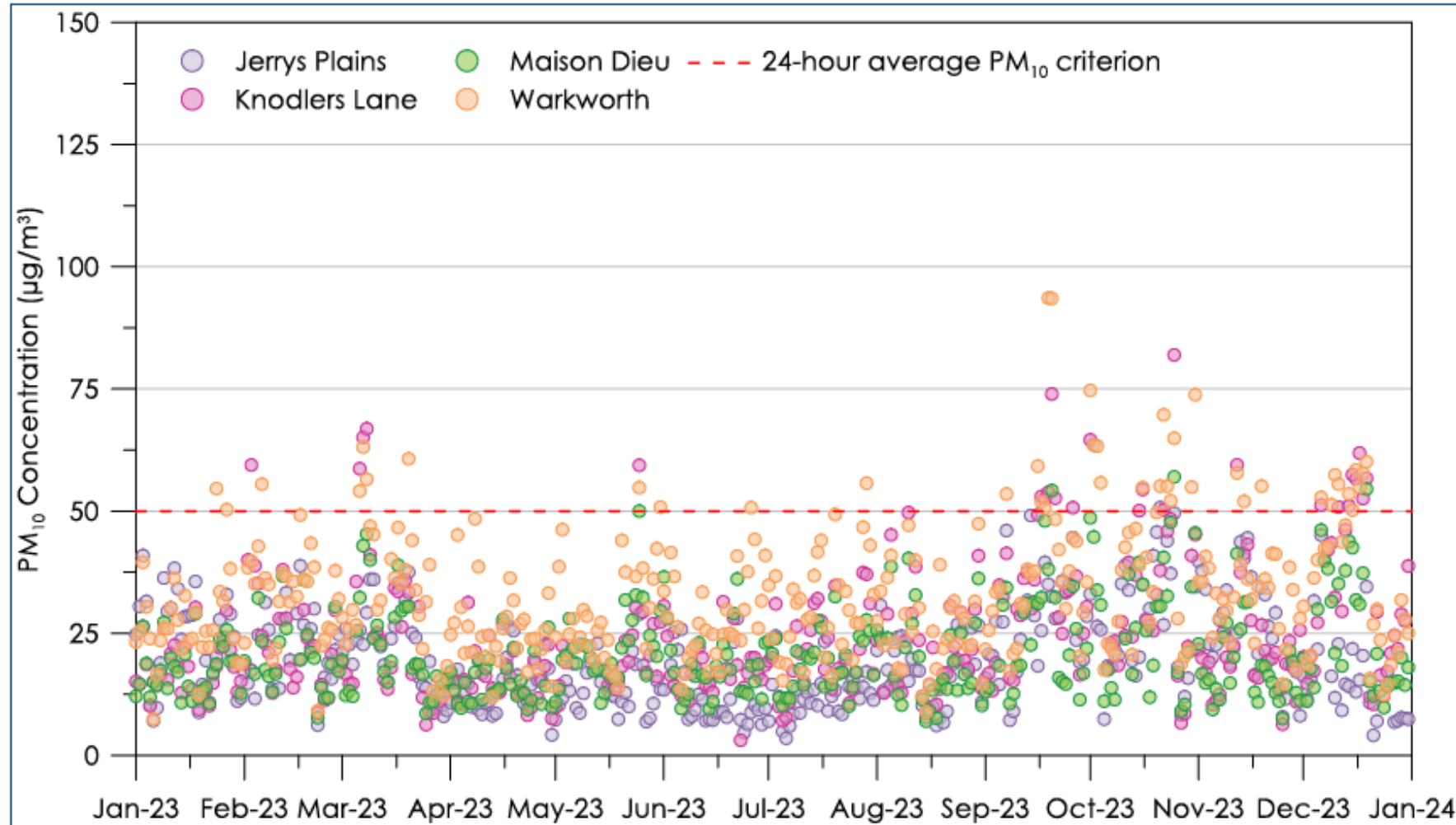
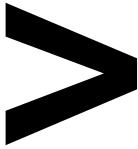
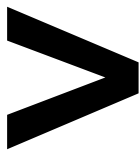


Figure 6-15: TEOM 24-hour Average Total PM<sub>10</sub> Results 2023



6.4.3.5.2 | LONG TERM PM<sub>10</sub> IMPACT ASSESSMENT CRITERIA

Annual average PM<sub>10</sub> concentrations were calculated for both HVAS and TEOM monitors and assessed against the relevant criteria as per the AQGGMP. This was undertaken for TEOM monitors using hourly average data and was calculated for HVAS units using 24-hour average concentrations on each of the run days.

Annual average PM<sub>10</sub> levels were above the impact assessment criteria at the Hunter Valley Gliding Club (HVAS) and Warkworth (TEOM) during the reporting period (refer to **Table 6-14**). These exceedances were investigated by a specialist consultant (see **Appendix A**). The investigation estimated maximum incremental contribution to PM<sub>10</sub> level from HVO South to be a minor contribution to the overall result. There are no privately owned residences near the Warkworth or Glider Club monitors and HVO has a Concessions and Mitigation Agreement with the Gliding Club with respect to air quality levels when the facilities are in use. Refer to Section 2.6.1 of **Appendix A** for more information.

Table 6-14: 2023 PM<sub>10</sub> Exceedance Investigation

Date	Site	Measured Annual Average PM <sub>10</sub> Level (µg/m <sup>3</sup> )	HVO Annual Average PM <sub>10</sub> Criteria (µg/m <sup>3</sup> )	Estimated HVO Maximum Contribution to PM <sub>10</sub> Level (µg/m <sup>3</sup> ) from HVO South	Discussion
2023	Warkworth (TEOM)	32.5	25 (HVO South)	3.4	Investigated based on wind direction, site contribution not significant.
2023	Glider Club (HVAS)	31.7	25 (HVO South)	12.8	Investigated based on wind direction, site contribution not significant.

A comparison of the long term PM<sub>10</sub> impact assessment criterion and previous years' data are shown in **Figure 6-16**.

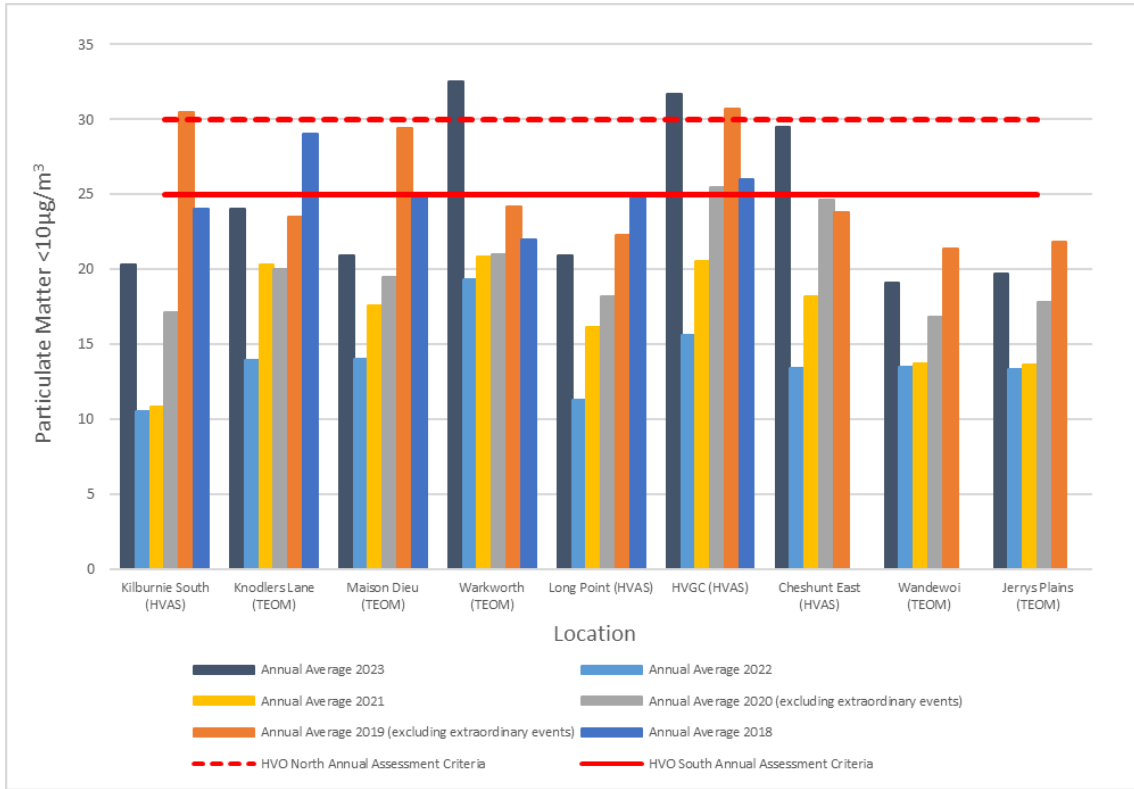
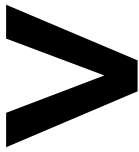


Figure 6-16: Annual Average HVAS PM10 Results 2018 to 2023



6.4.3.5.3 | *PM<sub>2.5</sub> SHORT TERM IMPACT ASSESSMENT CRITERIA*

PM<sub>2.5</sub> samples were collected at Maison Dieu and Kilburnie South using HVAS, and these results are provided in **Table 6-16** and **Figure 6-17**.

There was one PM<sub>2.5</sub> measurement at the Maison Dieu HVAS that was not able to be collected on the scheduled sampling date (based on a sampling frequency of every six days) due to a power outage (**Table 6-15**).

Table 6-15: *PM<sub>2.5</sub> HVAS Miscaptures - 2023*

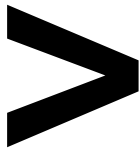
HVAS Location	Date	Reason for Miscapture
Maison Dieu	04/02/2023	Monitor failed to run for the full monitoring day due to a power outage. Investigation found that black ants had gained access inside the RCD/outlet box.

Results above criteria were recorded over 10 monitoring days during 2023. The results were investigated and HVO’s contribution was assessed based on wind direction (**Table 6-16**). The investigations determined HVO South was below its incremental criteria for all results. As discussed in the Long-Term Impact section the PM<sub>2.5</sub> levels recorded appear to be anomalously high when compared to co-located PM<sub>10</sub> monitor results.

Table 6-16: *Short Term Impact Assessment Criteria – PM<sub>2.5</sub> Results 2023*

Date	Site	Measured 24-Hour Average PM <sub>2.5</sub> Level (µg/m <sup>3</sup> )	HVO South 24-Hour Average PM <sub>2.5</sub> Incremental Criteria (µg/m <sup>3</sup> )	Estimated HVO South Contribution to PM <sub>2.5</sub> Level (µg/m <sup>3</sup> )	Discussion
17/01/2023	Kilburnie South	29.2	25	11.0	Investigated based on wind direction and background, site contribution below criteria
16/02/2023	Kilburnie South	30.0	25	5.4	Investigated based on wind direction and background, site contribution below criteria
06/03/2023	Maison Dieu	43.2	25	22.7	Investigated based on wind direction and background, site contribution below criteria
18/03/2023	Kilburnie South	35.9	25	1.7	Investigated based on wind direction and background, site contribution below criteria
14/09/2023	Kilburnie South	27.2	25	4.7	Investigated based on wind direction and background, site contribution below criteria





Date	Site	Measured 24-Hour Average PM <sub>2.5</sub> Level (µg/m <sup>3</sup> )	HVO South 24-Hour Average PM <sub>2.5</sub> Incremental Criteria (µg/m <sup>3</sup> )	Estimated HVO South Contribution to PM <sub>2.5</sub> Level (µg/m <sup>3</sup> )	Discussion
20/09/2023	Kilburnie South	44.9	25	0.0	Investigated based on wind direction and background, site contribution below criteria
20/09/2023	Maison Dieu	43.7	25	0.0	Investigated based on wind direction and background, site increment below criteria
02/10/2023	Kilburnie South	31.9	25	4.0	Investigated based on wind direction and background, site increment below criteria
07/12/2023	Kilburnie South	43.1	25	6.0	Investigated based on wind direction and background, site increment below criteria
13/12/2023	Kilburnie South	27.1	25	1.0	Investigated based on wind direction and background, site increment below criteria
13/12/2023	Maison Dieu	28.7	25	1.0	Investigated based on wind direction and background, site increment below criteria
19/12/2023	Kilburnie South	45.6	25	4.1	Investigated based on wind direction and background, site increment below criteria
19/12/2023	Maison Dieu	46.0	25	15.7	Investigated based on wind direction and background, site increment below criteria

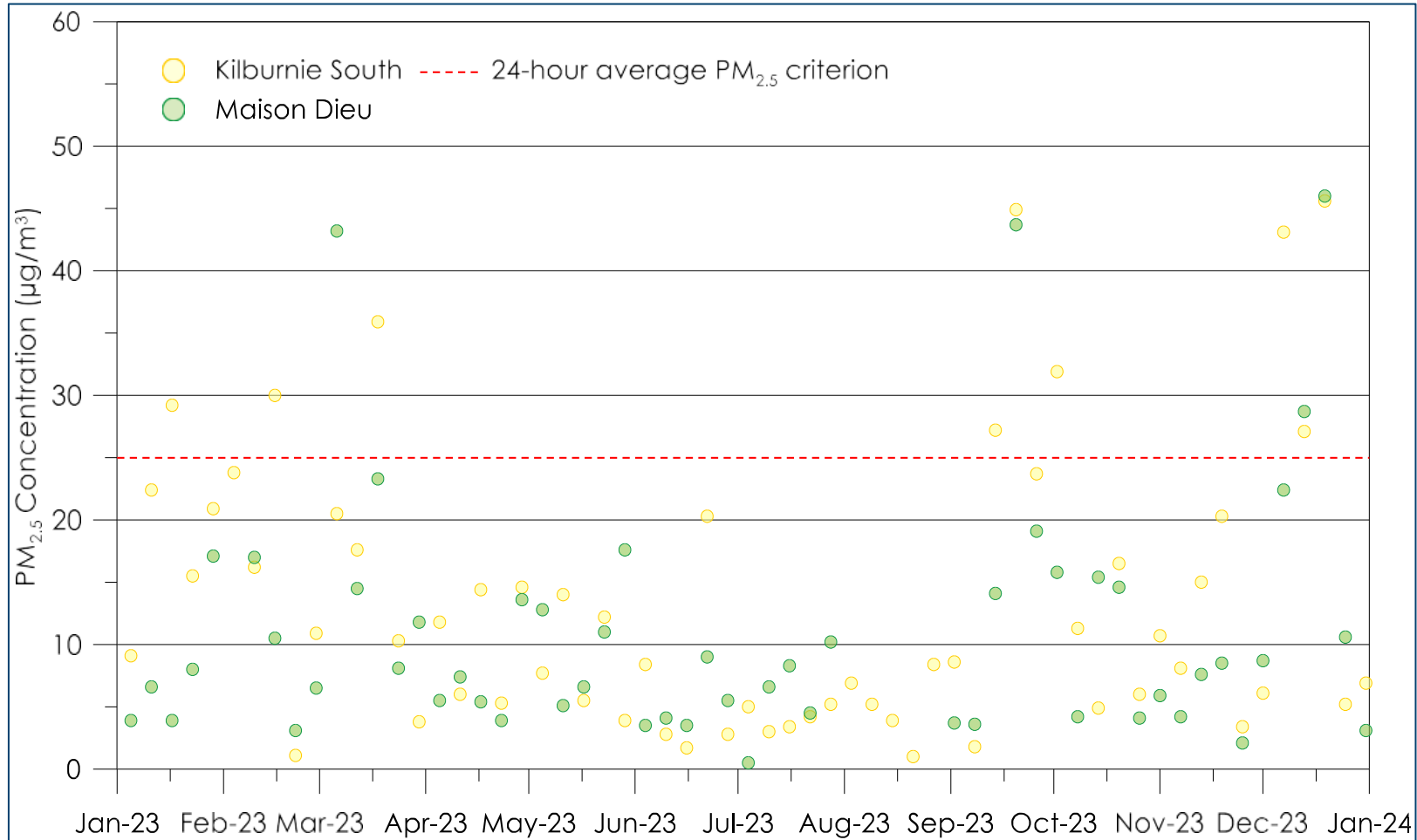
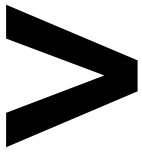


Figure 6-17: 24-hour Average PM<sub>2.5</sub> Results 2023



6.4.3.5.4 | *PARTICULATE MATTER <2.5µM (PM<sub>2.5</sub>) – LONG TERM (ANNUAL AVERAGE) IMPACT ASSESSMENT CRITERIA*

Annual average PM<sub>2.5</sub> was above the annual average criteria of 8 µg/m<sup>3</sup> at both locations for the reporting period (**Table 6-17**). While HVO’s contribution is not calculated to be significant, the elevated total levels are considered to be anomalously high and are not consistent with other regional PM<sub>2.5</sub> monitors or expected ratios of co-located PM<sub>2.5</sub> monitors. PM<sub>2.5</sub> levels recorded have been investigated throughout the year, including:

- Monitoring locations have been inspected multiple times to identify any significant local PM<sub>2.5</sub> sources, with none identified.
- Calculation of PM<sub>10</sub>:PM<sub>2.5</sub> ratios for monitoring equipment for co-located units (as shown in **Table 6-18**). The ratio in the Hunter Valley is typically 0.3 to 0.4. Ratios measured at HVO range from 0.43 to 0.62.
- Comparison to levels recorded by new EBAMs installed in March 2023.

It is believed that the source of the high readings is due to the high-volume air sampler monitoring method. HVO engaged an air quality consultant to review the air quality monitoring network. The review recommended the implementation of real-time PM<sub>2.5</sub> monitoring at Maison Dieu and Kilburnie South. During March 2023, HVO installed Beta Attenuation Mass Monitors (EBAMs) which is an equivalent type to that used in the EPA’s Upper Hunter Air Quality Monitoring Network. The use of the EBAMs is pending DPHI approval of the AQGG Management Plan. The aim of these monitors is to determine the potential contribution of HVO South to annual average PM<sub>2.5</sub> levels recorded at HVO HVAS monitors. Given that the results recorded at the Maison Dieu and Kilburnie South HVAS monitors appears to be implausibly high, monitoring data at these locations have been used in order to estimate HVO South’s increment to the recorded levels.

The HVO South contributions to the BAM monitors were estimated on an hourly basis for HVAS run days. The hourly contributions were estimated as the concentrations recorded at each monitor minus the estimated background level. The hourly contributions were then averaged for each 24-hour period to determine the 24-hour contributions from HVO South. The percentage contribution of the total level recorded at the BAM monitors was applied to the HVAS monitoring results from March 2023 onwards to determine the potential contribution from HVO South to the monitors. The two BAM monitors at Maison Dieu and Kilburnie South recorded an average of 4.8µg/m<sup>3</sup> and 4.9 µg/m<sup>3</sup> respectively. Further information is presented in Section 2.5.1 of Appendix A.

Table 6-17: PM<sub>2.5</sub> Annual Average Monitoring Data 2023

Monitoring Location	HVO South Annual Average PM <sub>2.5</sub> Criteria (µg/m <sup>3</sup> )	Measured Annual Average PM <sub>2.5</sub> Level (µg/m <sup>3</sup> )	Estimated Contribution to Annual Average PM <sub>2.5</sub> Level (µg/m <sup>3</sup> )
Maison Dieu	8	11.1	1.8
Kilburnie South	8	13.3	1.9

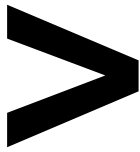


Table 6-18: Annual PM<sub>2.5</sub> / PM<sub>10</sub> Ratios in Upper Hunter

Year	PM <sub>2.5</sub> / PM <sub>10</sub> Ratios					
	Muswellbrook	Singleton	Camberwell	Merriwa	Maison Dieu	Kilburnie South
2015	0.46	0.39	0.33	*	*	*
2016	0.44	0.41	0.31	*	*	*
2017	0.43	0.39	0.27	*	*	*
2018	0.35	0.34	0.27	*	*	*
2019	0.35	0.36	0.26	*	*	*
2020	0.41	0.41	0.31	*	0.63	0.78
2021	0.41	0.37	0.30	0.38	0.48	0.54
2022	0.39	0.36	0.32	0.31	0.40	0.57
2023	0.35	0.37	0.30	0.34	0.43	0.62

\* Monitoring locations were not in place during this year

PM<sub>2.5</sub> levels measured at the Maison Dieu and Kilburnie South HVAS units were higher than UHAQMN annual average PM<sub>2.5</sub> results in comparable locations, as shown in **Table 6-19**.

Table 6-19: UHAQMN Annual Average PM<sub>2.5</sub> Results for 2023

UHAQMN Monitor	Measured Annual Average 2023 PM <sub>2.5</sub> Level (µg/m <sup>3</sup> )
Muswellbrook	7.5
Singleton	6.7
Camberwell	6.1
Merriwa	4.7

#### 6.4.4 | COMPARISON AGAINST EA PREDICTIONS

**Table 6-20** and **Table 6-21** show a comparison between 2023 air quality data and the Stage 2 predictions made in the HVO South Modification 5 EIS. Comparisons have been made against the predictions listed in the EA for the nearest private residence to each monitoring location.

PM<sub>10</sub> measurements in 2023 were similar to or below predicted levels for all monitoring locations for both short term (24-hour average) and long term (annual average) criteria as shown in **Table 6-14**. Annual average TSP measurements in 2023 were below predicted levels for all monitoring locations aside from Warkworth. Warkworth results are discussed in **Section 6.4.3.4**.

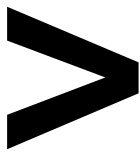


Table 6-20: HVO South PM<sub>10</sub> Annual Average Results Compared Against Cumulative Predictions<sup>^</sup>

Site (EA Receptor)	Short Term (24hr) Criteria		Long Term (Annual Average) Criteria	
	Predicted Maximum 24hr PM <sub>10</sub> Due to HVO South Alone (µg/m <sup>3</sup> )	2023 Maximum 24hr PM <sub>10</sub> HVO Contribution (µg/m <sup>3</sup> )	Predicted PM <sub>10</sub> Annual Averages (µg/m <sup>3</sup> )	2023 PM <sub>10</sub> Annual Average (µg/m <sup>3</sup> )
	Stage 2		Stage 2	
Maison Dieu (256)	36	13.5	21	19.1
Warkworth (90)	95	23.9	46	32.5
Kilburnie South (307)	31	33.7	27	20.3
Knodlers Lane (117)	59	33.1	28	24.0
Long Point (137)	36	36.1	20	20.9
Hunter Valley Gliding Club***	>50	75.3	>30	31.7

<sup>^</sup> Cumulative predictions for Stage 2 of the HVO South Mod 5 Environmental Assessment.

\*\*\* The HVGC has entered into a Concessions and Mitigation Agreement with Hunter Valley Operations.

Table 6-21: HVO South TSP Annual Average Results Compared Against Cumulative Predictions<sup>^</sup>

Site (EA Receptor)	Long Term (Annual Average) TSP Criteria	
	Stage 2 Prediction (µg/m <sup>3</sup> )	2023 PM <sub>10</sub> Annual Average (µg/m <sup>3</sup> )
Maison Dieu (256)	60	59.2
Warkworth (90)	106	130.8
Kilburnie South (307)	76	68.9
Knodlers Lane (117)	75	89.5
Long Point (137)	61	58.0

<sup>^</sup> Cumulative predictions for Stage 2 of the HVO South Mod 5 Environmental Assessment.

**Table 6-22** and **Table 6-23** detail comparisons between 2023 air quality monitoring results and the modelled predictions from the 2010 HVO North Carrington West Wing Air Quality Impact Assessment. Predictions have been sourced from modelled scenarios of Year Five of the Carrington West Wing development. It should be noted that while Approval has been granted for the commencement of that project, works have not yet commenced.

Annual average PM<sub>10</sub> levels for 2023 were above the predicted annual average presented in **Table 6-22** however HVO estimated contributions (North and South) to these were low. Annual average TSP levels were also above predicted levels (**Table 6-23**). HVO contribution to these has been estimated (Appendix A) to be low and not considered to be the primary cause of the elevated levels.

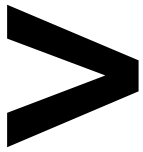


Table 6-22: HVO North 2023 PM<sub>10</sub> Annual Average Results Compared Against Cumulative Predictions<sup>^</sup>

Site (EA Receptor)	Long Term (Annual Average) Criteria			
	Predicted PM <sub>10</sub> Annual Average (µg/m <sup>3</sup> )	2023 PM <sub>10</sub> Annual Average (µg/m <sup>3</sup> )	HVO North Estimated Contribution to 2023 PM <sub>10</sub> Annual Average (µg/m <sup>3</sup> )	HVO South Estimated Contribution to 2023 PM <sub>10</sub> Annual Average (µg/m <sup>3</sup> )
Maison Dieu (6)	18.2	20.9	*	0.8
Warkworth (39)	20.5	32.5	*	3.4
Kilburnie South (4)	19.3	20.3	1.6	3.0
Jerrys Plains (13)	16.2	19.7	0.7	2.0
Cheshunt East (7)	18.9	29.5	12.0	**

<sup>^</sup> Cumulative predictions for Year Five (CWW) of the HVO North Environmental Assessment.

\* no relevant criteria for this location under the consent

Table 6-23: HVO North 2023 TSP Annual Average Results Compared Against Cumulative Predictions<sup>^</sup>

Site (EA Receptor)	Long Term (Annual Average) Criteria		HVO TSP Contribution (µg/m <sup>3</sup> )
	Predicted TSP Annual Average (µg/m <sup>3</sup> )	2023 TSP Annual Average (µg/m <sup>3</sup> )	
Maison Dieu (6) <sup>#</sup>	43.7	59.2	11.6 (HVO South)
Warkworth (39) <sup>#</sup>	46.3	130.8	51.9 (HVO South)
Kilburnie South (4)	44.9	68.9	10.3 (HVO North) 17.3 (HVO South)
Cheshunt East (7)	44.5	65.4	21.6 (HVO North)

<sup>^</sup> Cumulative predictions for Year Five (CWW) of the HVO North Environmental Assessment.

<sup>#</sup> Being upwind of HVO South, separate HVO North contribution was not calculated.

## 6.5 | GREENHOUSE GAS AND ENERGY MANAGEMENT

### 6.5.1 | REPORTED GREENHOUSE GAS EMISSIONS

HVO reports greenhouse gas emissions (GHG) in accordance with National Energy and Greenhouse Gases (NGER) legislation. Each financial year HVO is required to submit to the Federal government the emissions from their NGERs registered facility into the Emissions and Energy Reporting System (EERS). Also, because HVO emits over 100kt of CO<sub>2</sub>e- each year, HVO is registered as a Safeguard facility with a Safeguard baseline. Emissions above the baseline for that year need to be offset by retiring Australian Carbon credit Units (ACCU). The NGERs reporting year is based on a financial year, not a calendar year such as this Annual Review. In order to prevent incompatible public reporting, the values in this report also cover a financial year. **Table 6-24** contains the Scope 1 (direct emissions from the mining activities during the year), and Scope 2 emissions (electricity consumption by the mine during the year) compared to annual average emissions forecast for HVO South (PA 06\_0261) in the *Air Quality and Greenhouse Gas Study HVO South Modification 5 (Todoroski Air Sciences, 2017)* (the EIS forecast). Greenhouse emission



forecasts for HVO North are only suitable for comparison in the EIS for the Carrington West Wing modification, which has not commenced.

Table 6-24: Greenhouse Gas Emissions 2023

FY 2022/2023	Scope 1 (tCO <sub>2</sub> e-)	Scope 2 (tCO <sub>2</sub> e-)	Total Scope 1 & Scope 2 (tCO <sub>2</sub> e-)
EERS Reported Value (HVO North and South)	456,690	61,585	518,275
EIS Forecast (HVO South only)	570,807	137,231	708,038
Safeguard Baseline (HVO North and South)	-	-	633,681

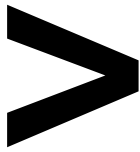
**6.5.2 | COMPARISON AGAINST PREDICTIONS**

The EIS forecast estimated that the annual average greenhouse gas emissions (Scope 1 and Scope 2) from HVO South would be 708,038 CO<sub>2</sub>e-. As outlined in **Table 6-24**, total emissions during FY2023 were 518,275 CO<sub>2</sub>e-. Total emissions reported are for the HVO Complex, which includes activities in both HVO South and HVO North. Scope 1 and Scope 2 emissions were also below EIS forecast. Considering that total emissions are below forecast and that the forecast does not include HVO North, HVO is considered to be operating in line with predictions.

**6.5.3 | STEPS TAKEN TO IMPROVE ENERGY EFFICIENCY AND REDUCE GHG EMISSIONS**

HVO is actively engaged in minimising greenhouse gas emissions associated with their coal operations and supporting the NSW Government objectives of net-zero emissions by 2050. In addition, HVO is governed by a range of climate change commitments made by Yancoal and Glencore, as the JV partners of HVO, including:

- Yancoal
  - Supporting innovation and investment in carbon capture, utilisation and storage through various industry and policy initiatives, to work towards the commitments outlined in the Paris Agreement;
  - Taking a constructive role in public policy development and participation in relevant industry associations, guided by recognition of the aims of the Paris Agreement; and
  - Supporting research into technologies that will reduce GHG emissions from the downstream consumption of products (Scope 3).
- Glencore
  - Glencore Coal Australia open cut and underground sites minimise emissions from diesel and electricity consumption by:
    - Optimisation of mining practices e.g. haulage planning, blast design, conveying arrangements.
    - Optimisation of engine performance e.g. studies undertaken in collaboration with OEMs to enhance fuel efficiency and emissions reduction.



- New fleet is purchased with the most fuel-efficient engines available.
- Ongoing monitoring of potential biofuel and fuel additive opportunities.
- Ongoing monitoring and assessment of emerging technologies.

## 6.6 | WASTE AND HAZARDOUS MATERIALS

### 6.6.1 | RECYCLING

HVO has continued reinforcing the principles of effective waste management across the site, including recycling.

During the reporting period, 6% of non-mineral waste material generated at HVO was disposed of in licensed offsite landfill facilities and 94% of waste was recycled. These results show an increase in recycling rates compared to 2022.

A total of 16,160 tonnes of waste was removed from site during the reporting period. The high recycling rates are influenced by the recycling of effluent (8,560 tonnes), waste oil (1,113 tonnes) and scrap steel (1,179 tonnes).

### 6.6.2 | SEWAGE TREATMENT/DISPOSAL

The sewage treatment and disposal facilities at HVO consist of sewage treatment plants which treat, disinfect and re-use the treated effluent on-site where practicable. The remaining effluent from some septic systems that is unable to be treated on site is sent to approved facilities for disposal.

HVO currently operates 3 main grouped on-site sewage management facilities that are interconnected from multiple systems. These facilities are located at Howick, HVO North and HVO South. Design works continued towards upgrade of these systems.

### 6.6.3 | HYDROCARBONS

A total of 1,113kL of waste oil was taken offsite to be refined into a base oil for reuse in new oil products during the reporting period. Other hydrocarbons recycled via a licenced waste hydrocarbon disposal contractor include approximately 14.9 tonnes of waste grease.

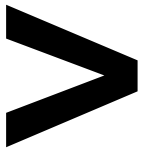
### 6.6.4 | CONTAMINATED SOIL

HVO operates and maintains two bioremediation areas to manage hydrocarbon contaminated soil.

Contaminated soil is taken to one of the bioremediation areas and placed in cells based on the time of contamination. Contaminated soil is spread out in beds approximately 300 mm in height and turned to provide aeration for beneficial microbial activity.

Soil in the treatment area is sampled and tested as required until total hydrocarbon levels are below relevant guidelines. Soil meeting these criteria is then removed and disposed of in the spoil dump.





6.6.5 | ACID ROCK DRAINAGE

There were no observed issues relating to Acid Rock Drainage during 2023. The Geochemical Monitoring Programme was reviewed during the reporting period, and this will be implemented from 2024.

6.6.6 | BUILDING DEMOLITION

No building demolition was conducted during 2023.

6.6.7 | WASTE/HAZARDOUS MATERIALS NON-COMPLIANCES

There were no externally reportable incidents related to waste or hazardous material management during the reporting period.

6.7 | HERITAGE

6.7.1 | ABORIGINAL CULTURAL HERITAGE MANAGEMENT AND COMMUNITY CONSULTATION

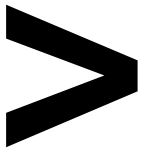
Aboriginal cultural heritage is managed under the provisions of separate Aboriginal Cultural Heritage Management Plans (ACHMPs) approved for each consent. At HVO North, where mining or associated development activities may impact Aboriginal cultural heritage sites, an Aboriginal Heritage Impact Permit (AHIP) must also be sought from Heritage New South Wales (formerly Office of Environment and Heritage) under Part 6 of the National Parks and Wildlife Act 1974 (NPW Act), on the basis of the management requirements established through the ACHMP process.

The HVO South ACHMP area was approved as a State Significant Development which excludes the requirement for obtaining AHIPs prior to implementing cultural heritage management measures authorised under the provisions of the ACHMP.

HVO consults with the Hunter Valley Operations Cultural Heritage Working Group (CHWG) which is comprised of representatives from HVO and Registered Aboriginal Parties (RAPs) from Upper Hunter Valley aboriginal community groups, corporations and individuals. The CHWG met and discussed cultural heritage management matters associated with HVO at the meeting held on 30 November 2023.

Aboriginal cultural heritage at HVO is managed in consultation with the RAPs associated with the CHWG, in accordance with the ACHMPs, and development consent conditions, to protect, manage and mitigate cultural heritage at HVO. Management measures include:

- Ongoing consultation and involvement of the local Aboriginal community in all matters pertaining to Aboriginal cultural heritage management;
- Compliance with existing ACHMP's and Development Consent conditions;
- A cultural heritage Geographic Information System (GIS) and Cultural Heritage Zone Plan (CHZP) incorporating cultural heritage spatial and spatial data (site location, description, assessments, date recorded, associated reports, management provisions and various other details to assist with the management of sites);
- A Ground Disturbance Permit (GDP) system for the assessment and approval of ground disturbing activities to ensure these activities do not disturb cultural heritage places;



- Limit of Disturbance Boundary (LODB) procedures to demarcate approved disturbance areas and delineate areas not to be disturbed;
- Ongoing cultural heritage site inspections, monitoring and auditing along with regular compliance inspections of development works;
- Protective management measures such as fencing/barricading sites to avoid disturbance, protective buffer zones, cultural heritage off-set areas; and
- Communicating cultural heritage issues and site awareness to personnel via internal electronic and face to face processes.

In consultation with the CHWG and Heritage NSW, a Cultural Heritage Storage Facility (CHSF) was established at Hunter Valley Services. The CHSF is a storage shed, with an adjacent shipping container, fitted out to allow safe and secure storage of cultural materials, such as stone artefacts. It is a central repository for all materials collected during community collection and salvage activities on all lands related to HVO (including offset properties).

**6.7.2 | ABORIGINAL ARCHAEOLOGICAL AND CULTURAL HERITAGE INVESTIGATIONS**

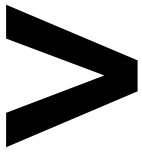
Arrow Heritage Solutions conducted due diligence assessments and surveys at 6 separate areas in 2023 which were the subject of internal Ground Disturbance Permits (GDPs). These assessments included;

- GDP 438 – Hunter River Fenceline Realignment, inspection and survey completed 9 May 2023
- Mitchelhill Biodiversity Area Track Maintenance, inspection and survey completed 9 May 2023
- GDP 479 – Lemington Road Culvert and Road Repairs, inspection and survey completed 16 August 2023
- GDP 458 – Powerline Vegetation Clearing Hunter Valley Load Point, inspection and survey completed 23 August 2023
- GDP 480 – Mitchelhill Biodiversity Area Firebreak, inspection and survey completed 20 September 2023
- GDP 481 – Hook Biodiversity Area Firebreak, inspection and survey completed 21 September 2023

A separate due diligence survey was conducted by Ungooroo Aboriginal Corporation in conjunction with an assessment report prepared by Arrow Heritage on 16 June 2023 for GDP 469 covering the planting of native tubestock along Bayswater Creek.

No artefacts were identified within the GDP areas covered by the assessments.

At the December 2022 HVO Cultural Heritage Working Group (CHWG) meeting, the CHWG reached a consensus to recommend salvage of a remnant artefact scatter that formed part of AHIMs site 37-2-0047, located between access roads near the Hunter River at HVO South. The scatter was located in an area that had been the subject of two historical Aboriginal Heritage Impact Permits, AHIP #798 and AHIP SZ315. The remnant artefacts were identified in 2020, inspected by the CHWG in 2021 and the subject of consultation with the CHWG at several meetings in 2021 and 2022. The salvage of these artefacts is authorised under the Conditions established in the Hunter Valley Operations South Consent PA 06\_0261 and the HVO South Aboriginal Heritage Management Plan. Salvage and investigation works were completed by 4 RAPS working under the supervision of Arrow Heritage Solutions over a 2 day period on the 10 & 11 May 2023. Salvage methodology included surface collection and 7 areas that were the subject of sub surface investigation.



During 2023, consultation with Registered Aboriginal Parties (RAPs) associated with the HVO Continuation Project (HVO South (SSD1186621) and HVO North (SSD 11826681) continued in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010). A summary of the primary consultation activities completed during the 2023 included:

- Notification of the public exhibition of the HVO Continuation Project Environmental Impact Statement
- Provision of correspondence providing update on the progress of the HVO Continuation Project and a summary of the key changes following exhibition including reduced impacts to Aboriginal cultural sites
- Meetings and site inspections with various Project RAPs
- Provision of newsletters and Project updates
- Notification and overview of the HVO Continuation Project Submissions Report and Amendment Report (HVO North)

Consultation with Project RAPs will remain ongoing throughout 2024 during the assessment phase of the HVO Continuation Project.

HVO also conducted consultation meetings as part of the requirements for preparing the ACHA for the Wilton and Mitchell Pit Extension AHIP application. Consultation meetings were conducted on the following dates:

- Meeting 1: 21 July 2023;
- Meeting 2: 15 August 2023;
- Meeting 3: 19 September 2023; and
- Meeting 4: 17 October 2023.

The Wilton and Mitchell Pit Extension AHIP Application was submitted to Heritage NSW 4 December 2023.

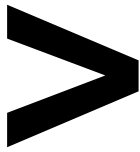
### 6.7.3 | HERITAGE AUDITS AND INCIDENTS

Under the provisions of the HVO South ACHMP, two compliance inspections were conducted in 2023 and under the provisions of the HVO North HMP, a single compliance inspection was conducted during 2023. The purpose of the compliance inspections is to provide RAPs with:

The opportunity to visit mine operations and mine areas to inspect operational compliance with ACHMP/HMP provisions and GDP procedures;

- To inspect and monitor the condition and management of sites; and
- To review the effectiveness and performance of the ACHMP/HMP provisions in the management of cultural heritage at the mine.
- These compliance inspections were conducted by RAP representatives of the CHWG with the assistance of a qualified archaeologist and HVO personnel.

The biannual 2023 HVO South compliance inspection was conducted on 12 May 2024 by 3 RAP representatives of the CHWG. A total of 16 aboriginal heritage sites were inspected focusing on areas south of Cheshunt Pit that are soon to be transferred to a neighbouring mine entity. The findings and recommendations of these inspections are documented in the HVO South Aboriginal Heritage



Management Plan May 2023 Compliance Audit Inspections report dated June 2023 and included as **Appendix D**.

The annual 2023 HVO South and HVO North compliance inspection was conducted over several days between 8 and 10 of November 2023 by three RAP representatives of the CHWG and a suitably qualified and experienced archaeologist. During the HVO South portion of the compliance inspection, a total of 12 Aboriginal heritage sites were inspected in the HVO South Area at Cheshunt Farm, Stapleton, Stafford and Hornes buffer properties. These areas are not active mining areas, with some utilised for grazing by third party rural licensees. During the HVO North portion of the compliance inspection, a total of 52 heritage sites were assessed including the key sites in proximity to the Wilton and Mitchell Pit Extension, Mitchell Pit South, Wandewoi Biodiversity area and CM-CD1. The findings and recommendations of these inspections are documented in the Hunter Valley Operations Aboriginal Heritage Management Plans November 2023 Compliance Audit Inspections report dated November 2023 and included as Appendix D.

The inspections found that all sites have been managed in conformance with the ACHMP/HMP requirements. Sites requiring maintenance and upgrades to site barricading, fencing and vegetative sediment controls were identified. Barricade upgrade and maintenance will be included as part of the works planning for 2023. Inspections were hampered by high vegetation and ground cover. The CM-CD1 site report included reference to the program of fencing upgrades proposed and endorsed by the CHWG to assist with demarcation of control zones for various activities including exclusion areas and areas where specific land management activities can be conducted. The report noted the success of recent weed management activities and the preparations that had been made for a cultural burn that was cancelled due to unfavourable seasonal conditions.

During the reporting period there were 54 GDPs assessed for cultural heritage management considerations at HVO.

There were no incidents, nor any unauthorised disturbance caused to cultural heritage sites at HVO during 2023.

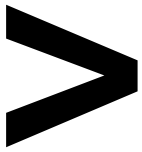


Figure 6-18: Axe head sighted during the November 2023 Aboriginal Heritage Compliance Inspection

#### 6.7.4 | HISTORIC HERITAGE – MANAGEMENT AND COMMUNITY CONSULTATION

Consultation was conducted at the Hunter Valley Operations Community Consultative Committee (CCC) Meetings held on 8 February, 10 May, 9 August, and 8 November 2023 as outlined in **Section 9**. Topics discussed included:

- Yard maintenance works and Termite Interception System inspections at LEP listed European heritage properties.
- Progress on HVO 's plan for an Historic Homestead Project, which included the completion of detailed survey and condition reports for the Archerfield, Wandewoi and Carrington Stud homesteads. An inspection of selected homesteads by the CCC took place in May 2023 (**Figure 6-19**).
- Discussion of the Chain of Ponds Inn Annual Management Report prepared by Liddell Coal.
- The Cockatoo Fence Asset Protection Zone maintenance works which were completed in November 2023 with the manual brush cutting of existing firebreaks on either side of the fence structure.
- A presentation on the Archerfield Distillery wall temporary underpinning works completed in Q3 2023 (**Figure 6-20**)

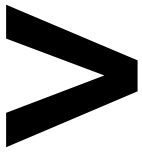
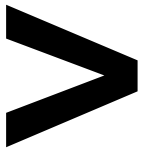


Figure 6-19: CCC Inspection of Archerfield Stables



Figure 6-20: Archerfield Homestead Distillery Wall underpinning



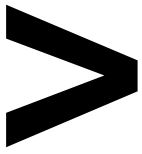
## 6.8 | BUSHFIRE MANAGEMENT

The following bushfire management control and mitigation activities outlined in the HVO Bushfire Management Plan were completed at the HVO site in 2023.

### 6.8.1 | OPERATIONAL AREAS

*Table 6-25: Bushfire Mitigation Measures Undertaken in Operational Areas*

<b>Task</b>	<b>Completion Note</b>
Inspect and maintain operational area fire trails and breaks	Completed as per SAP maintenance strategy
Inspect, install and maintain signage for main intersections, and gates of firebreak trails	Completed as per SAP maintenance strategy
Inspect and maintain areas surrounding administration buildings, workshops, crib huts and external roads	Completed as per SAP maintenance strategy
Inspect and maintain areas around power poles, switch yards, transformers, air break switches, and substations	Completed as per SAP maintenance strategy
Inspect and maintain areas around powerlines	Completed as per SAP maintenance strategy
Inspect and maintain areas around CHPP and load points	Completed as per SAP maintenance strategy
Inspect and maintain HC1 conveyor	Completed as per SAP maintenance strategy
Inspect and maintain workshops	Completed as per SAP maintenance strategy
Inspect and maintain water hydrant and pump function	Completed as per SAP maintenance strategy
Report any instances of bushfire outbreak to supervisor / manager, or raise emergency alarm	HVO recorded a bushfire related emergency alarm at the South Sub Station below the 706 crib hut on the 12/2/2023. The fire was controlled and extinguished by the site Emergency Response Team (ERT) and the local Rural fire Service (RFS).
Review Bushfire Management Plan including currency of information including maps, access routes)	Plan reviewed and updated in 2022 and endorsed by Hunter RFS and Singleton Council in 2023.
Bushfire reporting in the Annual Review	Completed – this report



**6.8.2 | NON-OPERATIONAL AREAS**

*Table 6-26: Bushfire Mitigation Measures Undertaken in Non-Operational Areas*

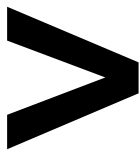
Task	Completion Note
Report any instances of bushfire outbreak to supervisor / manager, or raise emergency alarm	HVO recorded a minor grassfire event in non-operational areas at the Archerfield Property on the 10/8/2023. The fire was extinguished by the ERT and the local RFS.
Inspect and maintain non-operational fire trails and breaks	Inspection and maintenance of fire trails completed October 2023.
Inspect, install and maintain signage for gates or firebreak trails	Fire trail signage inspected in September 2023
Review fuel loads and complete necessary reduction including areas adjacent to neighbouring properties	Fuel Load inspection and review completed between May and September 2023

HVO did not conduct any fuel reduction burning activities during 2023.

**6.8.3 | HVO BUSHFIRE MANAGEMENT PLAN REVIEW AND IMPROVEMENT**

HVO is working to the Bushfire Management Plan updated in 2022 and endorsed in 2023.





## 7 | WATER MANAGEMENT

HVO manages surface and ground water according to three main objectives:

- Fresh water usage is minimised.
- Impacts on the environment and HVO neighbours are minimised; and
- Interference to mining production is minimal.

This is achieved by:

- Minimising freshwater use from the Hunter River.
- Preferentially using mine water for coal preparation and dust suppression.
- Emphasis on control of water quality and quantity at the source.
- Segregating waters of different quality where practical.
- Recycling on-site water.
- Ongoing maintenance and review of the system; and
- Disposing of water to the environment in accordance with statutes and regulations.

Plans showing the layout of all water management structures and key pipelines are shown in **Figure 7-1** to **Figure 7-3**. The HVO Water Management Plan contains further detail on management practices and is available on HVO website. Note that **Figure 7-1** to **Figure 7-3** are updated versions of plans presented in the currently approved *HVO Water Management* Plan and have been included in the revised version of the plan provided to DPHI for approval.

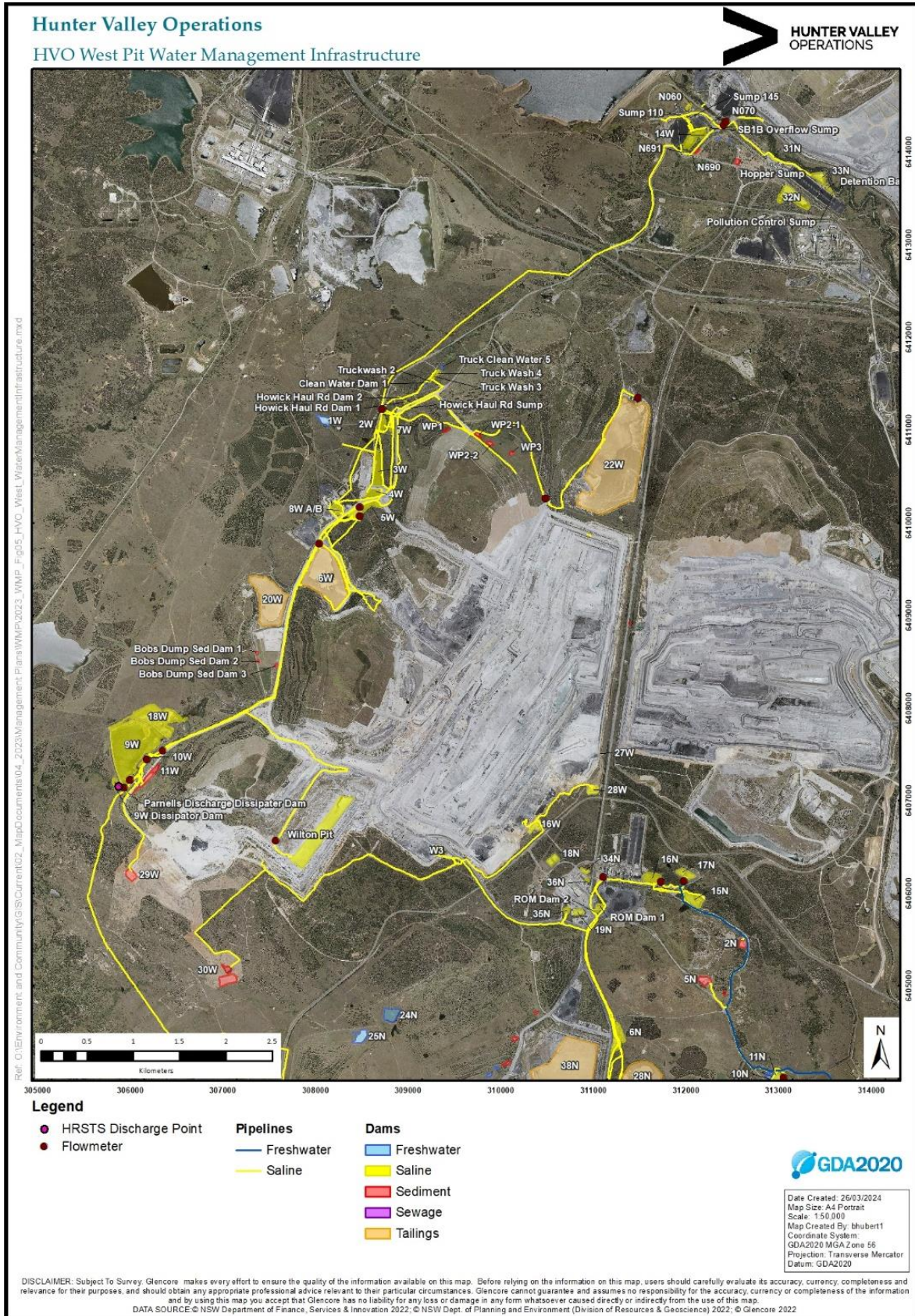


Figure 7-1: West Pit Water Management Infrastructure

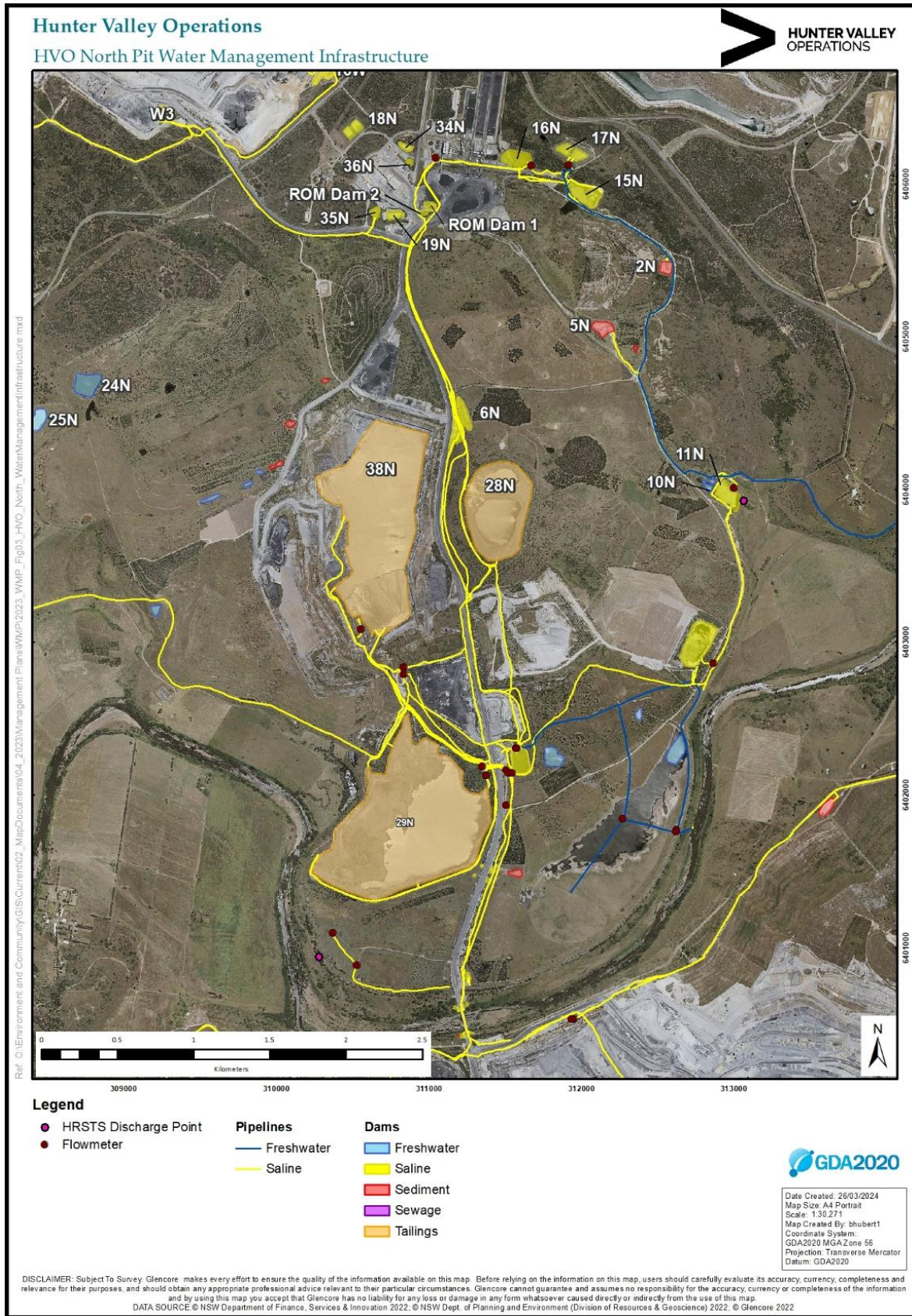
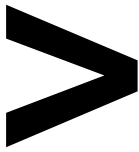


Figure 7-2: North Pit Water Management Infrastructure

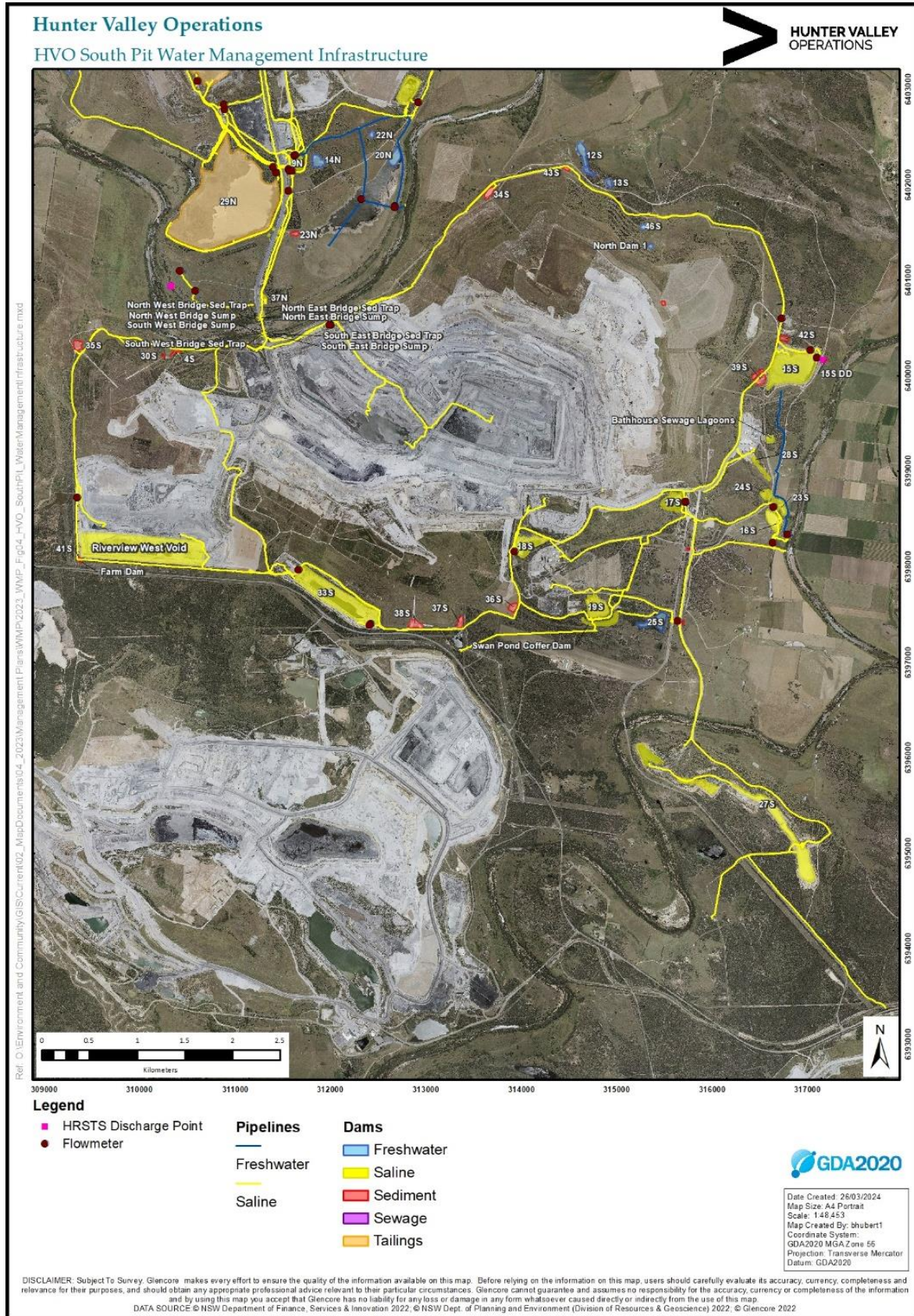


Figure 7-3: South Pit Water Management Infrastructure



## 7.1 | WATER BALANCE

The 2023 static water balance for HVO is presented in **Table 7-1**.

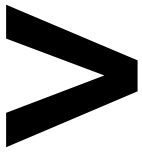
Table 7-1: 2023 Water Balance

Water Stream	Volume (ML)
<b>Inputs</b>	
Fresh Water (potable)	46 (0.8%)
Fresh Water (Hunter River extraction)	0 (0%)
Groundwater	650 (11.6%)
Rainfall Runoff	3,232 (57.9%)
Recycled to CHPP from Tails & Storage (not included in total)	3,429 (61.4%)
Imported (Liddell/Ravensworth (via Cumnock))	825 (14.8%)
Water from ROM Coal	832 (14.9%)
<b>Total Inputs</b>	<b>5,585</b>
<b>Outputs</b>	
Dust Suppression	3,135 (32.7%)
Evaporation – Mine Water & Tailings Dams	2,770 (29.0%)
Entrained in Process Waste	1,846 (19.3%)
Discharged (HRSTS)	0 (0%)
Vehicle Wash-down	310 (3.8%)
Sent to Third Party	0 (0%)
Miscellaneous Industrial Use	350 (3.2%)
Water in Coarse Reject	393 (4.1%)
Water in Product Coal	756 (7.9%)
<b>Total Outputs</b>	<b>9,560</b>
<b>Change in Pit Storage</b>	<b>2,102 (decrease)</b>

### 7.1.1 | WATER INPUTS

A total of 459 mm of rainfall was recorded at HVO in 2023 producing an estimated 3,232 ML of runoff. Water falling on undisturbed clean water catchments is diverted off site into natural systems where practicable.

Groundwater inflows to the pits are calculated via numerical groundwater modelling methods and were estimated to have contributed 650 ML to the site during 2023 (**Table 7-1**). No fresh water was extracted from the Hunter River during the reporting period.



7.1.2 | WATER OUTPUTS

The main outputs were water use for dust suppression (3,135ML), evaporation from dams (2,770 ML), water entrained in process waste (1,846 ML) and water in product coal (756 ML).

HVO participates in the Hunter River Salinity Trading Scheme (HRSTS) allowing it to discharge from licensed discharge points during declared discharge events, associated with increased flow in the Hunter River. HVO maintains three licensed discharge monitoring locations:

- Dam 11N, located at HVO North, which discharges to Farrell's Creek.
- Lake James, located at HVO South, which discharges to the Hunter River; and
- Parnell's Dam, located at HVO West, which discharges to Parnell's Creek.

There have been no discharges under the Hunter River Salinity Trading Scheme and Environment Protection Licence 640 during 2023.

7.2 | SURFACE WATER

Surface water monitoring activities continued in 2023 in accordance with the HVO WMP and HVO Surface Water Monitoring Program (SWMP). HVO maintains a network of surface water monitoring sites located on mine site dams, discharge points and surrounding natural watercourses (Figure 7-4). Water quality monitoring is undertaken to verify the effectiveness of the water management system onsite, and to identify the emergence of potentially adverse effects on surrounding watercourses. A number of mine water dams are monitored routinely to verify the quality of mine water. This water is used in coal processing, dust suppression, and other day to day activities around the mine.

Surface water monitoring data is reviewed on a quarterly basis. The review involves a comparison of measured pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS) results against internal trigger values which have been derived from the historical data set. The response to measured monitoring levels outside the trigger limits is detailed in the HVO Monthly Environmental Monitoring Reports that can be found on the HVO website.

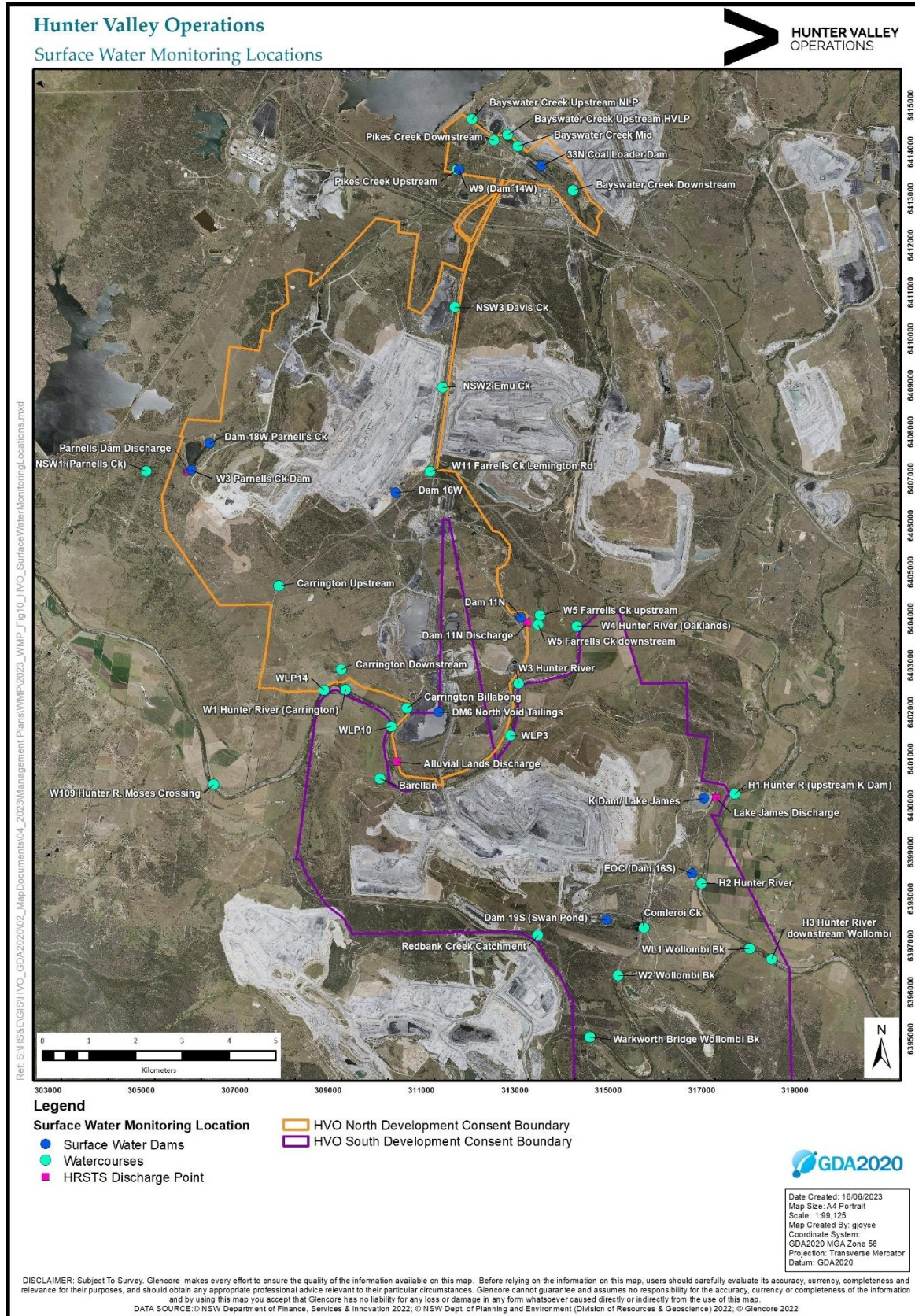
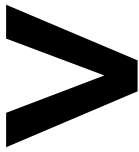


Figure 7-4: Surface Monitoring Locations



### 7.2.1 | SURFACE WATER MONITORING

Routine surface water monitoring was undertaken in 2023 in accordance with the HVO SWMP. All laboratory analysis of surface water was carried out in accordance with approved methods by a NATA accredited laboratory.

Water quality is evaluated through the parameters of pH, EC and TSS. Pertinent surface water sites are also sampled for comprehensive analysis annually. Long term water quality trends for the Hunter River, Wollombi Brook, other surrounding tributaries, and site dams are also presented in this section. The sampling frequency for ephemeral water sites was modified in 2016, from quarterly to a rain-event trigger system, in an effort to ensure samples taken were more representative of typical water quality for those streams – up to eight sampling events per annum can now be taken under the revised sampling protocol.

All required sampling and analysis was undertaken, except as detailed in **Table 7-2**. Australia and New Zealand Environment and Conservation Council (ANZECC) criteria are shown in the figures for comparative purposes only.

Table 7-2: HVO Water Monitoring Data Recovery for 2023 (By Exception)

Location	Data Recovery (%)	Comments
WLP3	75%	This monitoring location was not able to be accessed during one monitoring event due to lack of safe access.

#### 7.2.1.1 | HUNTER RIVER

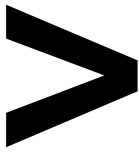
The Hunter River was sampled from eight monitoring locations during 2023. Long term trends for pH, EC and TSS are shown in **Figure 7-5** to **Figure 7-7**.

Trigger exceedance results are detailed in **Table 7-3**.

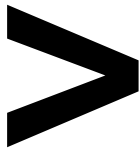
Table 7-3: Hunter River Internal Trigger Tracking Results

Location	Date	Trigger Limit	Action Taken in Response
W1 – Hunter River	29/03/2023	TSS – 50	<p>First Exceedance of TSS.</p> <ul style="list-style-type: none"> <li>- Field Observations indicate that the sample was brown in colour and slightly turbid.</li> <li>- Approximately 60mm of rainfall in the seven days prior to sampling.</li> <li>- No HRSTS discharges upstream of W1 on or prior to the 29/03/23.</li> <li>- No sediment basins overtopped during rain event</li> <li>- On 29/03/23 TSS at W109 Hunter River (upstream of W1) indicated a slightly elevated TSS result of 44 mg/L but was lower than the W1 result.</li> <li>- Other monitoring locations in the Hunter River downstream of W1 (W3, W4, H1 and H2) also exceeded the TSS trigger value.</li> </ul> <p>Investigation: There were no onsite events identified to indicate that the TSS exceedance was associated with a HVO mining impact. The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff.</p>

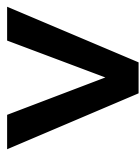




Location	Date	Trigger Limit	Action Taken in Response
W3 – Hunter River	29/03/2023	TSS – 57	<p>First Exceedance of TSS.</p> <ul style="list-style-type: none"> <li>- Field Observations indicate that the sample was brown in colour and slightly turbid.</li> <li>- Approximately 60mm of rainfall in the seven days prior to sampling.</li> <li>- No HRSTS discharges upstream of W3 on or prior to the 29/03/23.</li> <li>- No sediment basins overtopped during rain event</li> </ul> <p>- On 29/03/23 TSS at W109 Hunter River (upstream of W3) indicated a slightly elevated TSS result of 44 mg/L and W1 (50 mg/L) recorded a trigger value exceedance (also upstream of W3) but both of these results were lower than W3 (57 mg/L).</p> <p>- Other monitoring locations in the Hunter River downstream of W3 (W4, H1 and H2) also exceeded the TSS trigger value.</p> <p>Investigation: There were no onsite events identified to indicate that the TSS exceedance was associated with a HVO mining impact. The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff.</p>
W4 – Hunter River	29/03/2023	TSS – 66	<p>First Exceedance of TSS.</p> <ul style="list-style-type: none"> <li>- Field Observations indicate that the sample was brown in colour and slightly turbid.</li> <li>- Approximately 60mm of rainfall in the seven days prior to sampling.</li> <li>- No HRSTS discharges upstream of W4 on or prior to the 29/03/23.</li> <li>- No sediment basins overtopped during rain event</li> </ul> <p>- On 29/03/23 TSS at W109 Hunter River (upstream of W4) indicated a slightly elevated TSS result of 44 mg/L and W1 (50 mg/L) and W3 (57 mg/L) recorded trigger value exceedances (both upstream of W3) but all of these results were lower than W4 (66 mg/L).</p> <p>- Other monitoring locations in the Hunter River downstream of W4 (H1 and H2) also exceeded the TSS trigger value.</p> <p>Investigation: There were no onsite events identified to indicate that the TSS exceedance was associated with a HVO mining impact. The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff.</p>
H1 – Hunter River	29/03/2023	TSS – 64	<p>First Exceedance of TSS.</p> <ul style="list-style-type: none"> <li>- Field Observations indicate that the sample was brown in colour and slightly turbid.</li> <li>- Approximately 60mm of rainfall in the seven days prior to sampling.</li> <li>- No HRSTS discharges upstream of H1 on or prior to the 29/03/23.</li> <li>- No sediment basins overtopped during rain event</li> </ul> <p>- On 29/03/23 TSS at W109 Hunter River (upstream of W4) indicated a slightly elevated TSS result of 44 mg/L and W1 (50 mg/L), W3 (57 mg/L) and W4 (66 mg/L) recorded trigger value exceedances (all upstream of W4). The TSS result at H1 (64 mg/L) was greater than recorded at W109, W1 and W3 and similar to that recorded at W4.</p> <p>Investigation: There were no onsite events identified to indicate that the TSS exceedance was associated with a HVO mining impact. The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff.</p>



Location	Date	Trigger Limit	Action Taken in Response
H2 – Hunter River	29/03/2023	TSS – 54	<p>First Exceedance of TSS.</p> <ul style="list-style-type: none"> <li>- Field Observations indicate that the sample was brown in colour and slightly turbid.</li> <li>- Approximately 60mm of rainfall in the seven days prior to sampling.</li> <li>- No HRSTS discharges upstream of H2 on or prior to the 29/03/23.</li> <li>- No sediment basins overtopped during rain event</li> </ul> <p>-On 29/03/23 TSS at W109 Hunter River (upstream of H2) indicated a slightly elevated TSS result of 44 mg/L, and W1 (50 mg/L), W3 (57 mg/L), W4 (66 mg/L) and H1 (64 mg/L) all recorded trigger value exceedances (all upstream of H2). The TSS result at H2 (54 mg/L) was greater than that recorded at W109, similar to that recorded at W1 and lower than that recorded at W3, W4 and H1 (immediately upstream of H2).</p> <p>Investigation: There were no onsite events identified to indicate that the TSS exceedance was associated with a HVO mining impact. The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff.</p>
H2 – Hunter River	06/06/2023	EC – 1137	<p>Third consecutive exceedance of EC.</p> <ul style="list-style-type: none"> <li>- Field Observations indicate that the sample was clear in colour and turbidity, with nil odour.</li> <li>- Approximately 1mm of rainfall in the seven days prior to sampling.</li> <li>- No HRSTS discharges upstream of H2 on or prior to the 6/06/23.</li> <li>- No sediment basins overtopped during rain event</li> </ul> <p>- On 6/06/23 site W109 Hunter River (upstream of H2) indicated a trigger value exceedance of 1,224 EC (µS/cm) within the broader catchment.</p> <p>- On 6/06/23 sites W3 (1248 µS/cm), W4 (1245 µS/cm) and H1 (1146 µS/cm) all recorded trigger value exceedances (all upstream of H2). The EC result at H2 (1137 µS/cm) was less than that recorded at W109, W3, W4 and H1 (immediately upstream of H2).</p> <p>Investigation: There were no onsite events identified to indicate that the EC exceedance was associated with a HVO mining impact. The EC exceedance appears to be a result of high EC within the broader catchment.</p>
W109 – Hunter River	19/12/2023	EC – 1322	<p>Third consecutive exceedance of EC.</p> <ul style="list-style-type: none"> <li>-Field observations indicated that the sample was light brown in colour and slightly turbid</li> <li>- Approximately 0mm of rainfall in the seven days prior to sampling</li> <li>- pH and TSS results are generally consistent with historical range of results at W109 presented in WMP.</li> </ul> <p>Investigation outcome: Because W109 is an upstream reference monitoring location it cannot be impacted by HVO mining activities. The trigger exceedance appears to be a result of high EC within the broader catchment.</p>



Location	Date	Trigger Limit	Action Taken in Response
W4 – Hunter River	19/12/2023	EC – 1385	<p>Third consecutive exceedance of EC.</p> <ul style="list-style-type: none"> <li>- Field Observations indicate that the sample was light brown in colour and slightly turbid.</li> <li>- Approximately 0mm of rainfall in the seven days prior to sampling.</li> <li>- No HRSTS discharges upstream of W4 on or prior to the 19/12/23.</li> <li>- On 19/12/23 EC at W109 Hunter River (upstream of W4) indicated a slightly elevated EC result of 1322 <math>\mu\text{S/cm}</math> and W1 (1399 <math>\mu\text{S/cm}</math>) and W3 (1379 <math>\mu\text{S/cm}</math>) recorded trigger value exceedances (both upstream of W4).</li> </ul> <p>Investigation: There were no onsite events identified to indicate that the EC exceedance was associated with a HVO mining impact. The EC exceedance appears to be a result of high EC within the broader catchment.</p>
W3 – Hunter River	19/12/2023	EC - 1379	<p>Third consecutive exceedance of EC.</p> <ul style="list-style-type: none"> <li>- Field Observations indicate that the sample was light brown in colour and slightly turbid.</li> <li>- Approximately 0mm of rainfall in the seven days prior to sampling.</li> <li>- No HRSTS discharges upstream of W3 on or prior to the 19/12/23.</li> <li>- On 19/12/23 sites W109 Hunter River (1322 <math>\mu\text{S/cm}</math>), W1 (1399 <math>\mu\text{S/cm}</math>) and W4 (1385 <math>\mu\text{S/cm}</math>) recorded EC trigger value exceedances (all upstream of W3).</li> </ul> <p>Investigation: There were no onsite events identified to indicate that the EC exceedance was associated with a HVO mining impact. The EC exceedance appears to be a result of high EC within the broader catchment.</p>

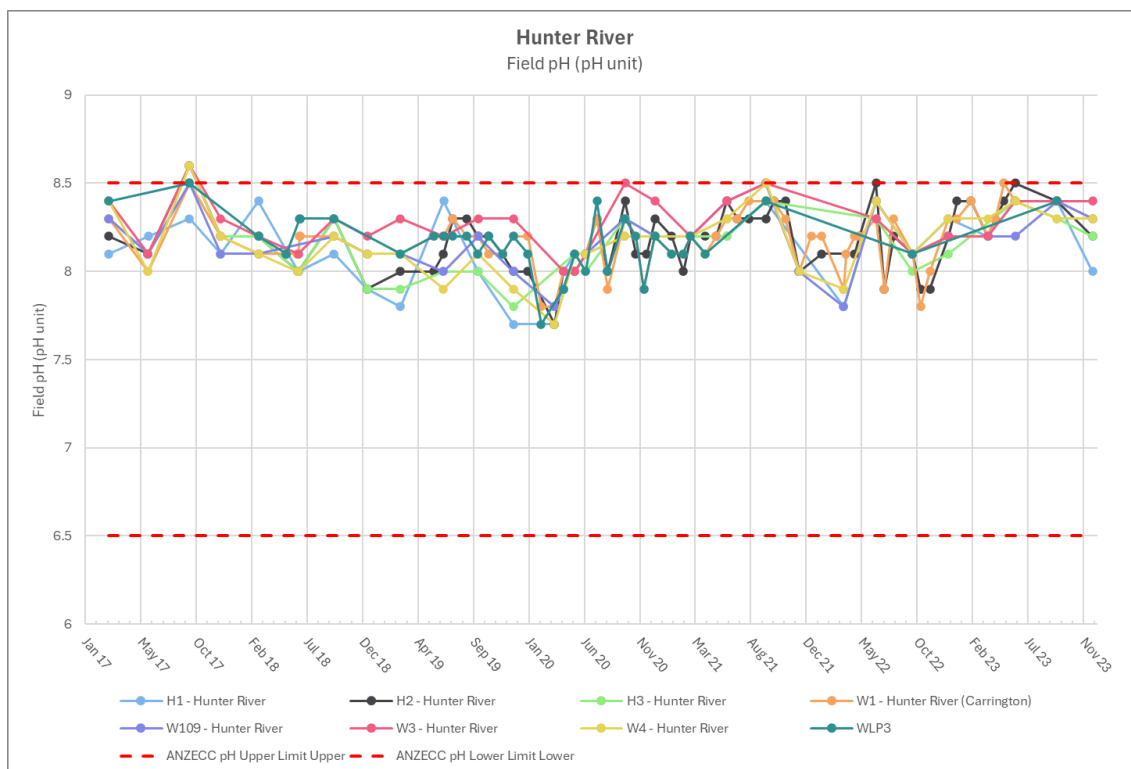


Figure 7-5: Hunter River pH Trends 2017 - 2023

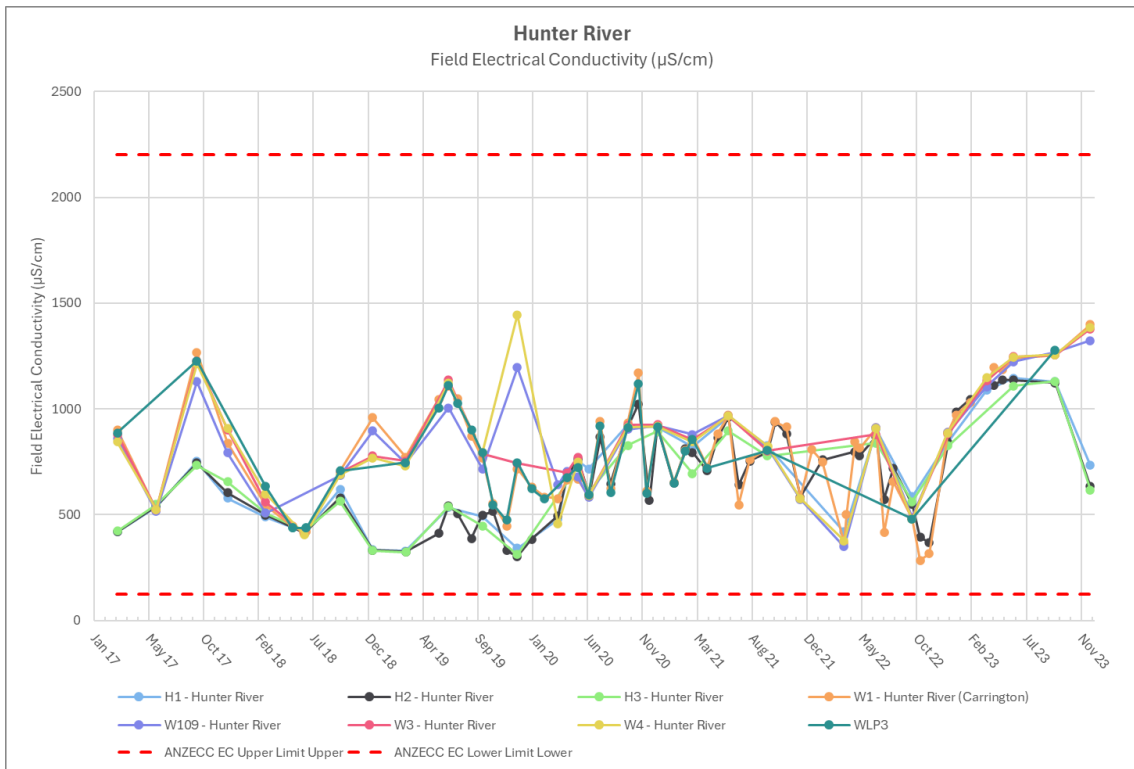


Figure 7-6: Hunter River EC Trends 2017 - 2023

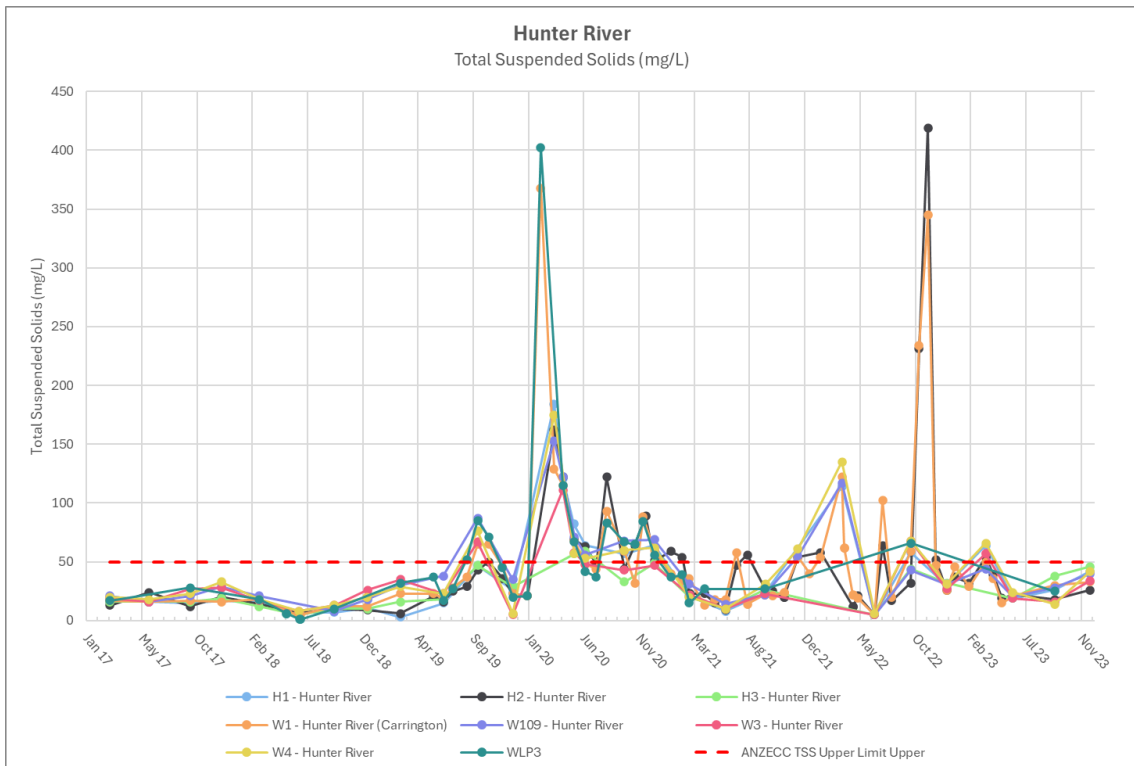
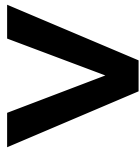


Figure 7-7: Hunter River TSS Trends 2017 - 2023



7.2.1.2 | WOLLOMBI BROOK

Wollombi Brook was sampled from three monitoring locations during 2023. Long term trends for pH, EC and TSS from Wollombi Brook are shown in **Figure 7-8** to **Figure 7-10**. Results were generally consistent with historical trends and acceptable ranges. Trigger exceedance results are detailed in **Table 7-4**.

Table 7-4: Wollombi Brook Internal Trigger Tracking Results

Location	Date	Trigger Limit	Action Taken in Response
WL1	20/09/2023	TSS – 68	<p>First Exceedance of TSS.</p> <ul style="list-style-type: none"> <li>- Field Observations indicate that the sample was brown in colour and turbid. A slow flow rate and low water level was recorded at WL1.</li> <li>- 0mm of rainfall in the seven days prior to sampling.</li> <li>- No HRSTS discharges upstream of WL1 on or prior to the 20/09/23.</li> <li>- On 20/09/23 TSS at W109 Hunter River and H2 (upstream of WL1) indicated TSS results of 28 mg/L and 18gm/L.</li> </ul> <p>The TSS result at WL1 (68 mg/L) was greater than that recorded at W109 and H2.</p> <p>Investigation: Given the lack of rainfall preceding the sampling it is unlikely that the TSS exceedance was associated with a HVO mining impact. Based on the field observations, it is likely the TSS exceedance is a result of low water level and natural mixing of the Hunter River with watercourse bed sediment at WL1.</p>
WL1	19/12/2023	TSS – 54	<p>First Exceedance of TSS</p> <ul style="list-style-type: none"> <li>- Field Observations indicate that the sample was light brown in colour and slightly turbid. A slow flow rate and low water level was recorded at WL1.</li> <li>- 0mm of rainfall in the seven days prior to sampling.</li> <li>- No HRSTS discharges upstream of WL1 on or prior to the 19/12/23.</li> <li>- On 19/12/23 TSS at W109 Hunter River and H2 (upstream of WL1) indicated TSS results of 40 mg/L and 26 mg/L.</li> </ul> <p>The TSS result at WL1 (54 mg/L) was greater than that recorded at W109 and H2.</p> <p>Investigation: Given the lack of rainfall preceding the sampling it is unlikely that the TSS exceedance was associated with a HVO mining impact.</p> <p>Drone footage captured in Q4 2023 of Wollombi Brook between sites W2 and WL1 indicates large areas of wash-out in parts of the bank.</p> <p>Field observations also indicate that site WL1 has changed dramatically since the flood events in early 2023 as overflow from the Hunter River flowed through the Brook during the 2023 flood events.</p> <p>Based on WL1 field observations and drone footage, it is likely the TSS exceedance is a result of low water level and natural mixing of the Hunter River with watercourse bed sediment at WL1.</p>

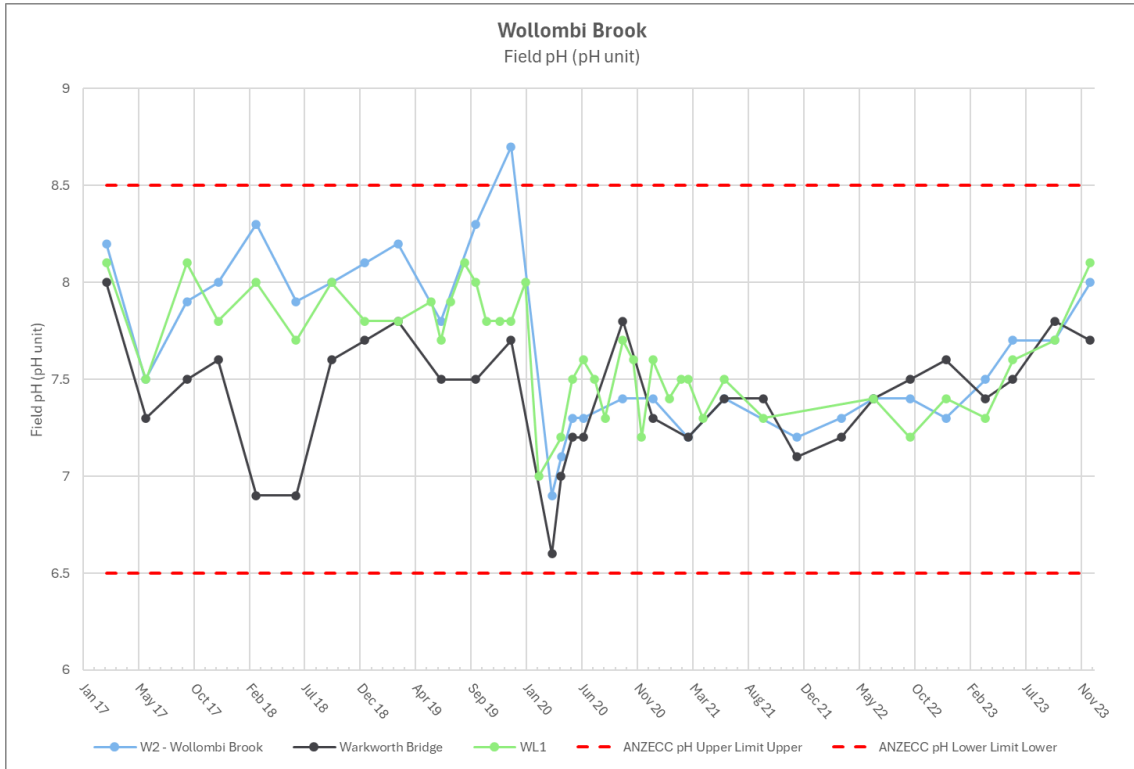


Figure 7-8: Wollombi Brook pH Trends 2017 - 2023

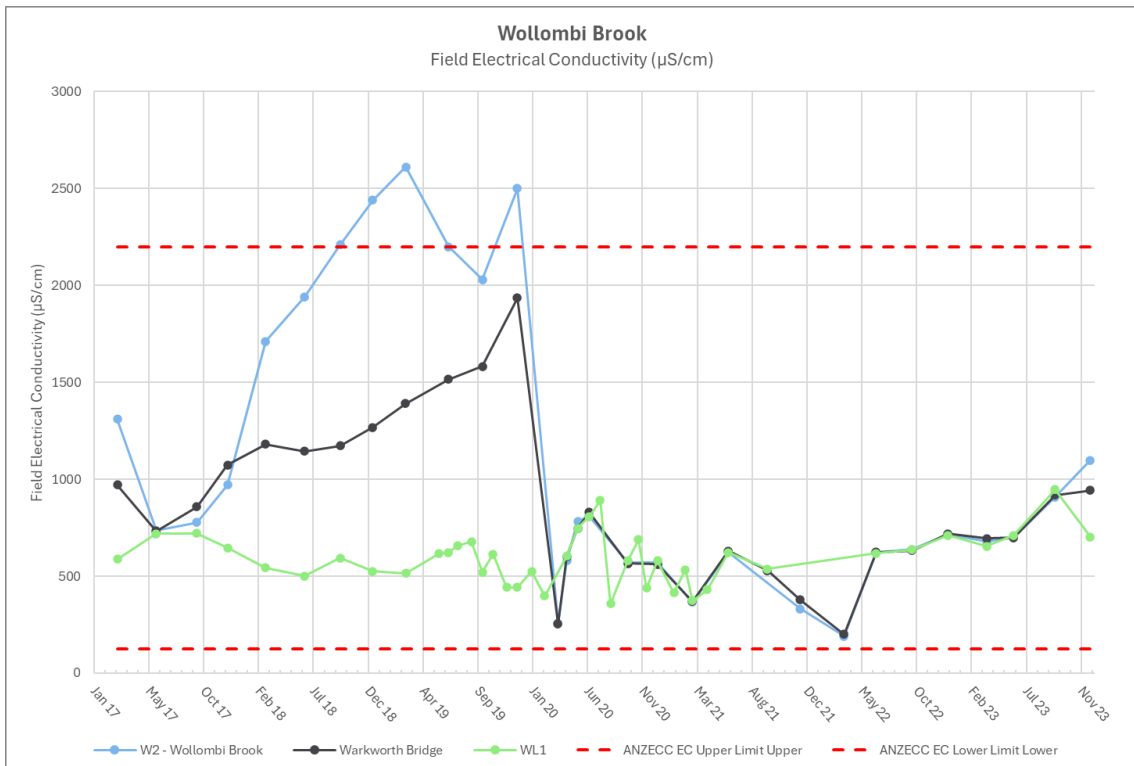


Figure 7-9: Wollombi Brook EC Trends 2017 - 2023

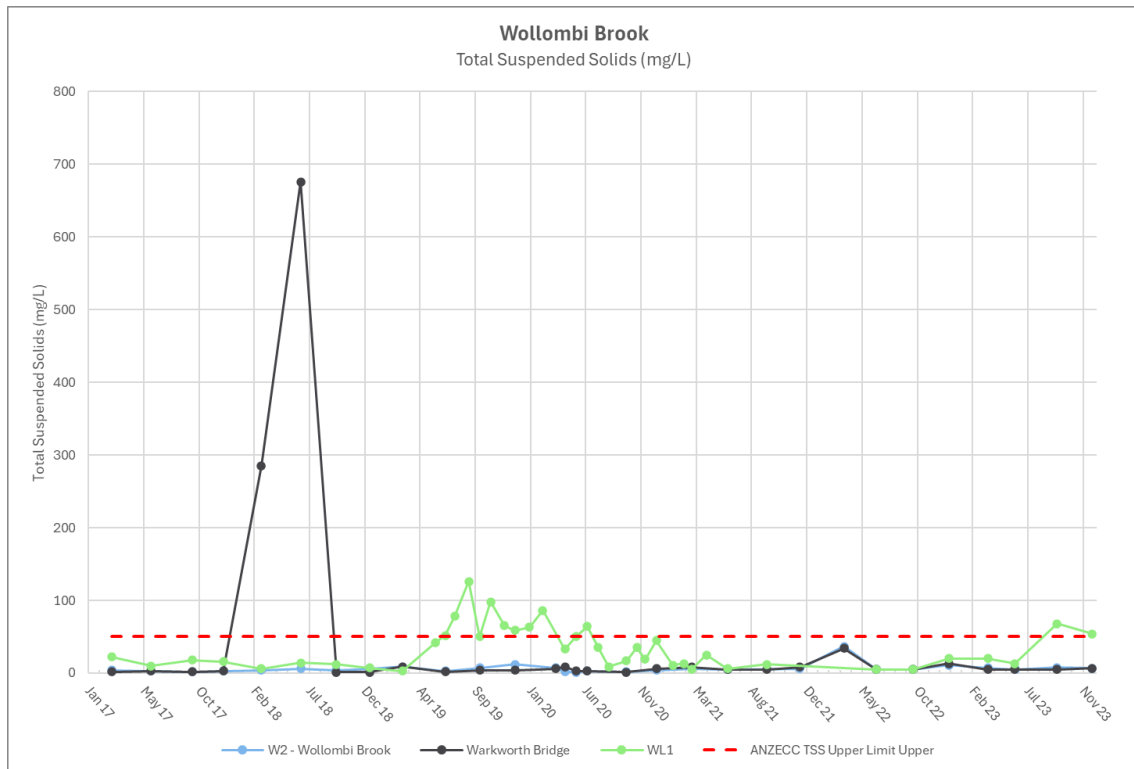
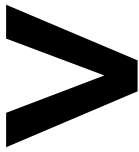


Figure 7-10: Wollombi Brook TSS Trends 2017 - 2023

### 7.2.1.3 | OTHER SURROUNDING TRIBUTARIES

Rain event-based monitoring of natural tributaries surrounding HVO continued during 2023.

In accordance with the HVO WMP, four rain event sampling rounds were triggered during 2023. These occurred following rainfall greater  $\geq 30$ mm in a 24-hour period on the days of 23/02/2023, 28/03/2023, 21/12/2023 and 28/12/2023. Monitoring during these rain events occurred on the following water courses:

- Comleroi Creek.
- Emu Creek.
- Farrells Creek.
- Pikes Creek.
- Redbank Creek.
- Davis Creek.
- Bayswater Creek; and
- Parnells Creek.

Long term trends for pH, EC and TSS are shown **Figure 7-11** to **Figure 7-14**. On occasion, some sampling sites recorded results outside of the internal trigger levels however, results for water quality remained generally consistent with historical trends. The ephemeral nature of these monitoring locations is the primary reason for the considerable variation in physical water quality.

Trigger tracking results are detailed in **Table 7-5**.

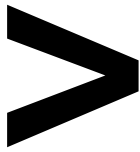
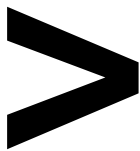


Table 7-5: Other Tributaries Internal Trigger Exceedance Results

Location	Date	Trigger Limit	Action Taken in Response
23/02/2023	Bayswater Creek Downstream	TSS – 53	<p>Rain event sampling.</p> <p>First Exceedance of TSS.</p> <p>-Field observations indicated that the sample was brown in colour and turbid with no flow.</p> <p>- Approximately 75mm of rainfall in the seven days prior to sampling.</p> <p>- No HRSTS discharges upstream of Bayswater Creek Downstream on or prior to the 23/02/23.</p> <p>- No sediment basins overtopped during rain event</p> <p>Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact.</p> <p>The exceeded TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff.</p>
23/02/2023	Comleroi Creek	TSS – 142	<p>Rain event sampling.</p> <p>First Exceedance of TSS.</p> <p>-Field observations indicated that the sample was brown in colour and turbid with pool/no flow.</p> <p>- Approximately 75mm of rainfall in the seven days prior to sampling.</p> <p>- No HRSTS discharges upstream of Comleroi on or prior to the 23/02/23.</p> <p>- No sediment basins overtopped during rain event</p> <p>Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. The TSS exceedance appears to be a result of disturbance of sediment while collecting sample from a pool of water at the monitoring site.</p>
21/12/2023	Bayswater Creek Upstream HVLP	TSS – 50	<p>Rain event sampling.</p> <p>First Exceedance of TSS.</p> <p>-Field observations indicated that the sample was light brown in colour and turbid with no flow(pool).</p> <p>- Approximately 28.2mm of rainfall in day prior to sampling.</p> <p>- No HRSTS discharges upstream of Bayswater Creek Upstream on or prior to the 21/12/23.</p> <p>- No sediment basins overtopped during rain event</p> <p>Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact.</p> <p>The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff.</p>





Location	Date	Trigger Limit	Action Taken in Response
21/12/2023	W11 – Farrells Creek Lemington Road	TSS – 63	<p>Rain event sampling.</p> <p>First Exceedance of TSS.</p> <p>-Field observations indicated that the sample was brown in colour and turbid with no flow(pool).</p> <p>- Approximately 28.2mm of rainfall in day prior to sampling.</p> <p>- No HRSTS discharges upstream of W11 on or prior to the 21/12/23.</p> <p>- No sediment basins overtopped during rain event</p> <p>Investigation: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact.</p> <p>The TSS exceedance appears to be a result of rainfall prior to sampling leading to elevated suspended solids concentrations in broader catchment runoff.</p>

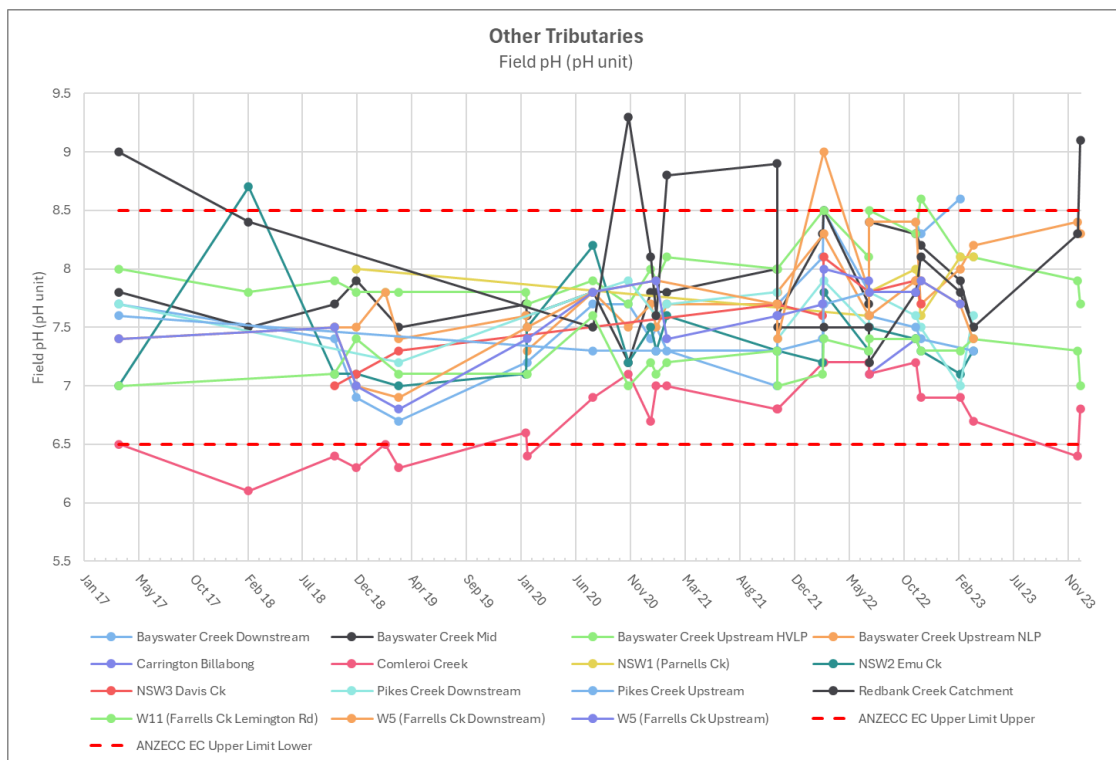


Figure 7-11: Other Tributaries pH Trends 2017 - 2023

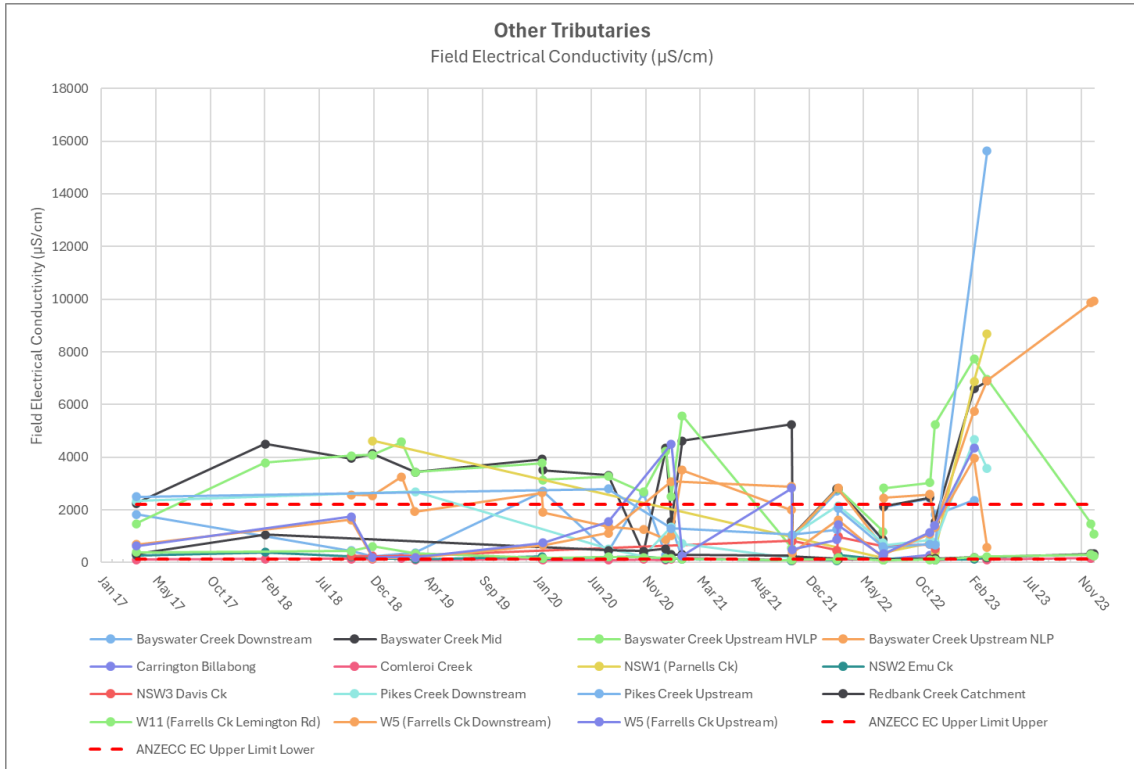


Figure 7-12: Other Tributaries EC Trends 2017 - 2023

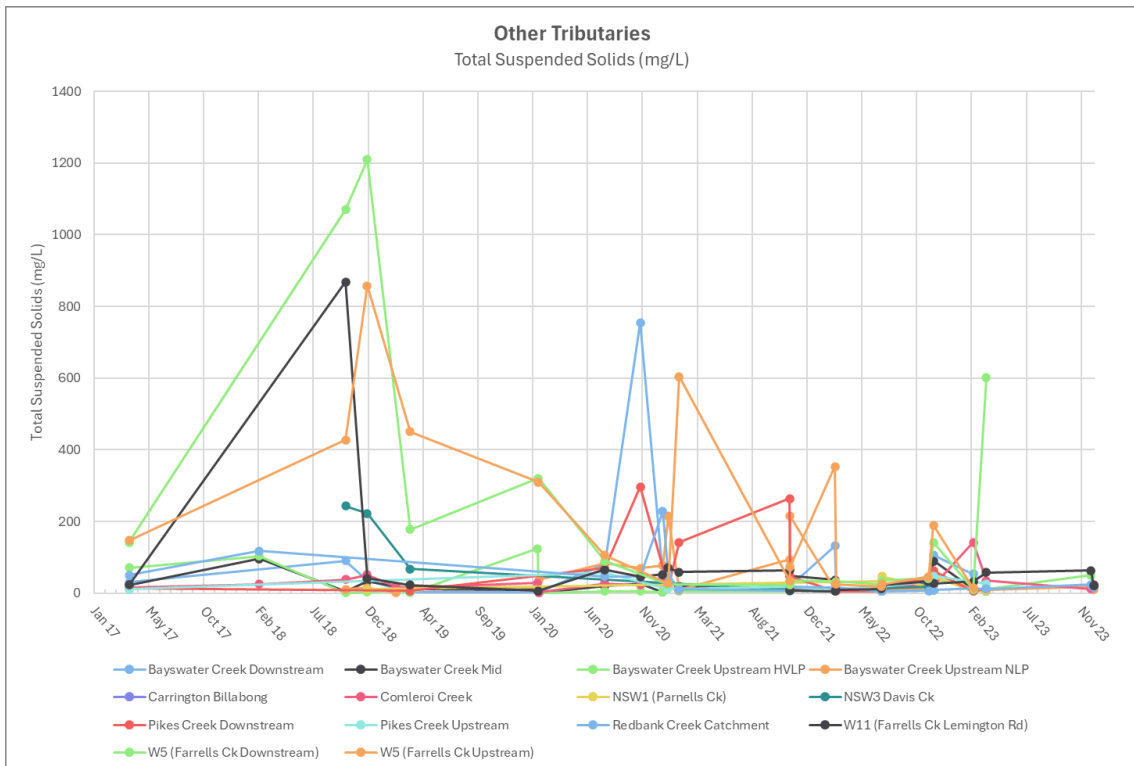


Figure 7-13: Other Tributaries TSS Trends 2017 – 2023

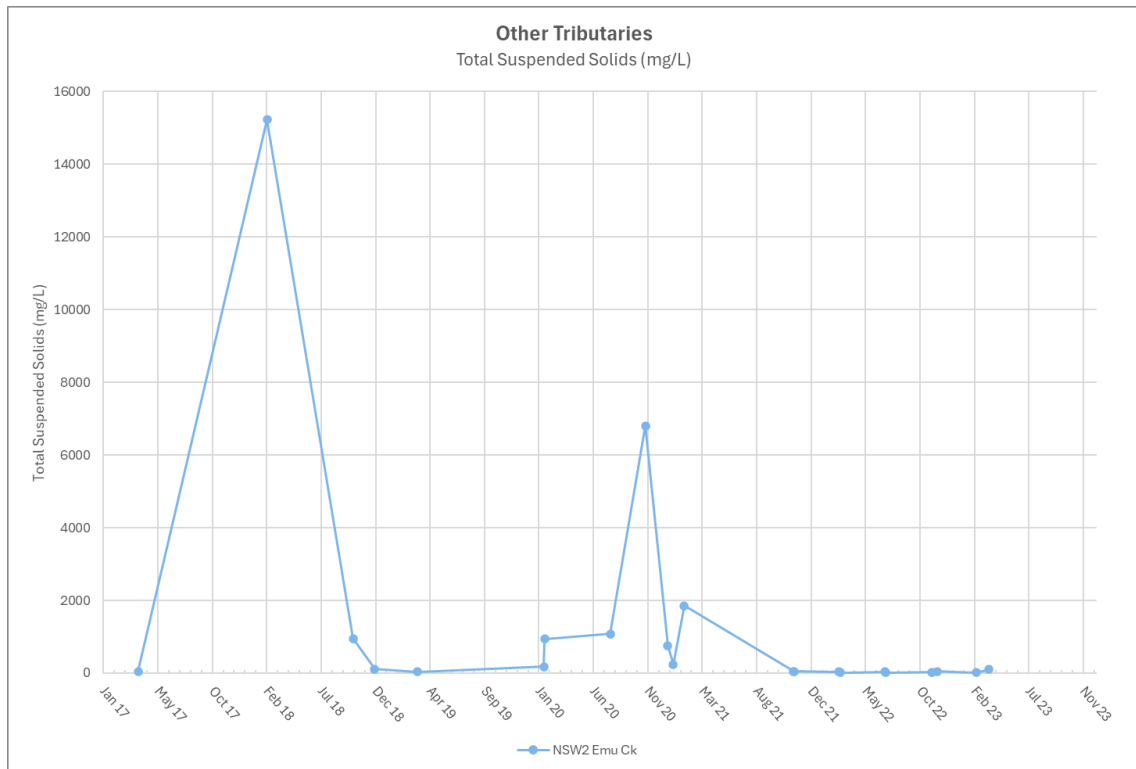
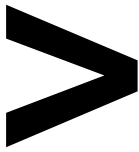


Figure 7-14: NSW2 Emu Creek TSS Trends 2017-2023

### 7.2.1.4 | HVO SITE DAMS

During 2023 monitoring was completed at across 10 onsite dams. Long term trends for pH, EC and TSS are shown in **Figure 7-15** to **Figure 7-17**. HVO's onsite dams do not have impact assessment criteria. Results for water quality remained generally consistent with historical water quality trends.

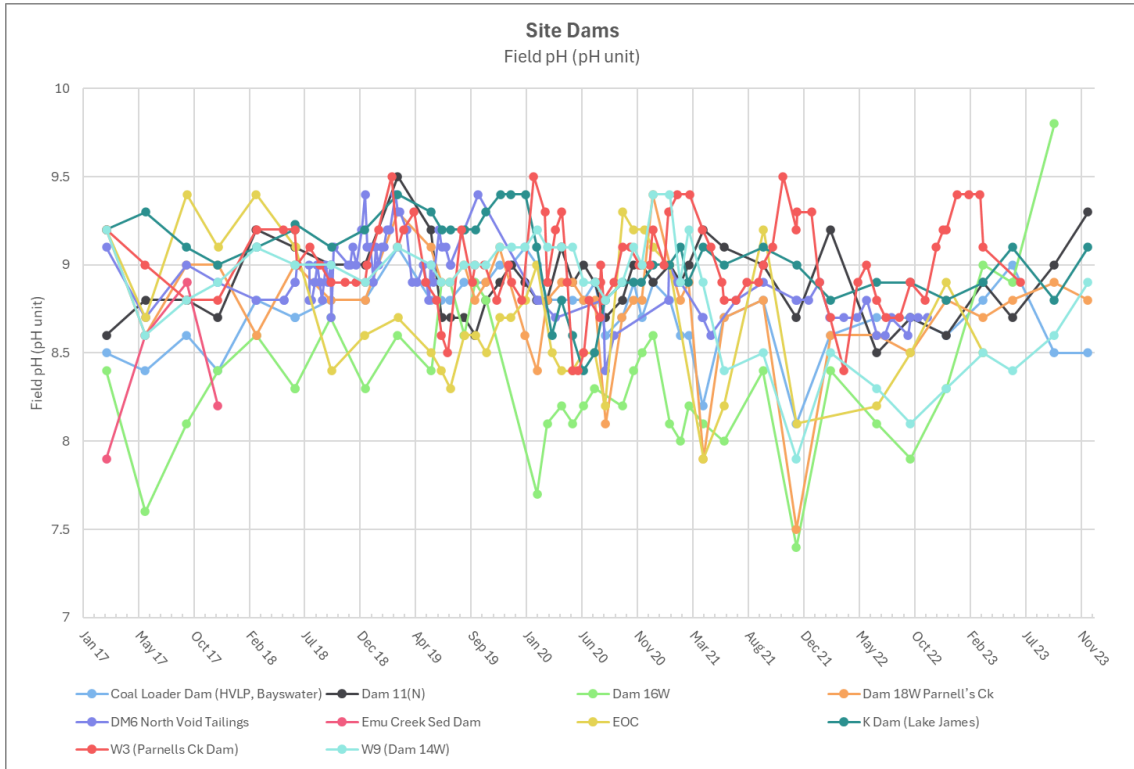


Figure 7-15: HVO Site Dams pH Trends 2017 - 2023

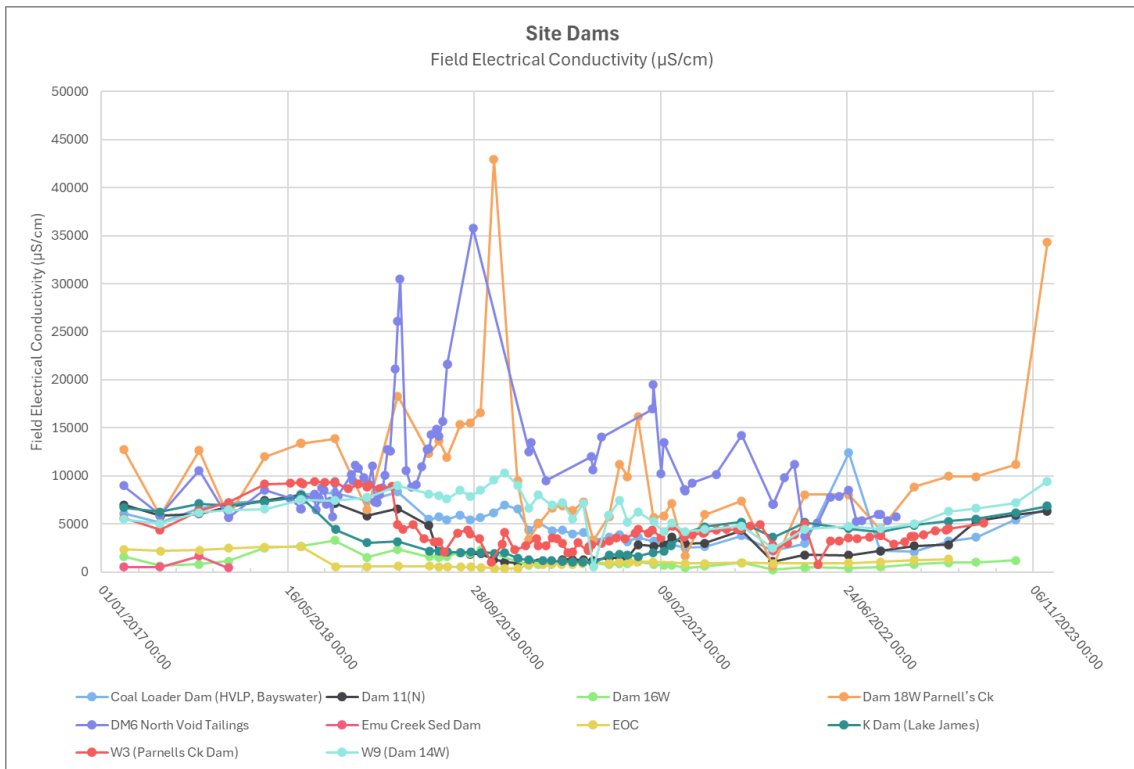


Figure 7-16: HVO Site Dams EC Trends 2017 – 2023

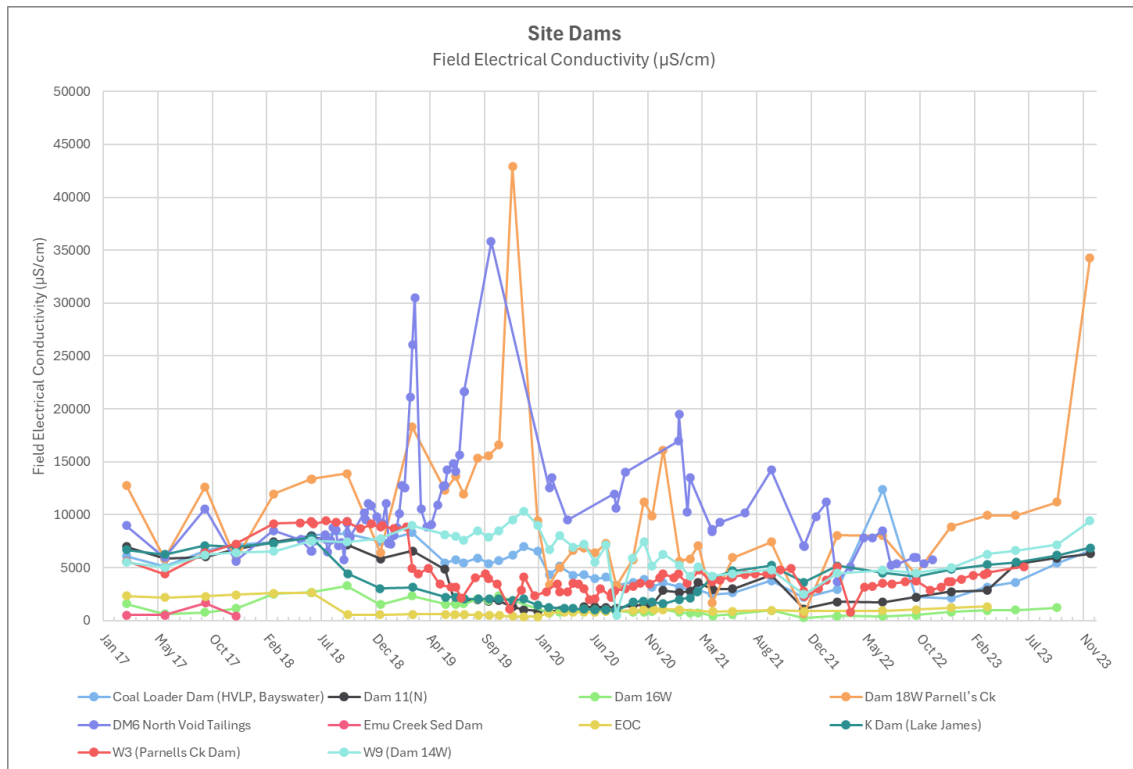
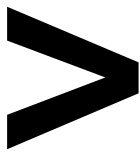


Figure 7-17: HVO Site Dams TSS Trends 2017 - 2023

## 7.3 | COMPARISON WITH EIS PREDICTIONS

### 7.3.1 | SOUTH PIT EIS PREDICTIONS

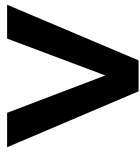
The South Pit EIS estimated an ‘instantaneous’ water quality for Electrical Conductivity of 5,700 µS/cm as an upper limit. Instantaneous water quality is a simple estimate obtained by dividing the total salt available by the maximum amount of possible void water. Electrical Conductivity measurements at Lake James averaged 5,960 µS/cm during 2023, generally in line with predicted EC levels (+ 4.56%) could be attributed to less than average annual rainfall.

The South Pit EIS estimated average runoff water quality from undisturbed catchments to be 400 mg/L for TSS and 615 µS/cm for EC. Comleroi Creek, south of Cheshunt Pit, was sampled four times during rain events in 2023 resulting in an average TSS of 53 mg/L and EC of 182 µS/cm, demonstrating that runoff water from undisturbed catchments in the HVO South area is of better quality than that which was predicted in the EIS.

### 7.3.2 | CARRINGTON PIT EIS PREDICTIONS

The long term mine water quality for Carrington is discussed in the Carrington Mine Environmental Impact Statement (ERM 1999). The EIS estimated an “instantaneous” water quality for Electrical Conductivity of 7,050 µS/cm.

Dewatering from Carrington is a mixture of surface runoff from overburden emplacements, coal mining areas and seepage from the coal seams and alluvium. Water is directed to Dam 9N and into Dam 11N. The



average EC and TSS in Dam 11N during 2023 was 5,098  $\mu\text{S}/\text{cm}$  and 18.75 mg/L respectively and is considered broadly representative of mine water quality for Carrington.

The Carrington EIS states that runoff from undisturbed catchments within the Carrington Pit will be directed around the mine via contour banks or surface drains to discharge where possible into natural creeks. The salinity of the runoff water was predicted to be approximately 615  $\mu\text{S}/\text{cm}$ . Runoff from rehabilitated lands was initially predicted to have higher TSS, with levels approaching pre-mining conditions after several years. Carrington Billabong (where water quality would be measured for this comparison) did not have any EC results during the 2023 rain event monitoring rounds, as the area was recorded as dry on all occasions.

### 7.3.3 | WEST PIT EIS PREDICTIONS

The West Pit EIS included the data in **Table 7-6** as representative of water quality in the local catchment area. During the review period Emu Creek (NSW2) recorded an average pH of 8.1 and an average EC of 5,066  $\mu\text{S}/\text{cm}$ , both lower than the predicted results of Table 42. The pH and EC at Farrells Creek (combined upstream and downstream monitoring sites) averaged 8.3 and 3,815  $\mu\text{S}/\text{cm}$  respectively during the review period, were also slightly lower than EIS predictions. The average pH and EC for Davis Creek (NSW3) were 8.4 and 4,898  $\mu\text{S}/\text{cm}$  respectively during the review period, equal to and slightly lower than EIS predictions. Parnell's Dam measured an average EC of 3,288  $\mu\text{S}/\text{cm}$  in 2023, within the prediction.



Table 7-6: Representative Water Quality for West Pit

Watercourse	pH (pH Units)	EC (µS/cm)
Davis Creek	7.7 to 8.4	767 to +8,000
Emu Creek	7.5 to 8.8	365 to +1,000
Farrells Creek	7.0 to 9.2	195 to +12,000
Mine Water (Parnell's Dam)	-	2,400 to 6,300

## 7.4 | PERFORMANCE RELATING TO HRSTS DISCHARGES

HVO participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing it to discharge to the Hunter River via three licensed discharge points, including Dam 11N, Dam 15S (Lake James) and Dam 9W (Parnells Dam). Discharges can only take place subject to the scheme's regulations.

As required by the EPL, HVO submitted a discharge report for the 2022/23 financial year. No water was discharged during 2023 in accordance with the HRSTS.

## 7.5 | GROUNDWATER

### 7.5.1 | GROUNDWATER MANAGEMENT

Groundwater monitoring activities were undertaken in 2023 in accordance with the HVO WMP and Groundwater Monitoring Programme. The monitoring results are used to establish and monitor trends in physical and geochemical parameters of surrounding groundwater potentially influenced by mining.

The groundwater monitoring programme at HVO measures the quality of groundwater against background data, EIS predictions and historical trends. Ground water quality is evaluated through the parameters of pH, EC, and Standing Water Level (SWL) (measured as elevation in metres with respect to the Australian Height Datum, mAHD). On a periodic basis (nominally once per annum) a comprehensive suite of analytes are measured, including major anions, cations and metals. Prior to sampling for comprehensive analysis, bore purging is undertaken to ensure a representative sample is collected.

Groundwater monitoring data is reviewed regularly for trigger exceedances and analysed in detail on a quarterly basis. The review involves a comparison of measured results against internal trigger values which have been derived from the historical data set. Trigger limits are calculated as the 95th percentile maximum value (EC and pH) and the 5th percentile minimum value (pH only) from data collected since 2011. Trigger levels have been set on the basis of geographical proximity and target stratigraphy. Bores that record as dry and bores of unknown seam have not been included in calculation of the trigger limits. The response to measured data outside the trigger limits is detailed in the HVO Water Management Plan. Where investigations and subsequent actions have been undertaken following review of monitoring data, these are detailed in this section. Monitoring locations are shown in **Figure 7-18**.

The Annual Groundwater Impacts Review conducted during 2023 is provided in **Appendix B**.



**7.5.2 | GROUNDWATER PERFORMANCE**

Sampling of groundwater was carried out in accordance with the HVO Groundwater Monitoring Programme. Where laboratory analysis was undertaken, this was performed by a NATA accredited laboratory. Sites with a data capture rate of less than 100 per cent are outlined in **Table 7-7**. Data recovery presented in this table has been calculated based on the number of times the sampling location was able to be accessed and at least one sampling parameter was able to be collected. Detailed data capture by sampling parameters is provided in **Appendix B**.

*Table 7-7: HVO Groundwater Monitoring Data Recovery for 2023 (By Exception)*

Location	Data Recovery	Comments
4034P	75%	Insufficient water to sample in Q1
4036C	25%	Bore blocked in Q1, Q2 and Q3
BZ3-1	50%	Dry, unable to sample in Q1 and Q2
BZ4A(2)	75%	Insufficient water to sample in Q2, Q3 and Q4
BZ8-2	50%	No access in Q2, insufficient water to sample in Q3 and Q4
C122(BFS)	50%	No access due to flooding in Q1 and Q2
CGW45	0%	Bore blocked
D510(AFS)	50%	Dry, unable to sample in Q2, bore blocked in Q4
D612(AFS)	75%	Dry, unable to sample in Q2
DM3	50%	Bore blocked, unable to sample
GW-101	50%	Dry, insufficient water to sample
GW-103 (VWP)	0%	All sensors failed in 2020
GW-107	50%	Dry, insufficient water to sample
GW-108	0%	Bore blocked
GW-110 (VWP)	0%	Calibration information unavailable for data conversion
NPz3	0%	Bore blocked
NPz5	0%	Mined through, no longer exists
PZ1CH200	50%	No access in Q1 and Q2
PZ2CH400	75%	No access in Q2
PZ3CH800	75%	No access in Q2
PZ4CH1380	75%	No access in Q2
PZ5CH1800	75%	No access in Q2



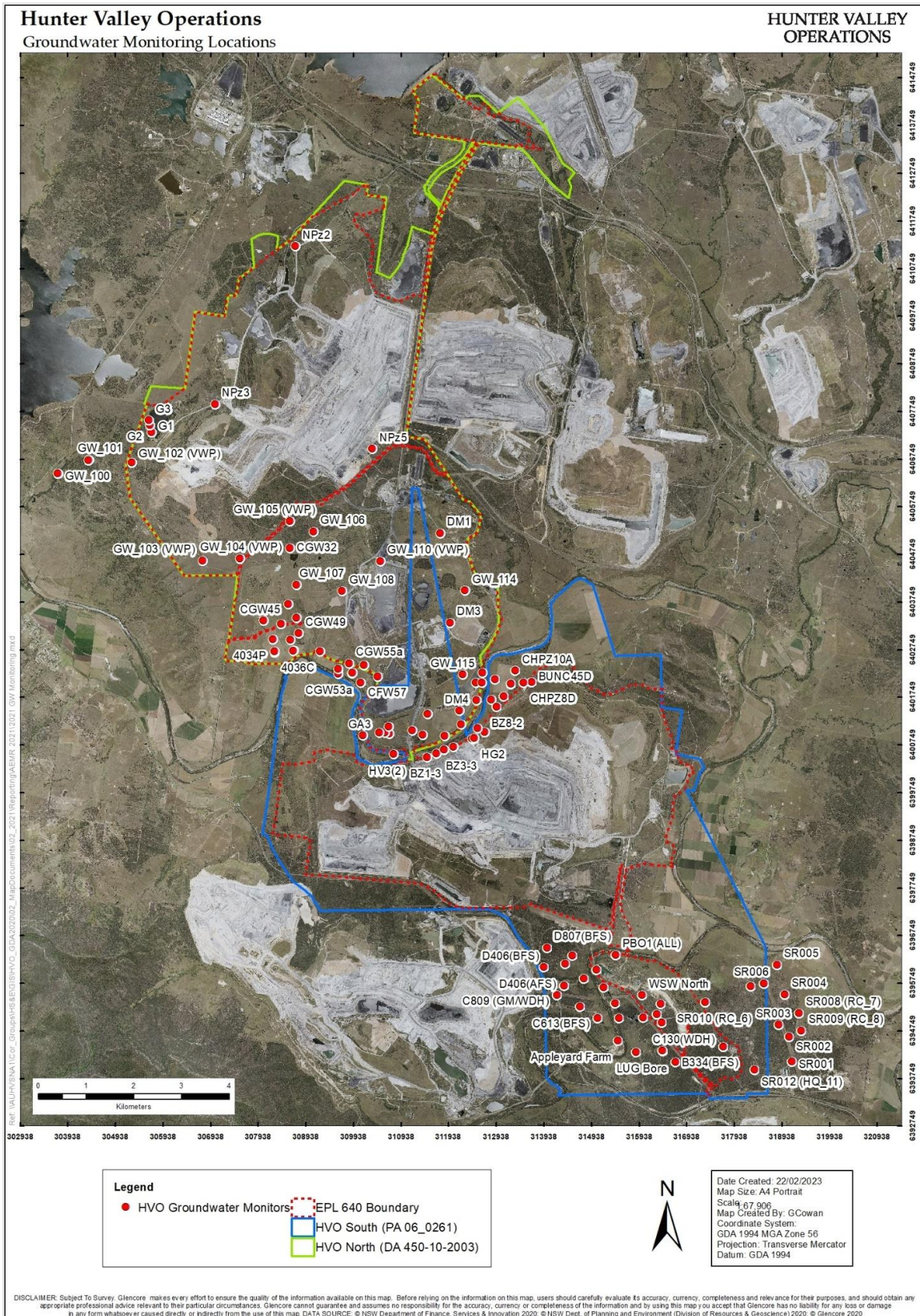
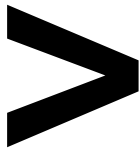


Figure 7-18: Groundwater Monitoring Network at HVO



7.5.3 | GROUNDWATER MONITORING SUMMARY

The following section presents groundwater monitoring data in relation to the geographic locations and target stratigraphy for groundwater monitoring bores.

Each location is discussed, and a summary of monitoring data presented. Where monitoring results required further investigation, these results are summarised. A trigger is considered to be exceeded when levels are outside of the internal statistical trigger limit for three (3) consecutive monitoring events. A detailed Annual Groundwater Review is provided in Appendix B.

7.5.4 | CARRINGTON BROONIE

The EC, pH and SWL trends for 2017 to 2023 for Carrington Broonie Seam groundwater bores are shown in Figure 7-19 to Figure 7-21 respectively. Water quality results were generally consistent with historical ranges with some minor variation noted with pH and SWL results. These levels were considered to be consistent with historical concentrations, with no adverse impacts identified.

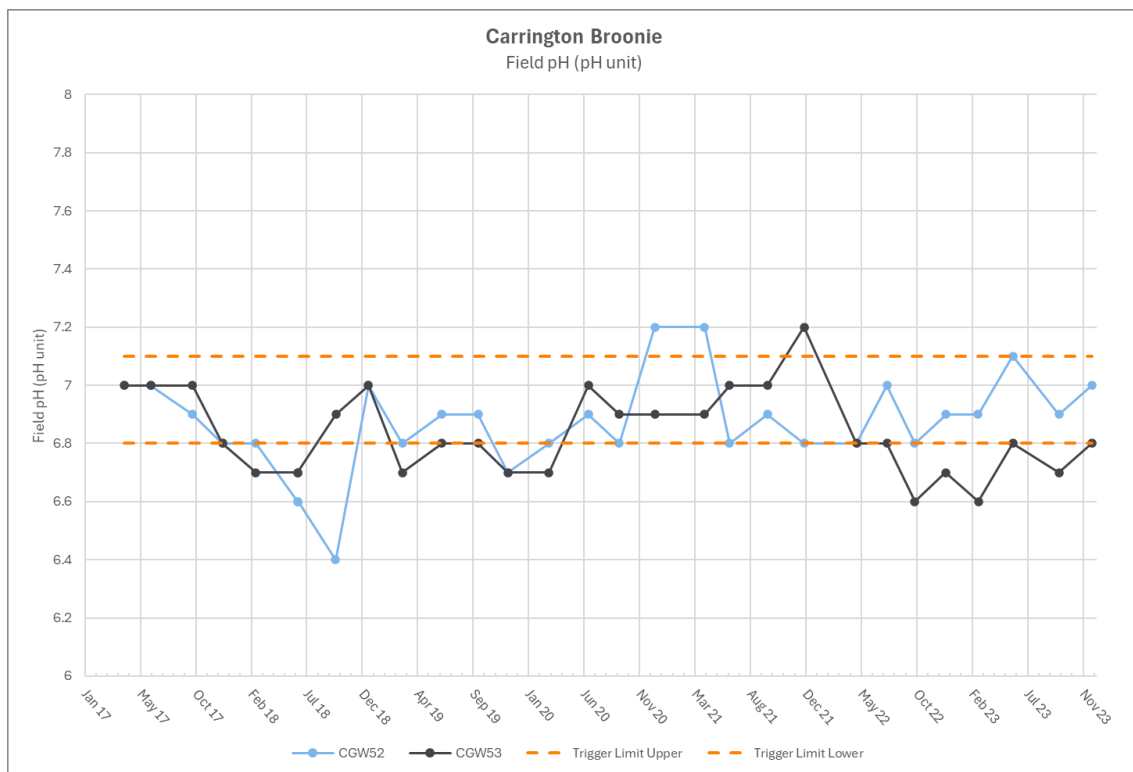


Figure 7-19: Carrington Broonie Groundwater pH Trends 2017 - 2023

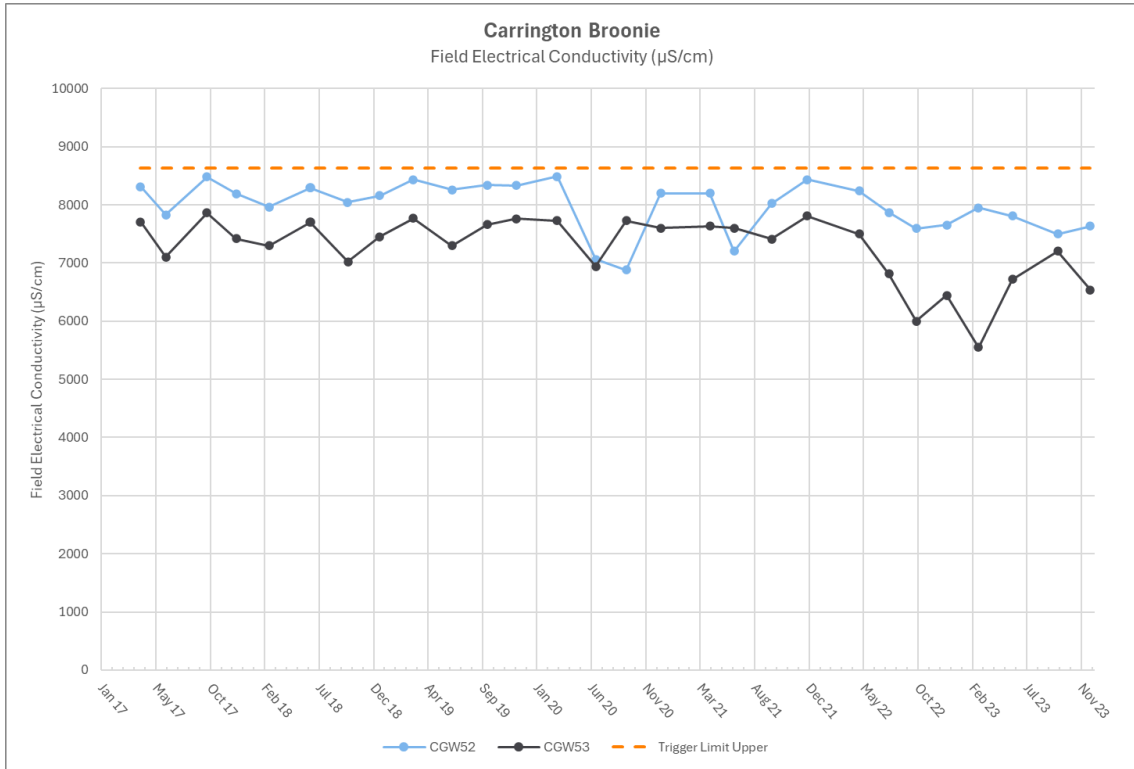
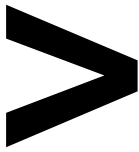


Figure 7-20: Carrington Broonie Groundwater EC Trends 2017 - 2023

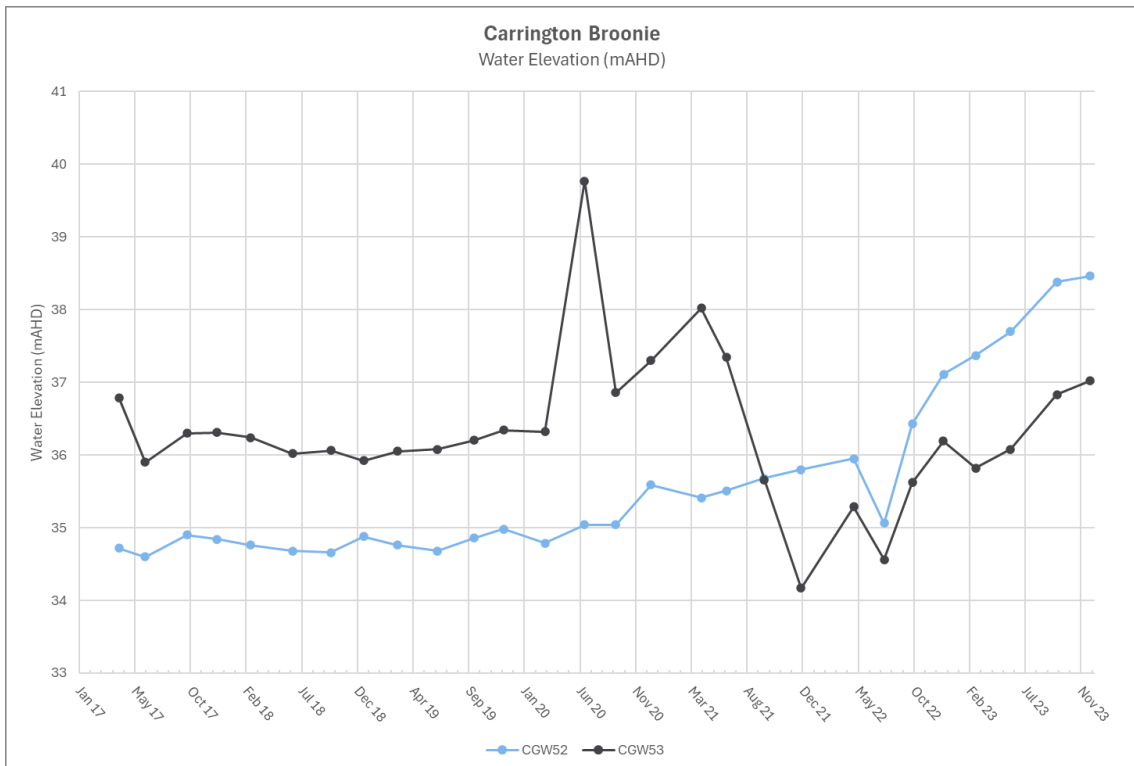
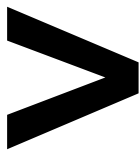


Figure 7-21: Carrington Broonie Groundwater SWL Trends 2017 - 2023



7.5.5 | CARRINGTON ALLUVIUM

The EC, pH and SWL trends for 2017 to 2023 for Carrington Alluvium groundwater bores are shown in Figure 7-22 to Figure 7-24. Water quality results were generally consistent with historical trends.

New triggers have been developed following an expert review of the groundwater network and better represent current conditions and monitoring in the area. These have been included in the revised Water Management Plan pending approval. Monitoring results are assessed against these new triggers as part of the North Void Tailings Storage Facility (NV TSF) Pollution Reduction Programme monitoring and reporting requirements via the Environmental Protection Licence. The current EC trigger is considered not to be representative of historical (pre-mining) conditions or adequate to assess improving water quality following seepage from the NV TSF.

HVO continued to mitigate potential impacts of seepage from the NV TSF. This included no deposition of tailings to the TSF and decanting of surface water to allow the tailings to dry and consolidate. Monitoring of the area continues at an increased frequency including data collection from continuous groundwater loggers measuring water level and quality. EC and pH have stabilised and standing water level has declined, this is an indication that current controls are being effective.

As part of a Pollution Reduction Programme, works in 2023 included a detailed engineering assessment for a low permeability barrier wall to be constructed between the TSF and the alluvium.

Trigger exceedances in the Carrington Alluvium are detailed in Table 6.2 of Appendix B.

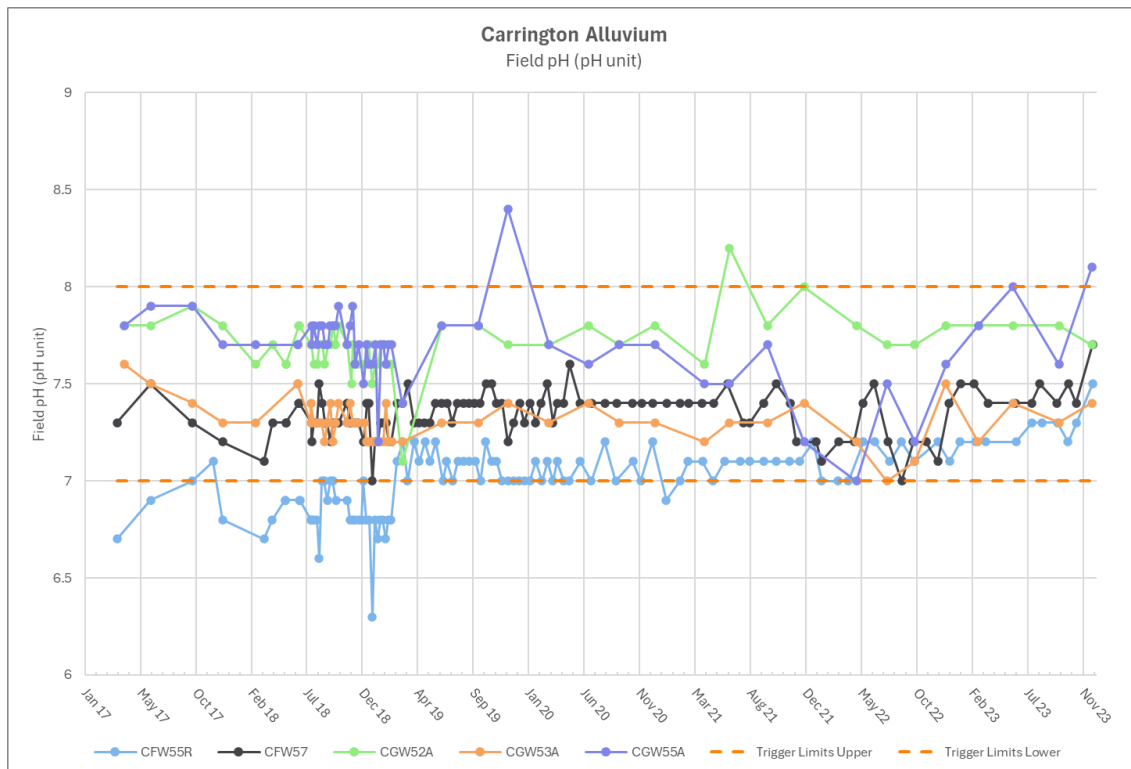


Figure 7-22: Carrington Alluvium Groundwater pH Trends 2017 - 2023

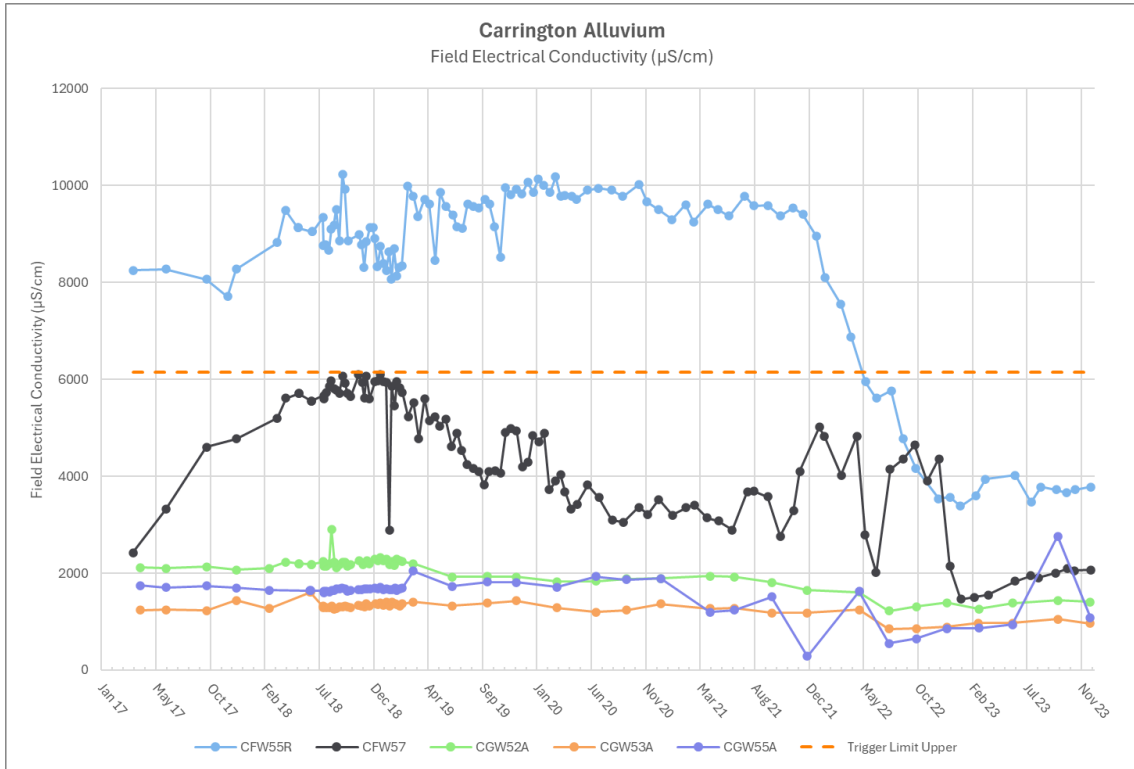
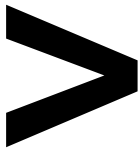


Figure 7-23: Carrington Alluvium Groundwater EC Trends 2017-2023

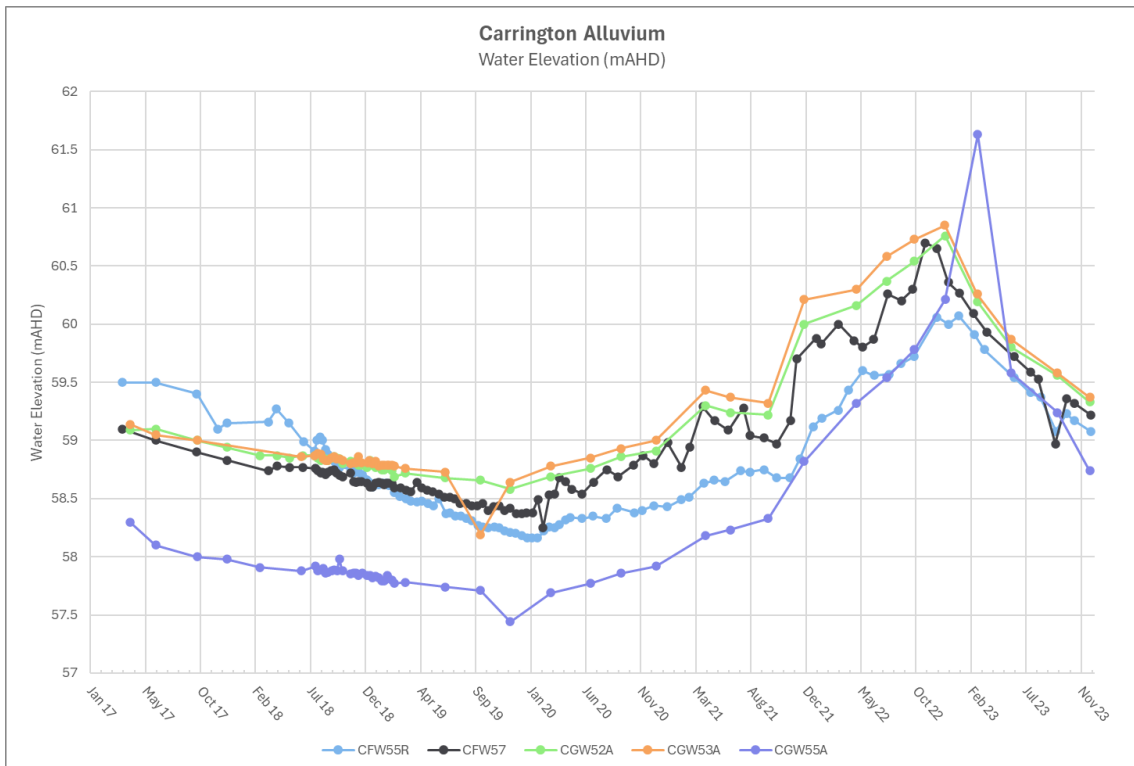


Figure 7-24: Carrington Alluvium Groundwater SWL Trends 2017 - 2023



7.5.6 | CARRINGTON INTERBURDEN

The EC, pH and SWL trends for 2017 to 2023 for groundwater bores in the Carrington Interburden are shown in Figure 7-25 to Figure 7-27 respectively. Water quality results were generally consistent with historical trends aside from CGW51a pH. There have been six consecutive readings above the pH trigger level at CGW51a since September 2022 – refer to Table 6.2 of Appendix B.

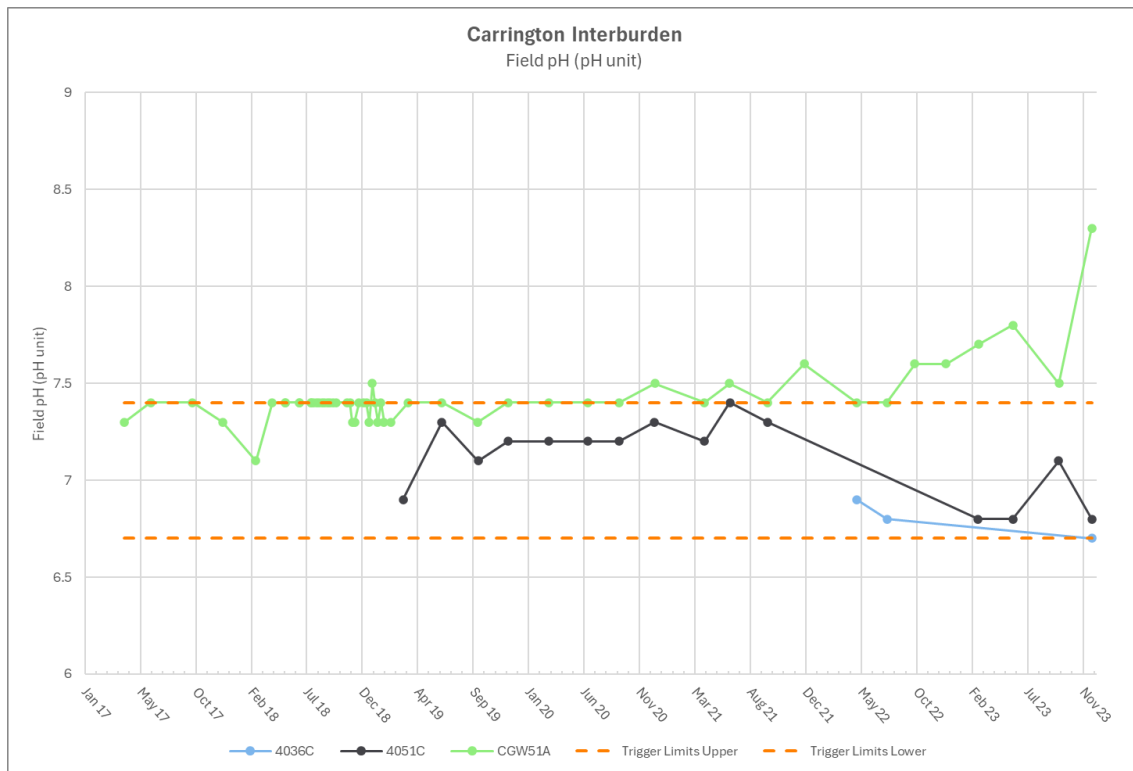


Figure 7-25: Carrington Interburden Groundwater pH Trends 2017 – 2023

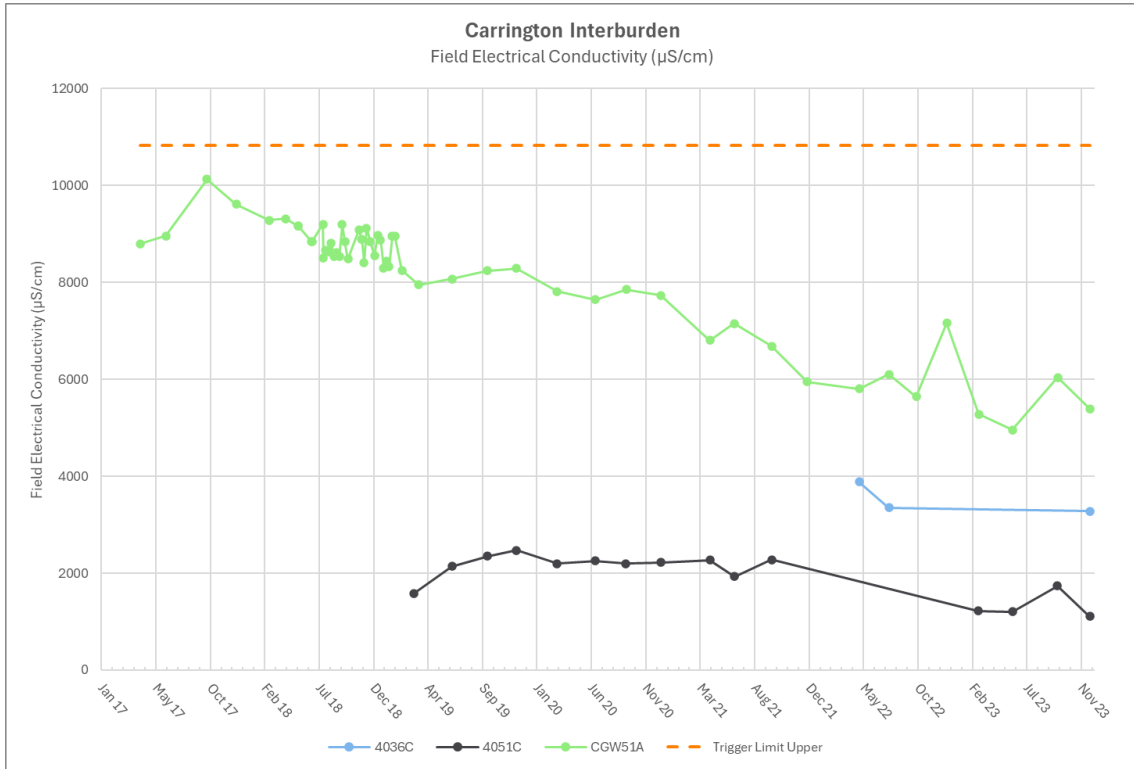
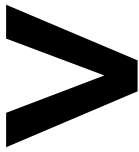


Figure 7-26: Carrington Interburden Groundwater EC Trends 2017 - 2023

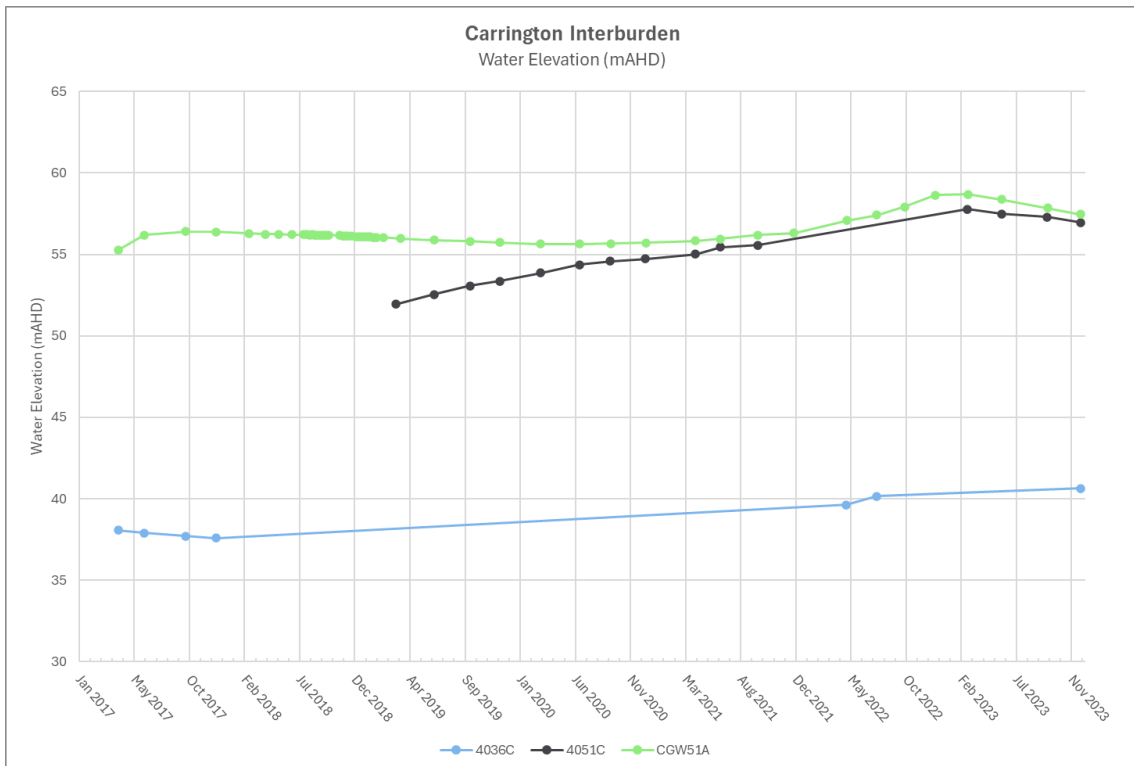


Figure 7-27: Carrington Interburden Groundwater SWL Trends 2017 - 2023



7.5.7 | CARRINGTON WEST WING ALLUVIUM

Results are shown in Figure 7-28 to Figure 7-30. Water quality results were generally consistent with historical trends. Bore CGW49 intersects alluvium within the western limb of the paleochannel. Historical readings show that bore CGW49 has recorded pH ranging between 7.3 and 7.7. Review of pH readings remained fairly stable and within historical levels over 2023. The results show no adverse impacts due to mining.

There were no trigger exceedances in 2023.

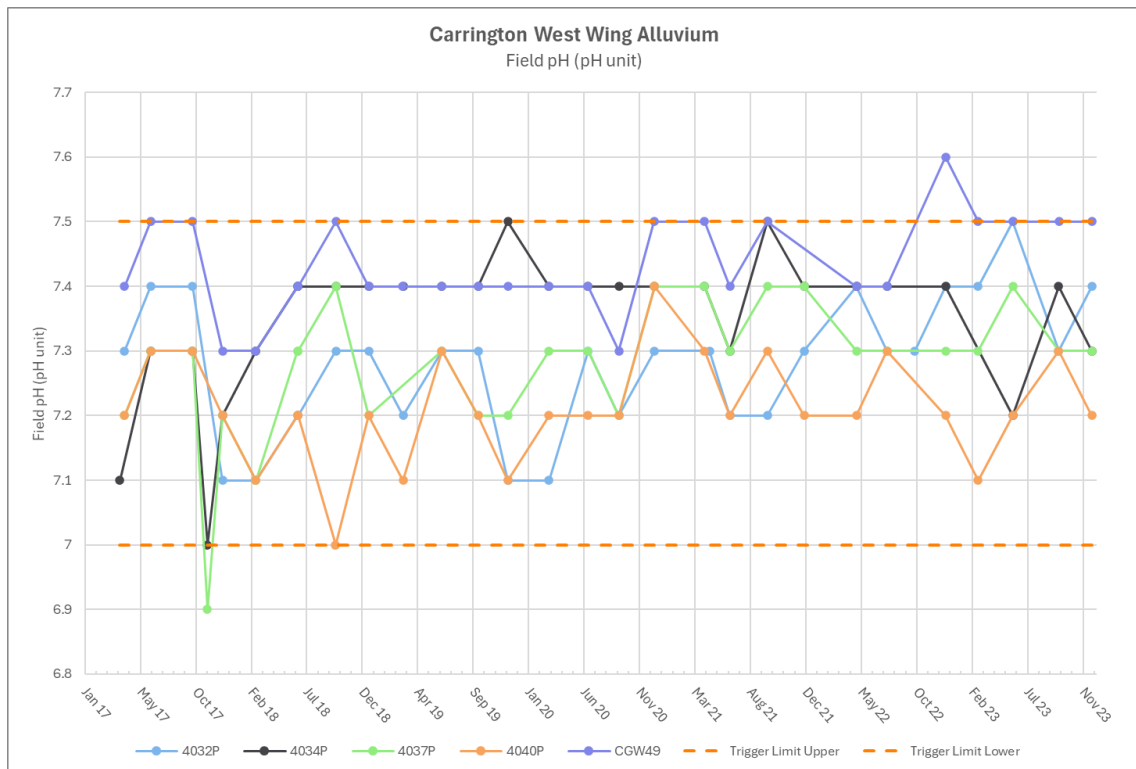


Figure 7-28: Carrington West Wing Alluvium Groundwater pH Trends 2017 - 2023



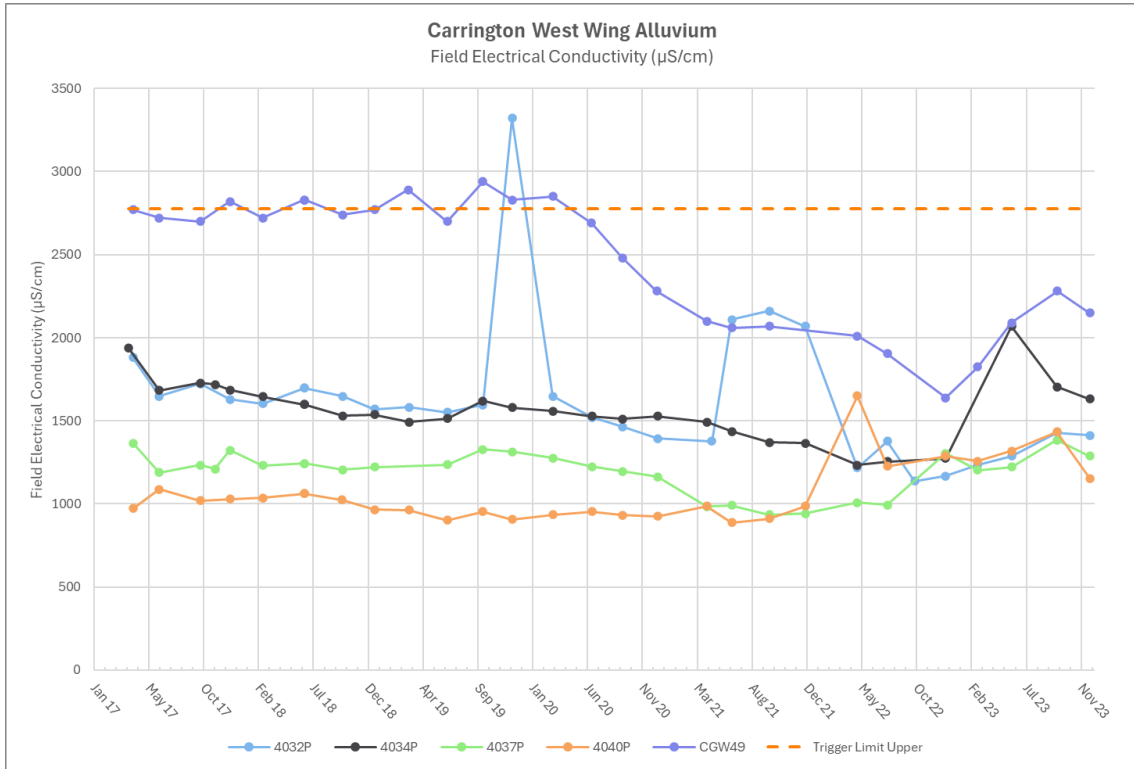
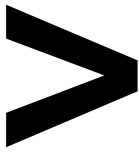


Figure 7-29: Carrington West Wing Alluvium Groundwater EC Trends 2017 – 2023

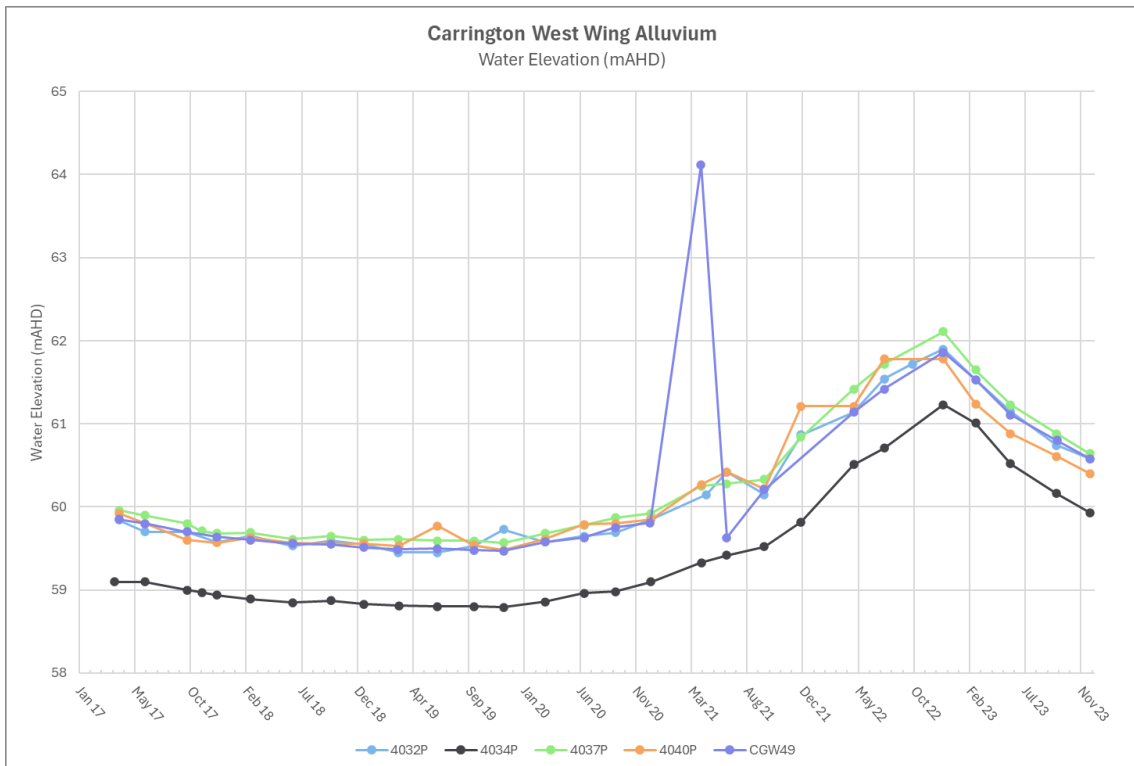
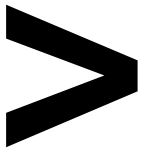


Figure 7-30: Carrington West Wing Alluvium Groundwater SWL Trends 2017 - 2023



7.5.8 | CARRINGTON WEST WING FLOOD PLAIN

Results are shown in Figure 7-31 to Figure 7-33. Water quality results were generally consistent with historical trends.

There were no trigger exceedances during 2023.

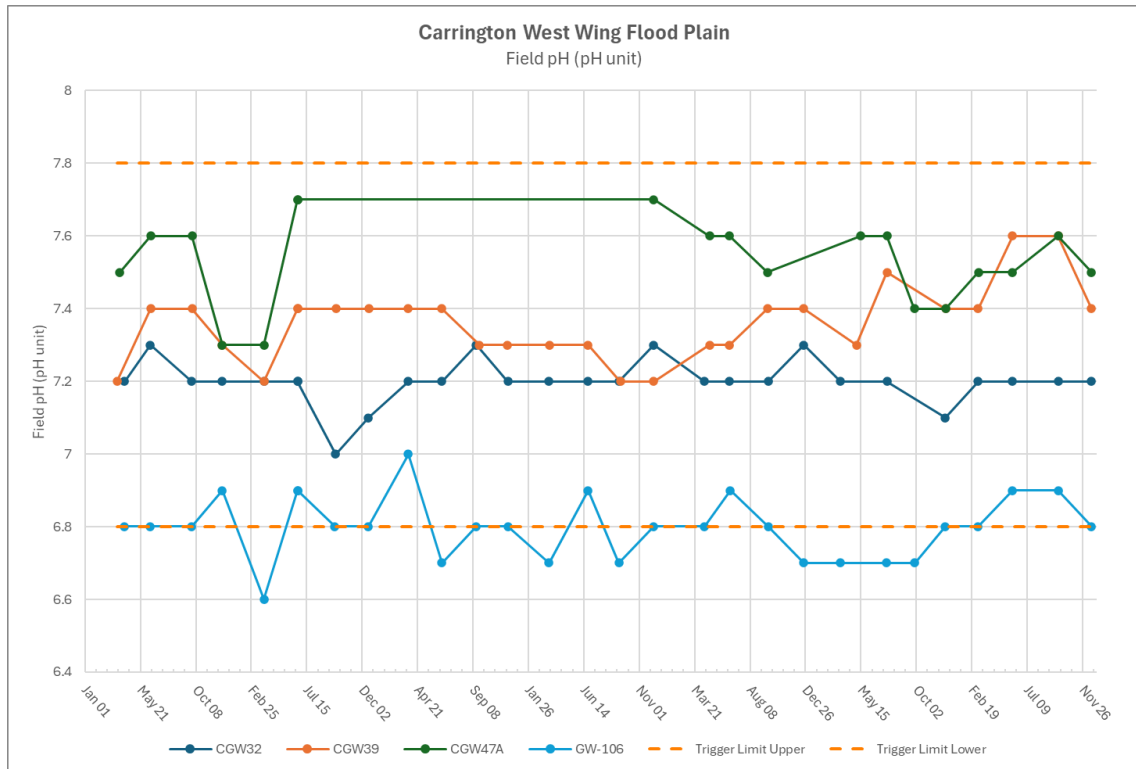


Figure 7-31: Carrington West Wing Flood Plain Groundwater pH Trends 2017 - 2023

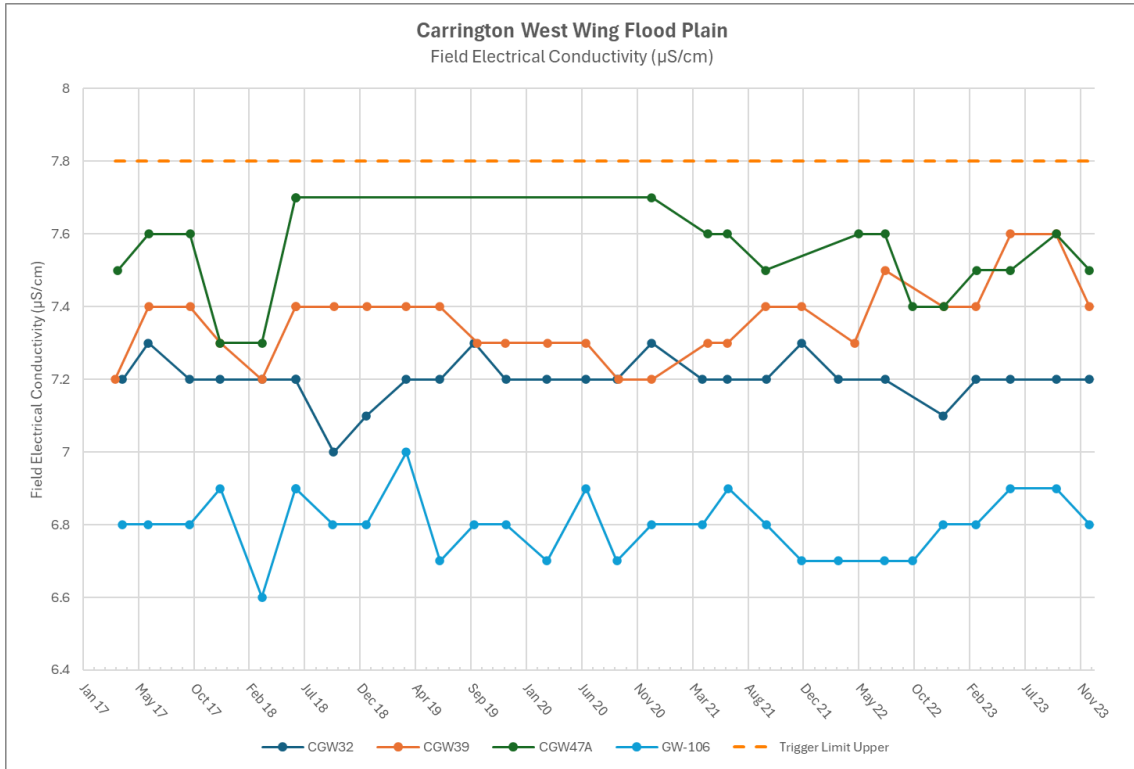
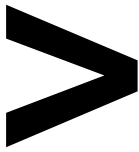


Figure 7-32: Carrington West Wing Flood Plain Groundwater EC Trends 2017 – 2023

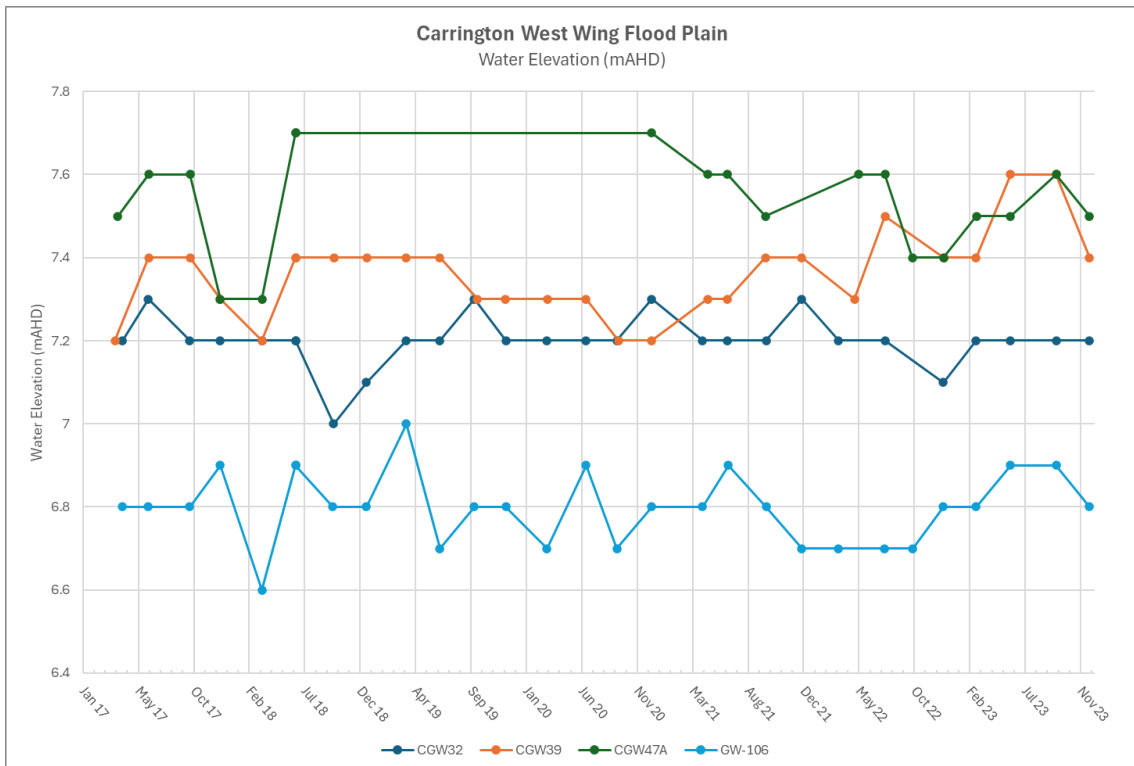
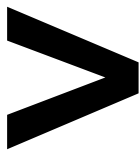


Figure 7-33: Carrington West Wing Flood Plain Groundwater SWL Trends 2017 - 2023



7.5.9 | CHESHUNT / NORTH PIT ALLUVIUM

Electrical Conductivity, pH and SWL trends for 2017 to 2023 are shown in Figure 7-34 to Figure 7-36. Water quality results were generally consistent with historical trends. Hobdens Well is screened within alluvium, located between the Hunter River and Cheshunt Pit. Historical readings show that Hobdens Well has recorded pH ranging between 7.1 and 7.8. Review of pH readings indicated levels fluctuated slightly, but within historical levels over 2023. It is recommended by Umwelt that the trigger level is updated to reflect historical trends.

Trigger tracking results for Hobdens Well are further detailed in Table 6.2 of Appendix B.

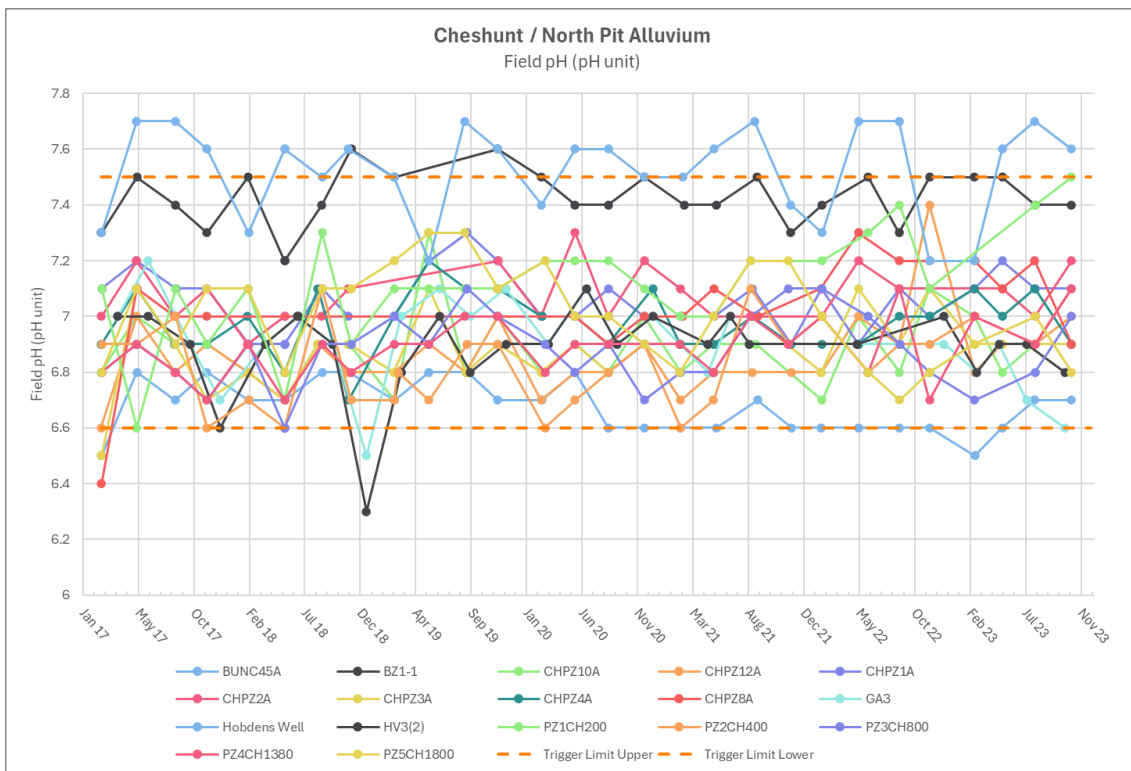


Figure 7-34: Cheshunt / North Pit Alluvium Groundwater pH Trends 2017 - 2023

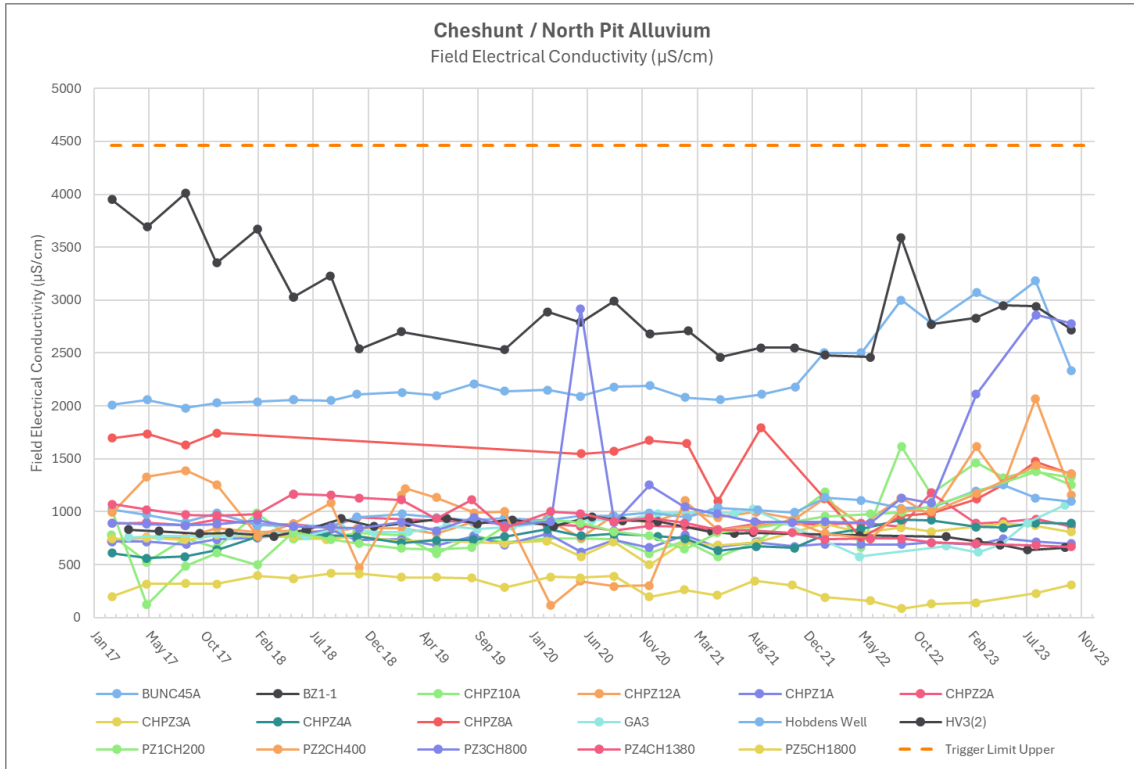
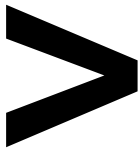


Figure 7-35: Cheshunt / North Pit Alluvium Groundwater EC Trends 2017 – 2023

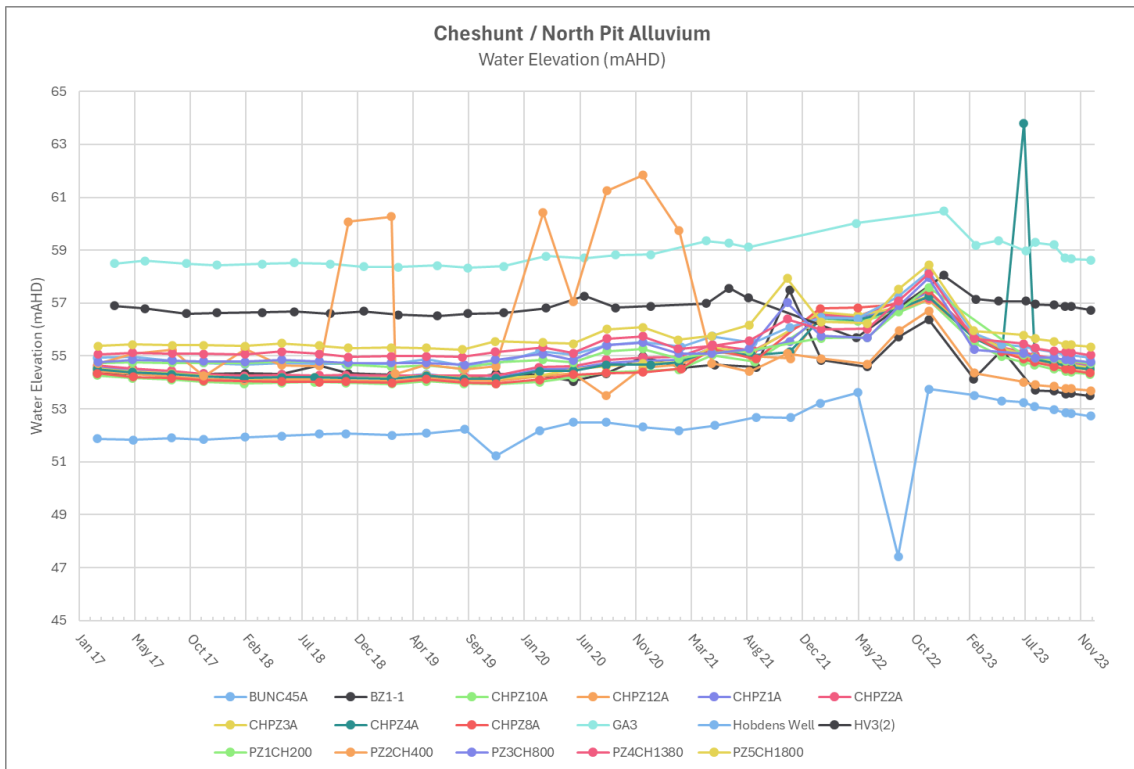
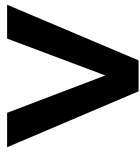


Figure 7-36: Cheshunt / North Pit Alluvium Groundwater SWL Trends 2017 - 2023



7.5.10 | CHESHUNT INTERBURDEN

The EC, pH and SWL trends for 2017 to 2023 are shown in Figure 7-37 to Figure 7-39. Water quality results were generally consistent with historical trends.

There were no trigger exceedances during 2023 (i.e. more than 3 consecutive results outside of trigger limits).

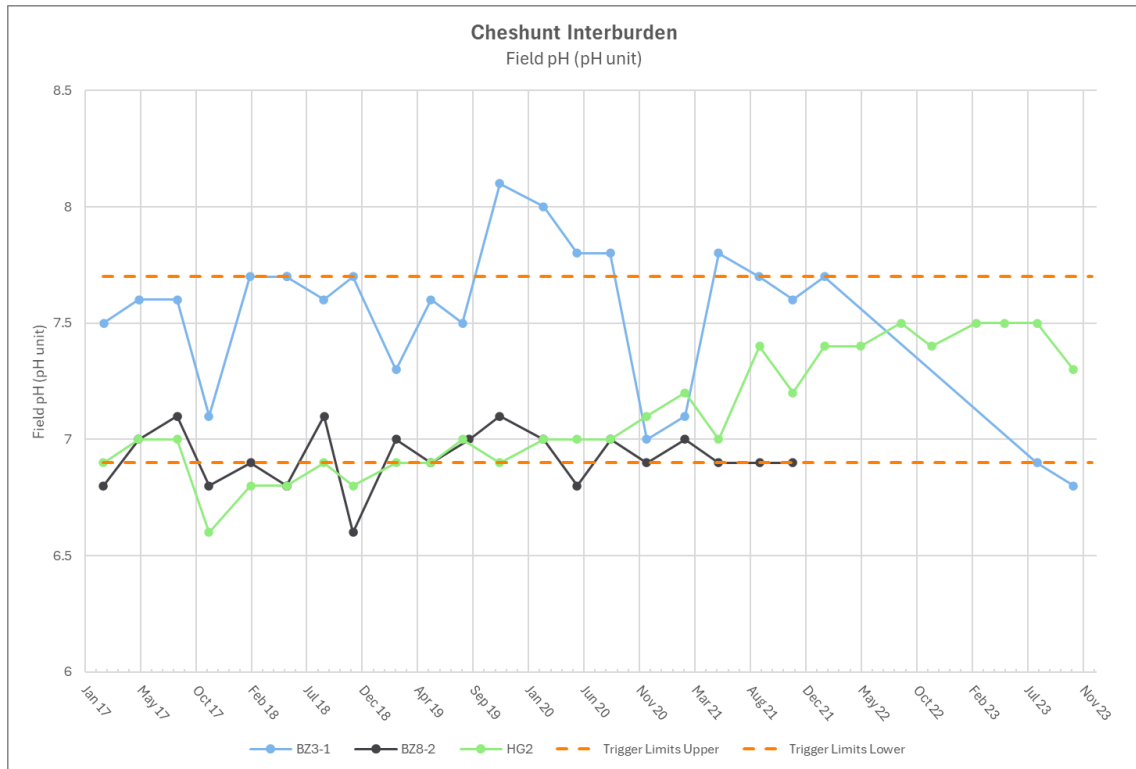


Figure 7-37: Cheshunt Interburden Groundwater pH Trends 2017 - 2023

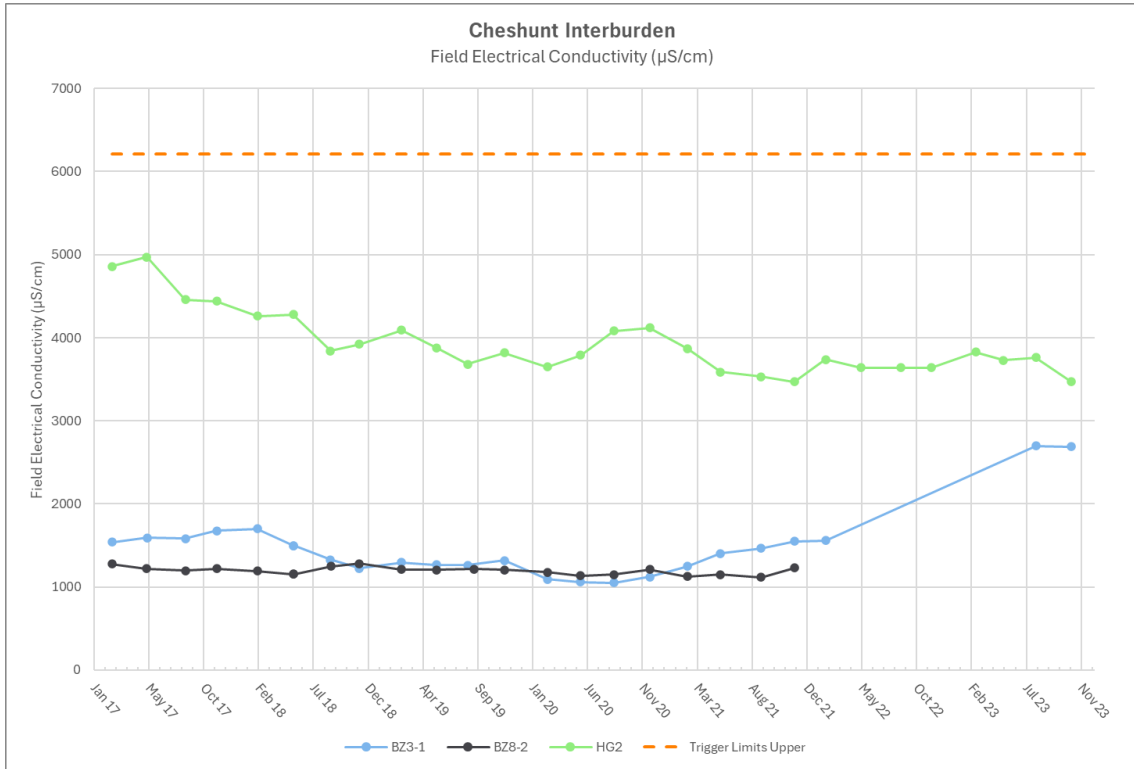
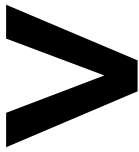


Figure 7-38: Cheshunt Interburden Groundwater EC Trends 2017 – 2023

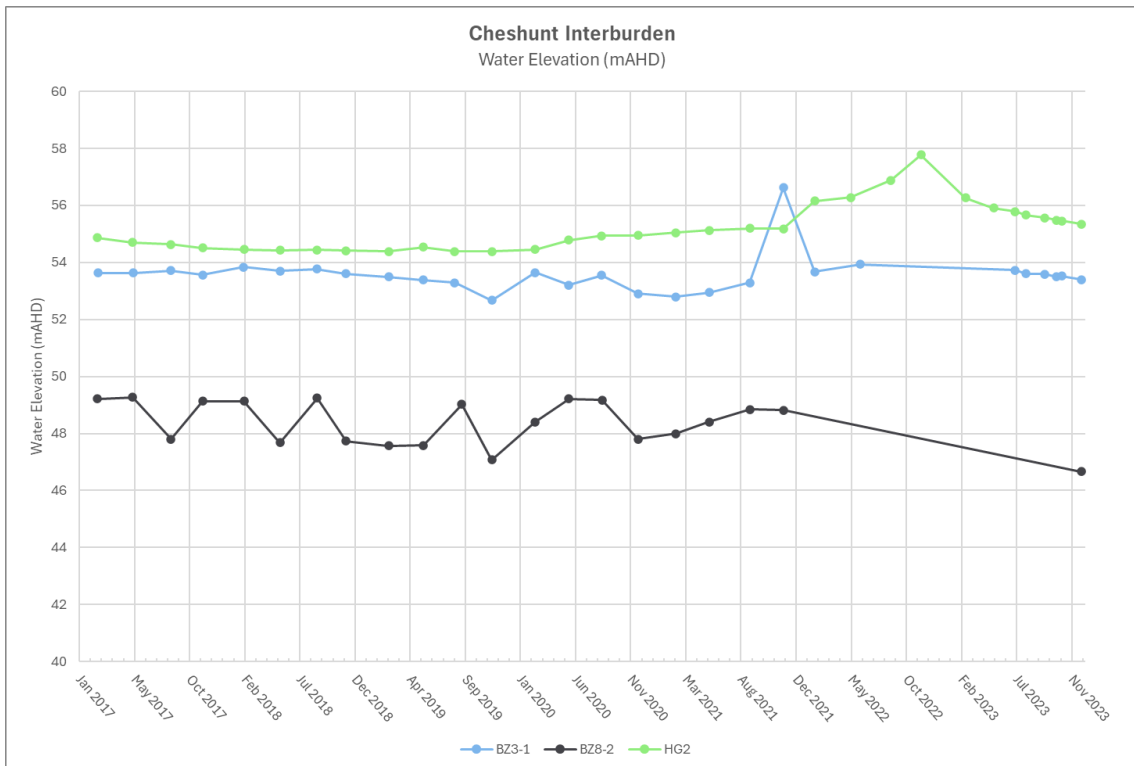
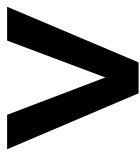


Figure 7-39: Cheshunt Interburden Groundwater SWL Trends 2017 - 2023



7.5.11 | CHESHUNT MT ARTHUR

The pH, EC and SWL trends for 2017 to 2023 are shown in Figure 7-40 to Figure 7-42. Water quality results were generally consistent with historical trends except for pH. Based on historical data, pH results from all three bores have been gradually trending downward since July 2011. The groundwater level measured at the bores has typically been within or below the screened section of bores BZ4A(2) and BZ3-3 (pH – 5<sup>th</sup> Percentile). Purging/sample collection within bore BZ2A(1) and BZ3-3 may induce localised groundwater drawdown to within the screened section. This may be the cause of the reducing pH measured at these bores. The updated draft WMP includes amendments to the Cheshunt - Mt Arthur seam groundwater monitoring, including:

- BZ2A(1) and BZ3-3 being removed from trigger level assessment, with trigger values remaining for BZ4(A)2; and
- the pH trigger level value reducing to 6.4 (from the current value of 6.5) for all bores monitoring the Cheshunt- Mt Arthur Seam.

Bore BZ3-3, located between Cheshunt Pit and the Hunter River, and had an increasing pH trend between June 2006 (6.0) and August 2012 (7.1) followed by a decreasing trend between December 2012 (7.1) and November 2022 (6.1). The 2023 readings ranging between of 6.2 and 6.4 are within the historical range. The 2019 Groundwater Annual Review (SLR, 2020) recommended further investigation of the bore condition and construction to confirm the geology being monitored in all of the 'BZ' bores in the Cheshunt area to understand the cause of the variability in the trends between the bores. Comprehensive water quality analysis was undertaken in August 2022. The results indicated the declining pH trend is not due to connectivity to spoil water via the nearby fault.

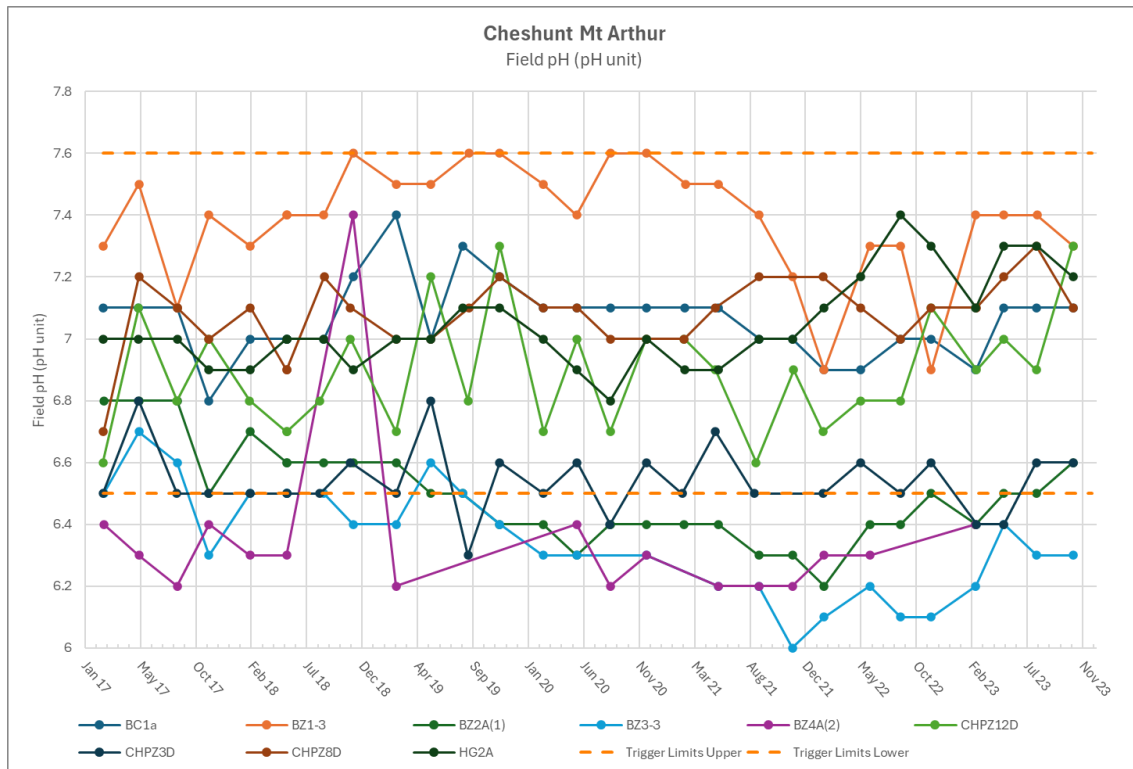


Figure 7-40: Cheshunt Mt Arthur Groundwater pH Trends 2017 - 2023



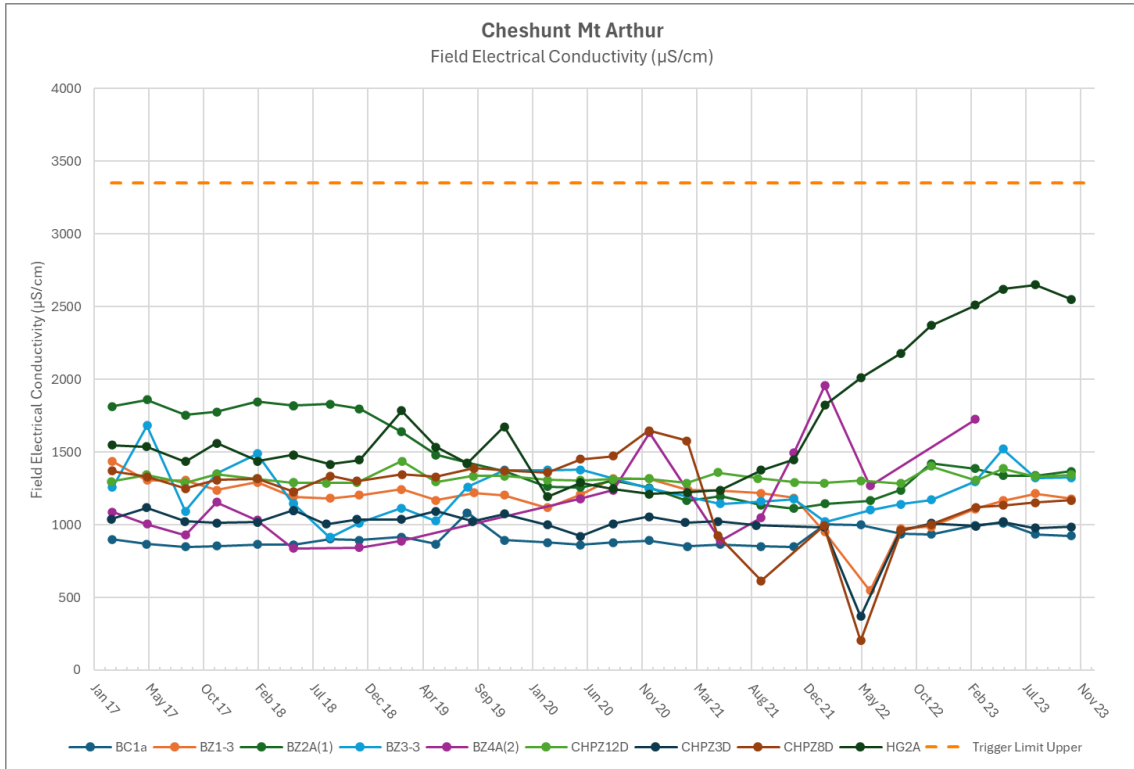
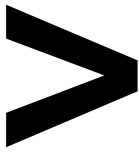


Figure 7-41: Cheshunt Mt Arthur Groundwater EC Trends 2017 – 2023

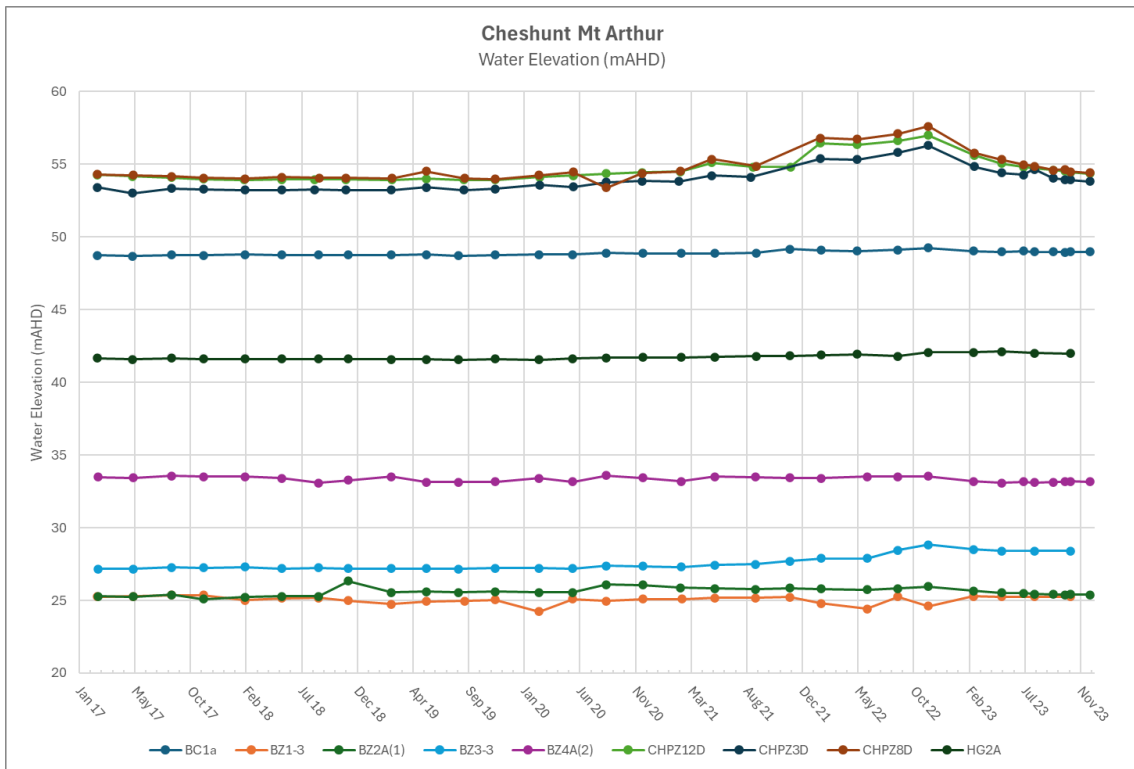


Figure 7-42: Cheshunt Mt Arthur Groundwater SWL Trends 2017 - 2023



7.5.12 | CHESHUNT PIERCEFIELD

The pH, EC and SWL trends for 2017 to 2023 are shown in Figure 7-43 to Figure 7-45. Water quality results were generally consistent with historical trends.

There were no trigger exceedances recorded in 2023.

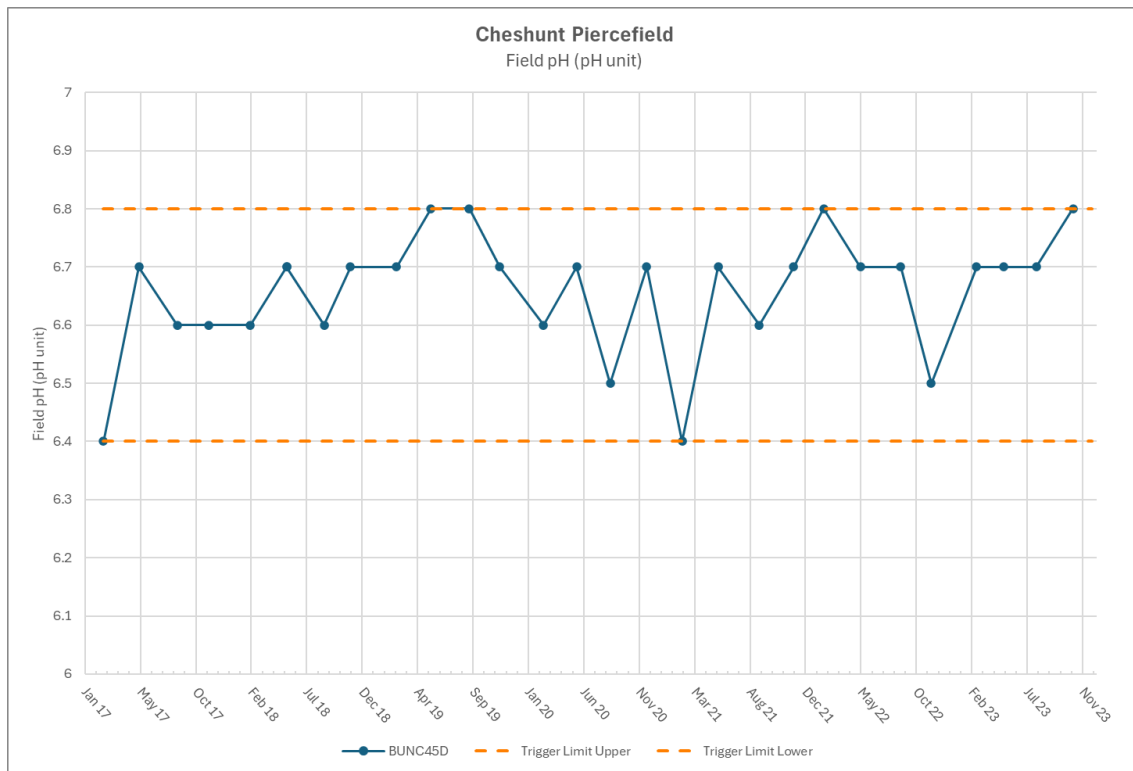


Figure 7-43: Cheshunt Piercefield Groundwater pH Trends 2017 - 2023

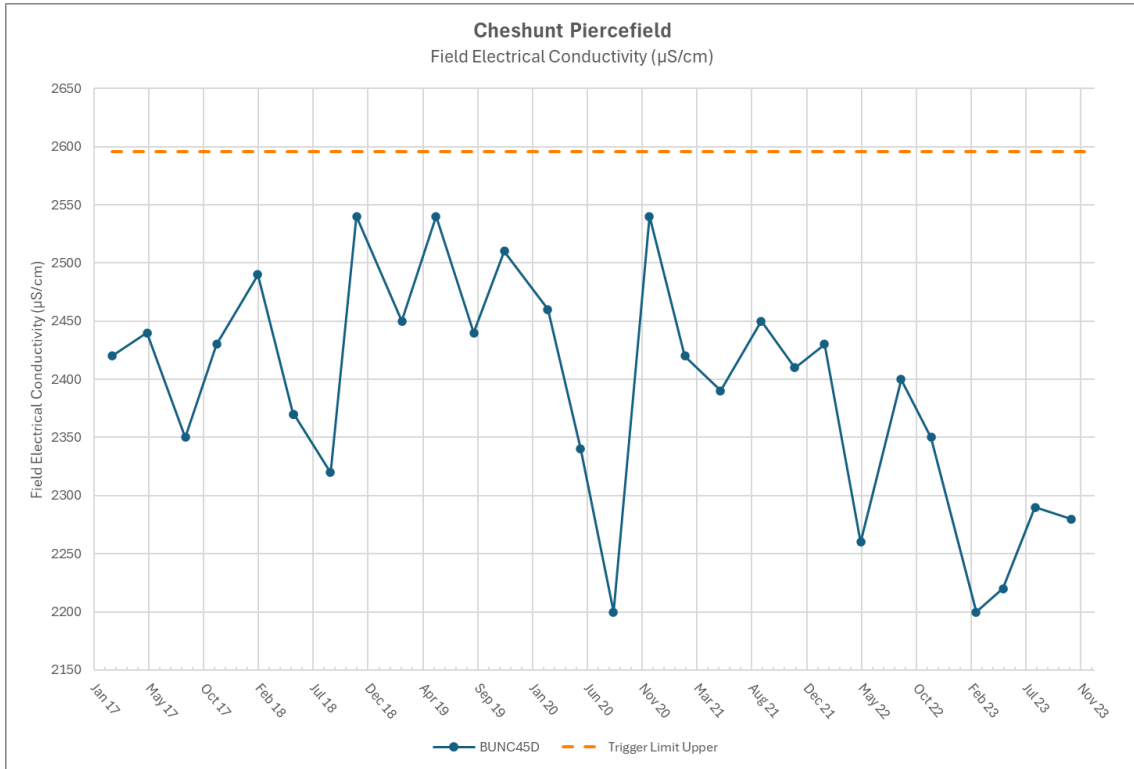
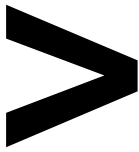


Figure 7-44: Cheshunt Piercefield Groundwater EC Trends 2017 – 2023

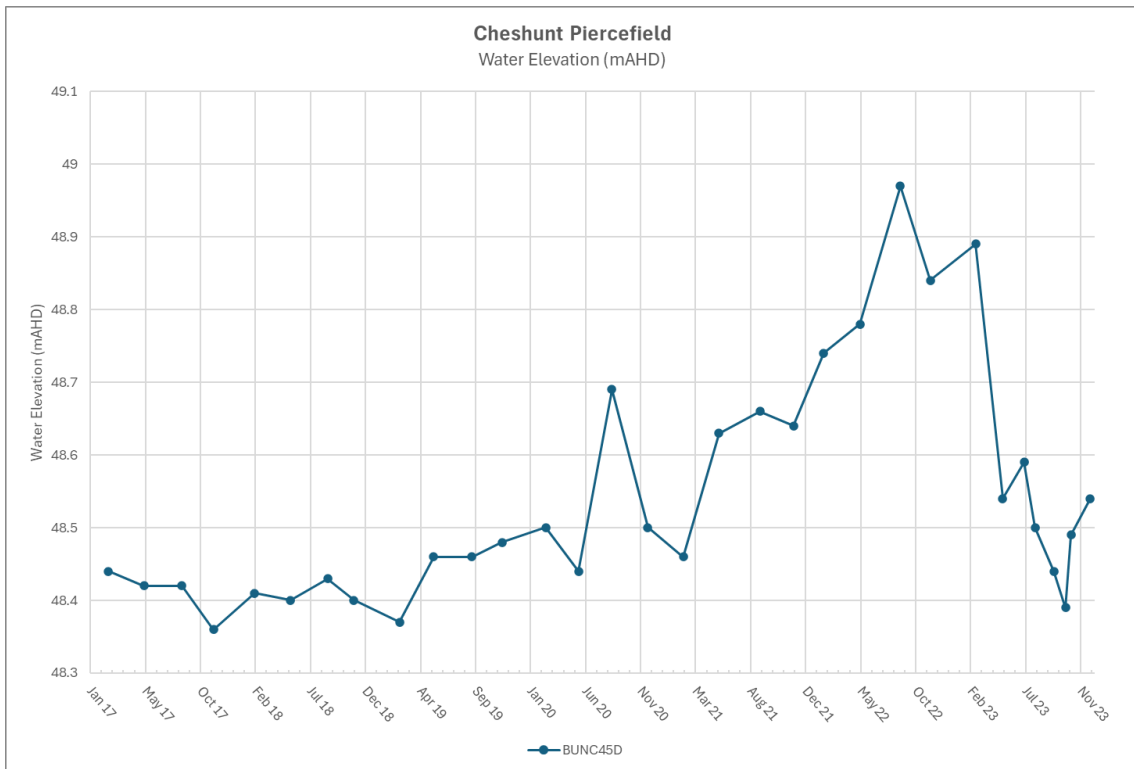
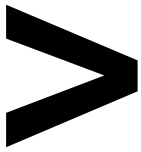


Figure 7-45: Cheshunt Piercefield Groundwater SWL Trends 2017 - 2023



7.5.13 | LEMINGTON SOUTH ALLUVIUM

The pH, EC and SWL trends for 2017 to 2023 are shown in Figure 7-46 to Figure 7-48. Water quality results were generally consistent with historical trends aside from one EC reading above the trigger level in Q4. Refer to Table 5.4 of Appendix B.

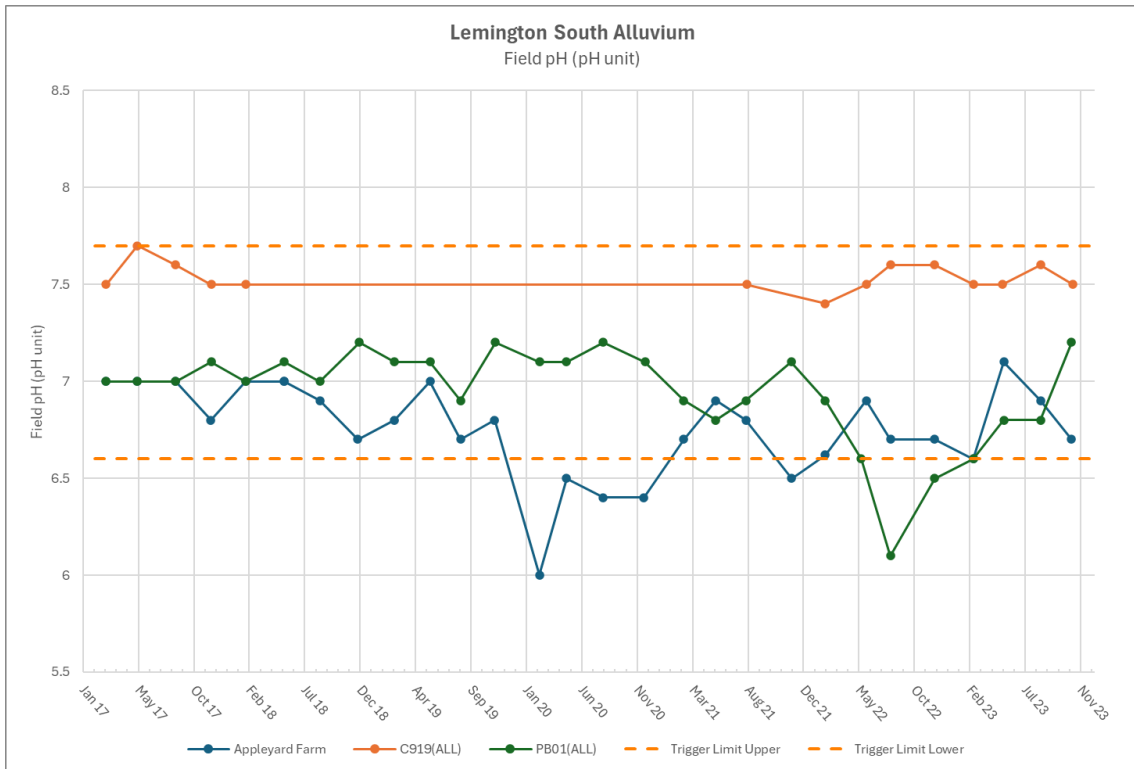


Figure 7-46: Lemington South Alluvium Groundwater pH Trends 2017 - 2023

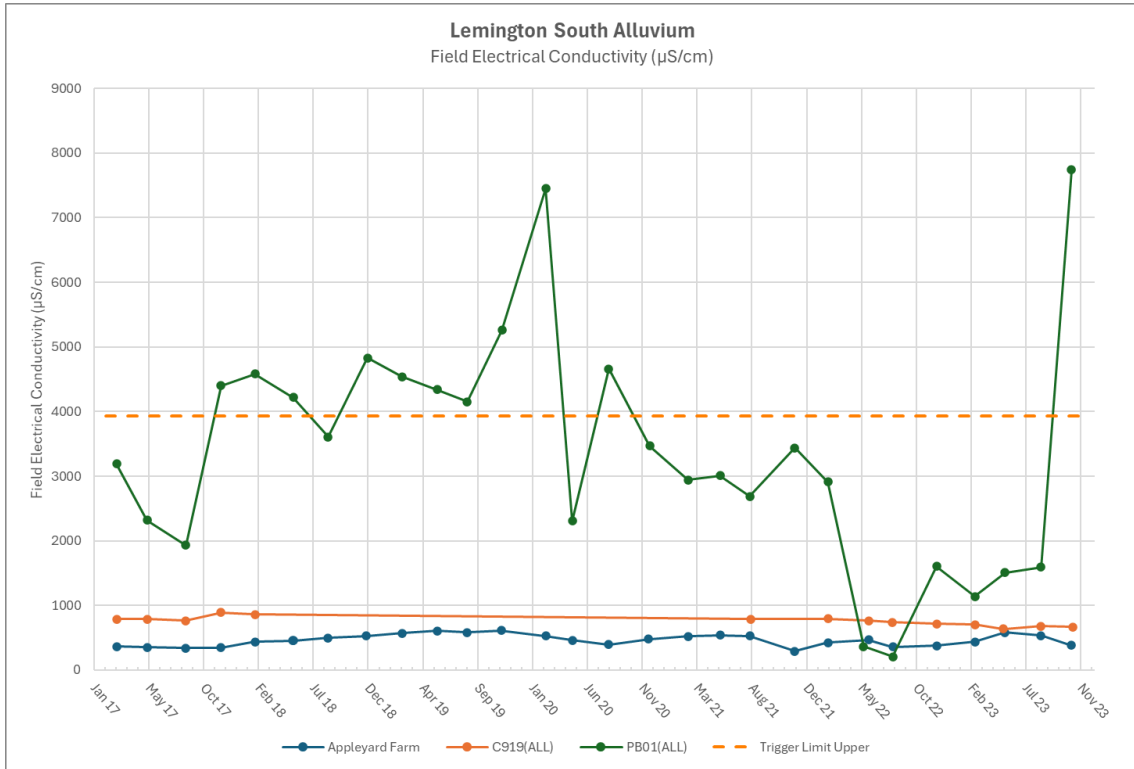
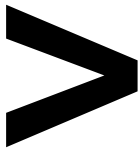


Figure 7-47: Lemington South Alluvium Groundwater EC Trends 2017 – 2023

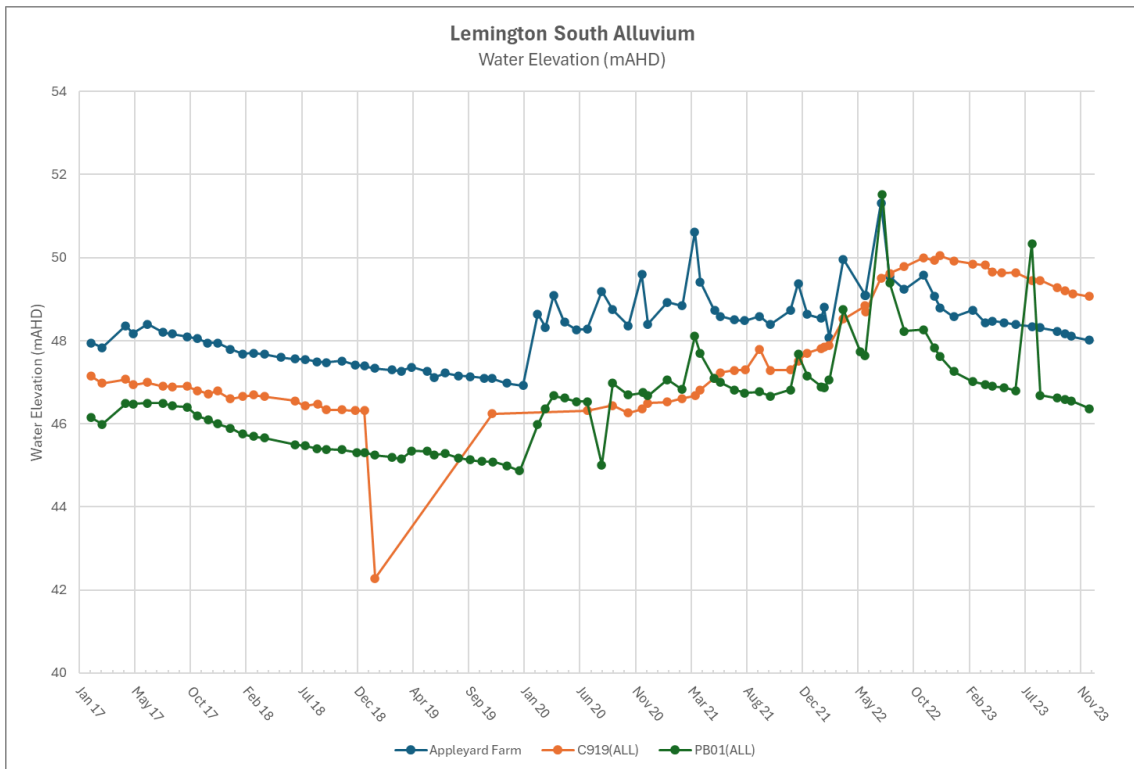
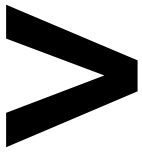


Figure 7-48: Lemington South Alluvium Groundwater SWL Trends 2017 - 2023



7.5.14 | LEMINGTON SOUTH ARROWFIELD

The pH, EC and SWL trends for 2017 to 2023 are shown in Figure 7-49 to Figure 7-51. Water quality results were generally consistent with historical trends.

There were no trigger exceedances recorded in 2023 for greater than three (3) consecutive events.

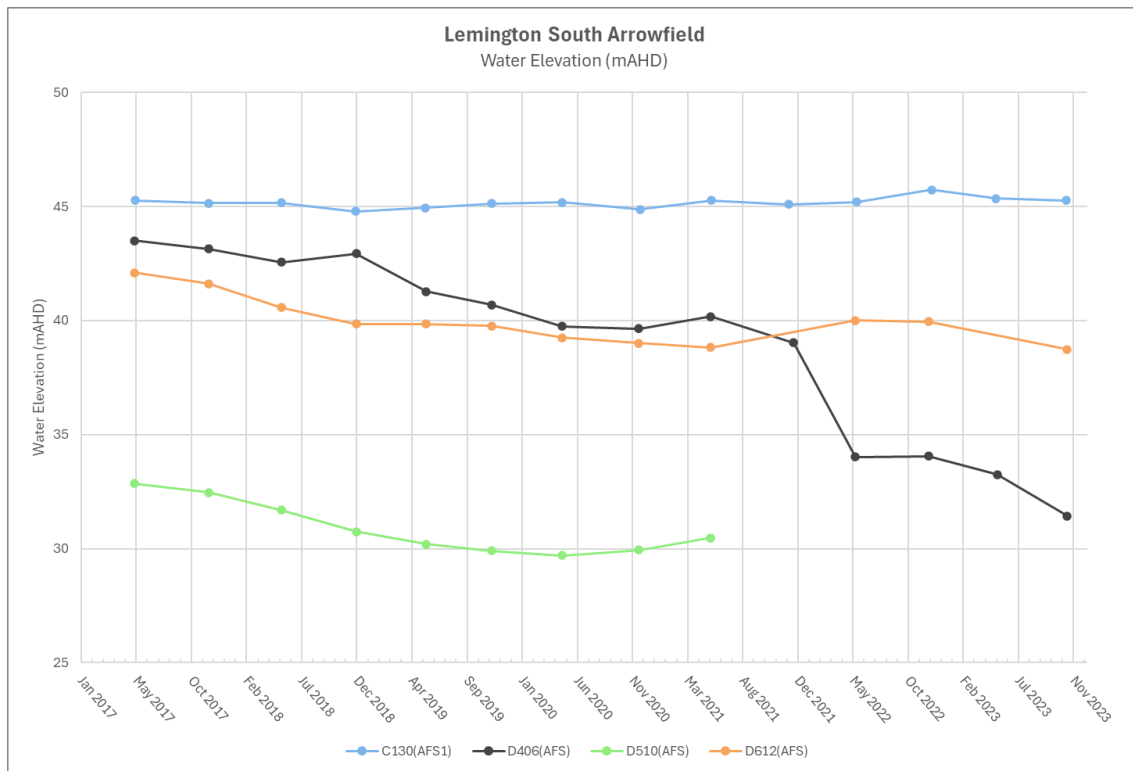


Figure 7-49: Lemington South Arrowfield Groundwater pH Trends 2017 - 2023

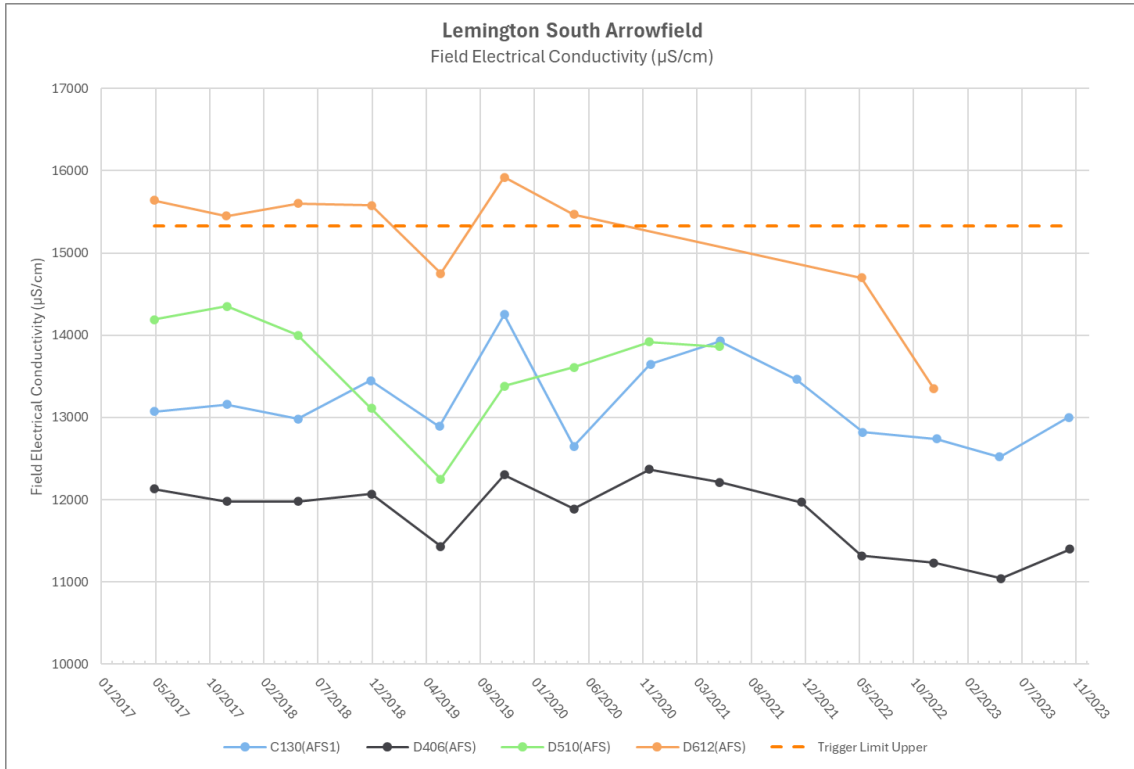
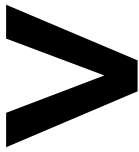


Figure 7-50: Lemington South Arrowfield Groundwater EC Trends 2017 - 2023

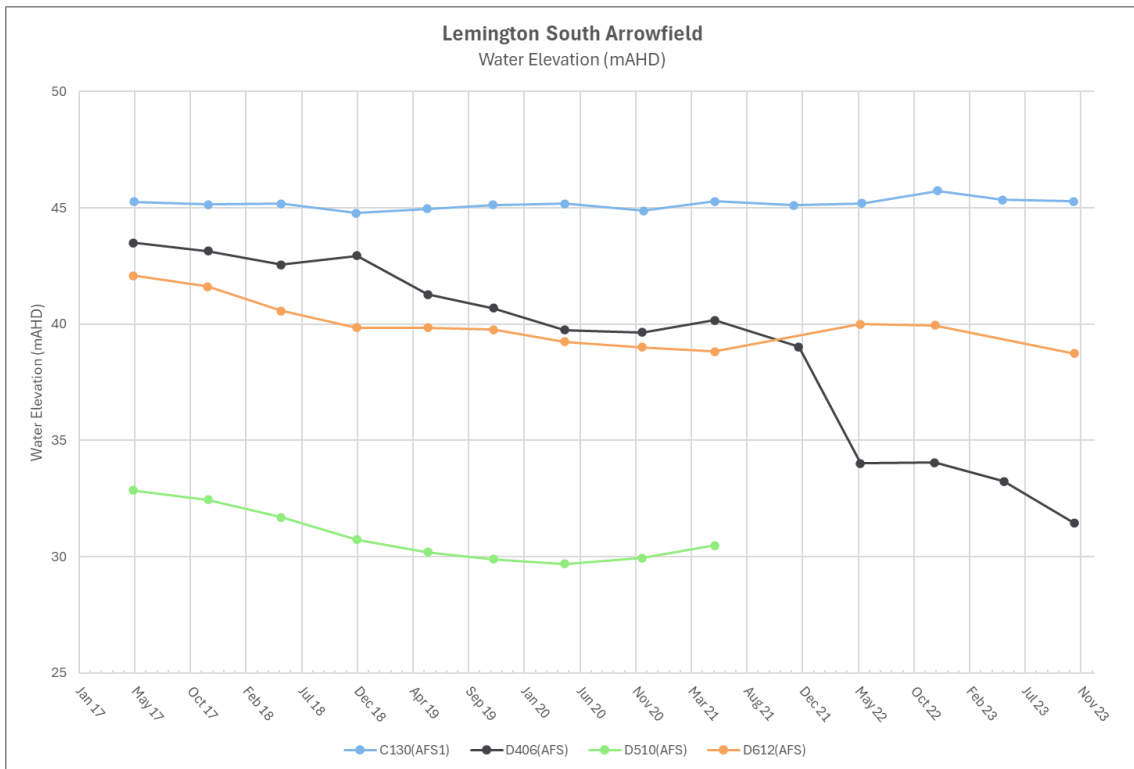
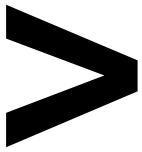


Figure 7-51: Lemington South Arrowfield Groundwater SWL Trends 2017 - 2023



7.5.15 | LEMINGTON SOUTH BOWFIELD

The pH, EC and SWL trends for 2017 to 2023 are shown in Figure 7-52 to Figure 7-54. Water quality results were generally considered to be consistent with historical trends. There were no exceedances of trigger levels (3 or more consecutive events) in 2023.

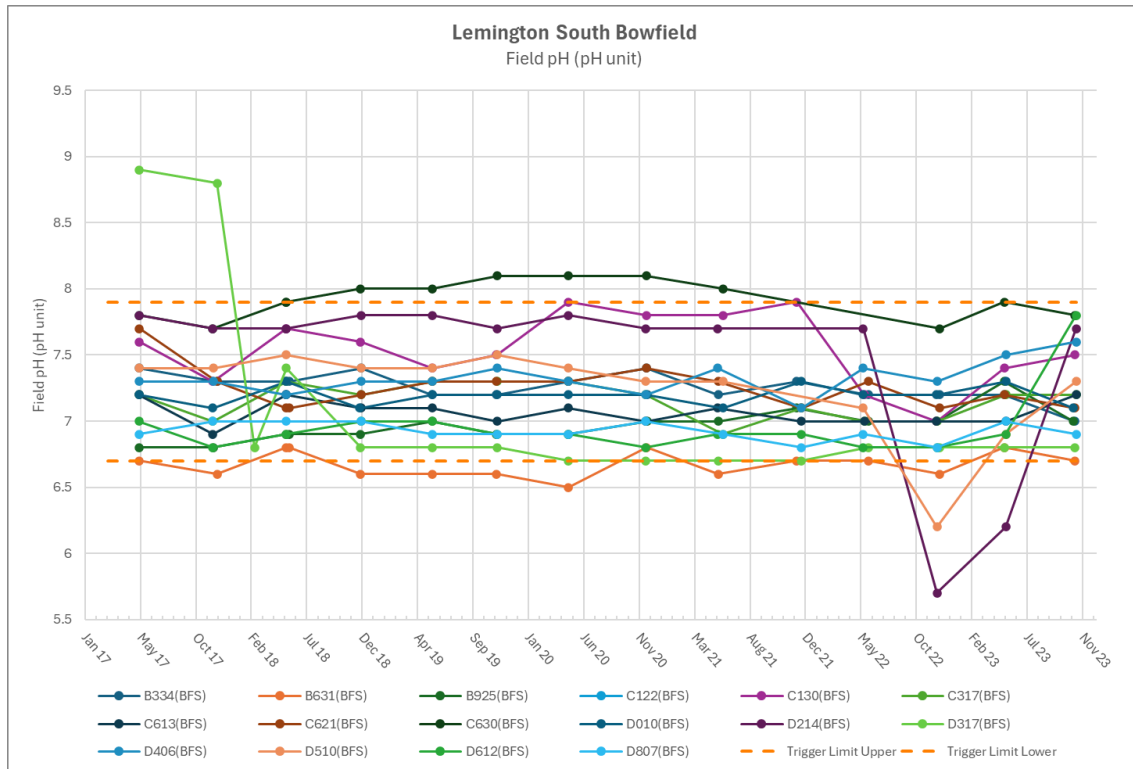


Figure 7-52: Lemington South Bowfield Groundwater pH Trends 2017 – 2023



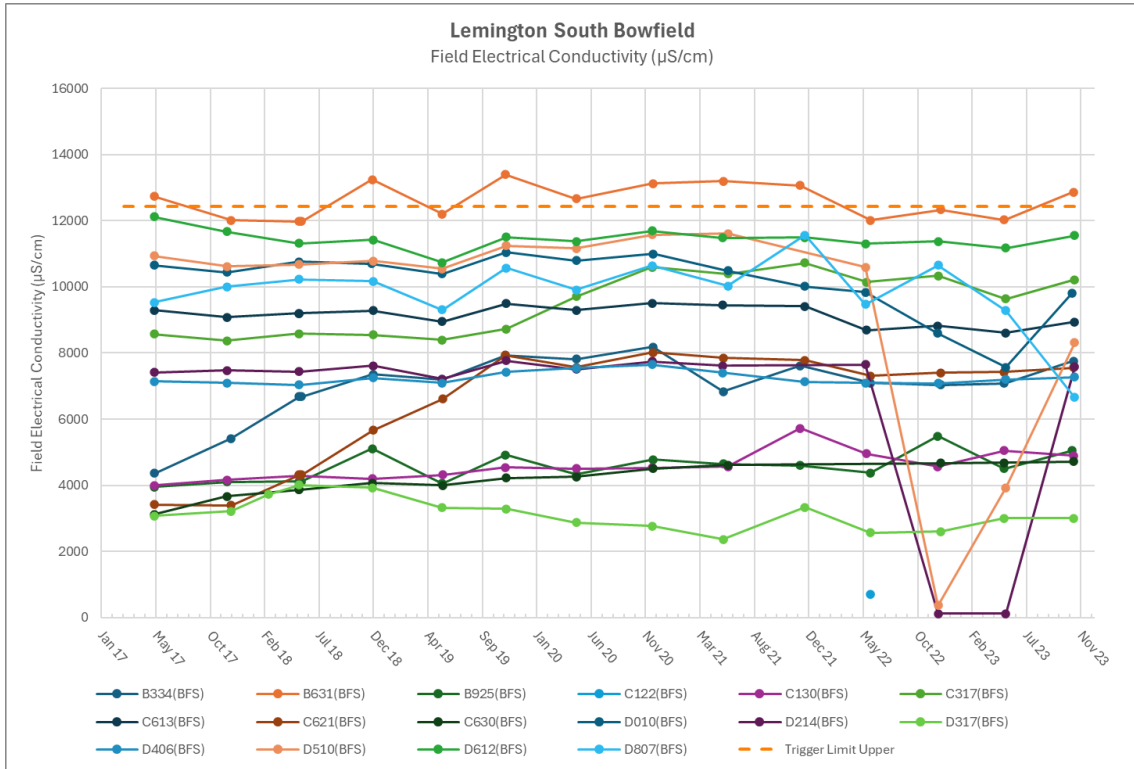
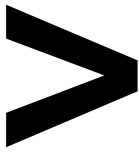


Figure 7-53: Lemington South Bowfield Groundwater EC Trends 2017 – 2023

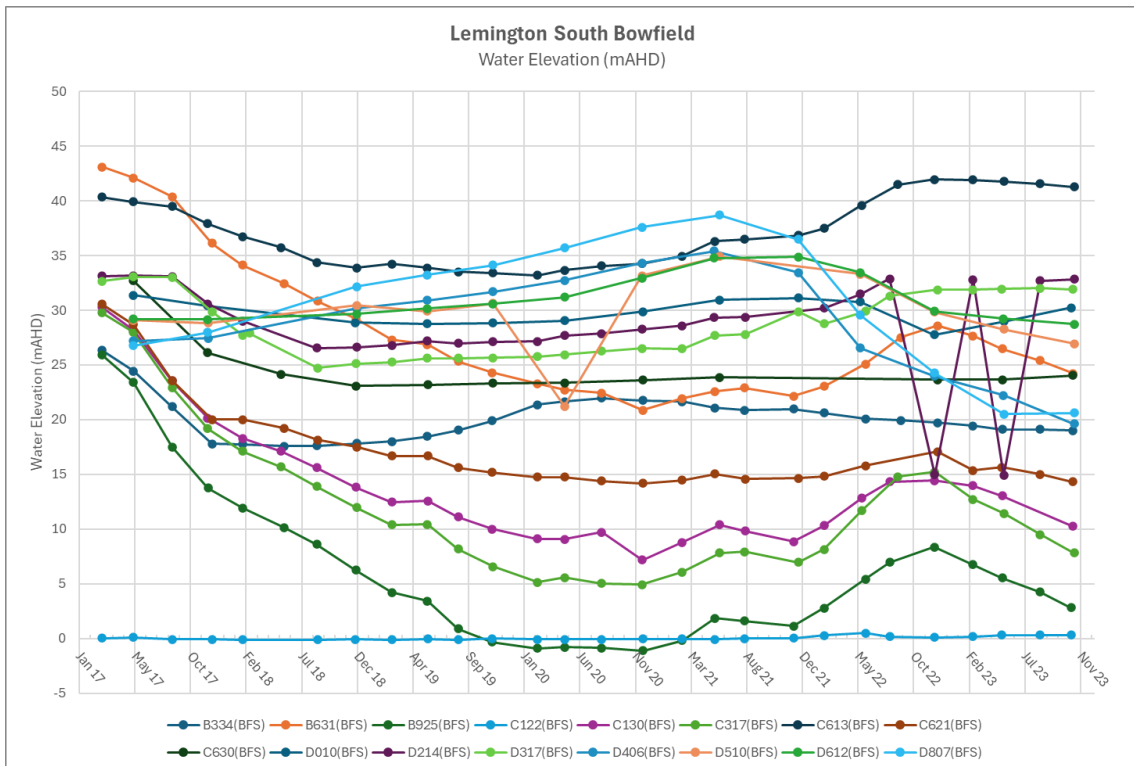


Figure 7-54: Lemington South Bowfield Groundwater SWL Trends 2017 - 2023



7.5.16 | LEMINGTON SOUTH INTERBURDEN

The pH, EC and SWL trends for 2017 to 2023 are shown in Figure 7-55 to Figure 7-57. Historical readings of C130(ALL) show regular fluctuations of pH between 6.6 and 7.2 The 2023 readings for pH are considered consistent with historical concentrations.

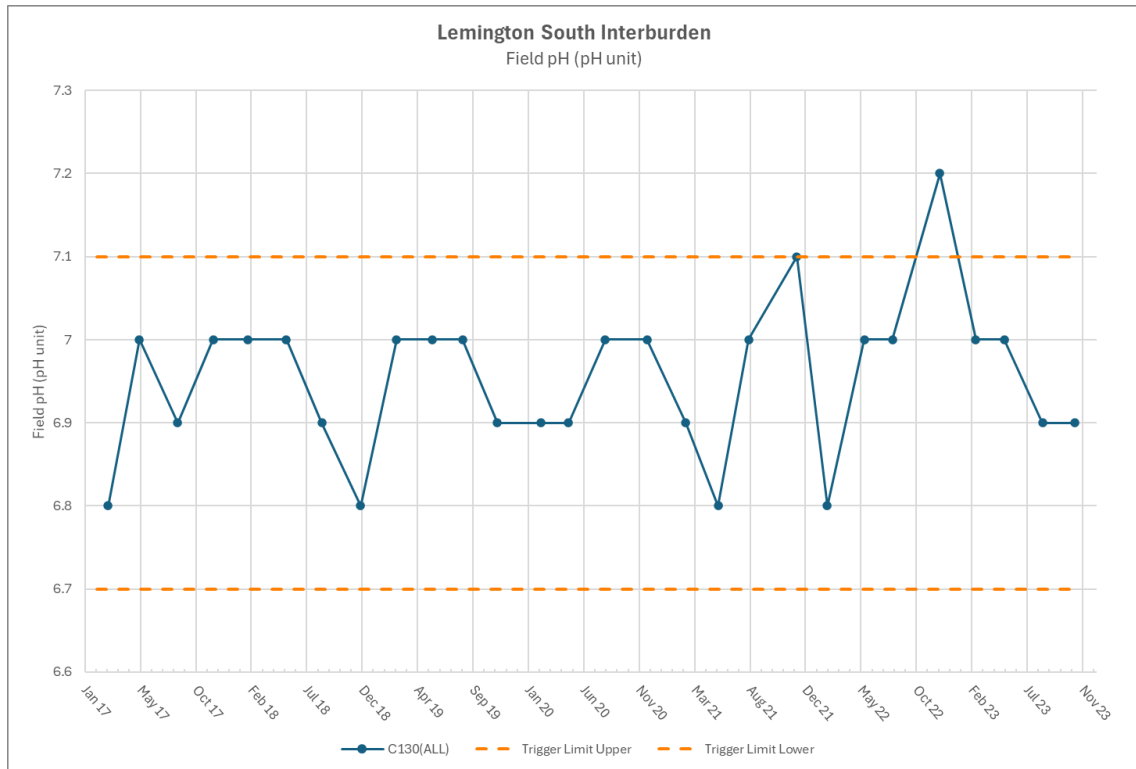


Figure 7-55: Lemington South Interburden Groundwater pH Trends 2017 - 2023

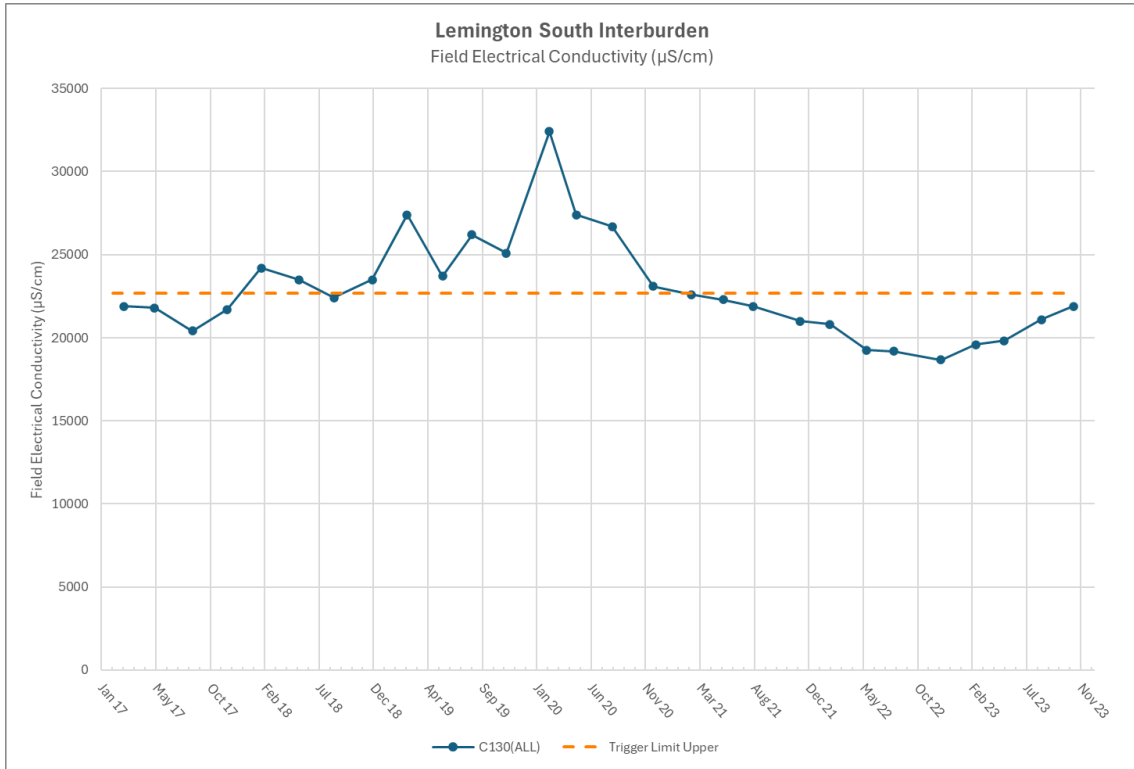
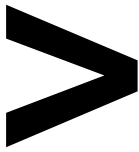


Figure 7-56: Lemington South Interburden Groundwater EC Trends 2017 - 2023

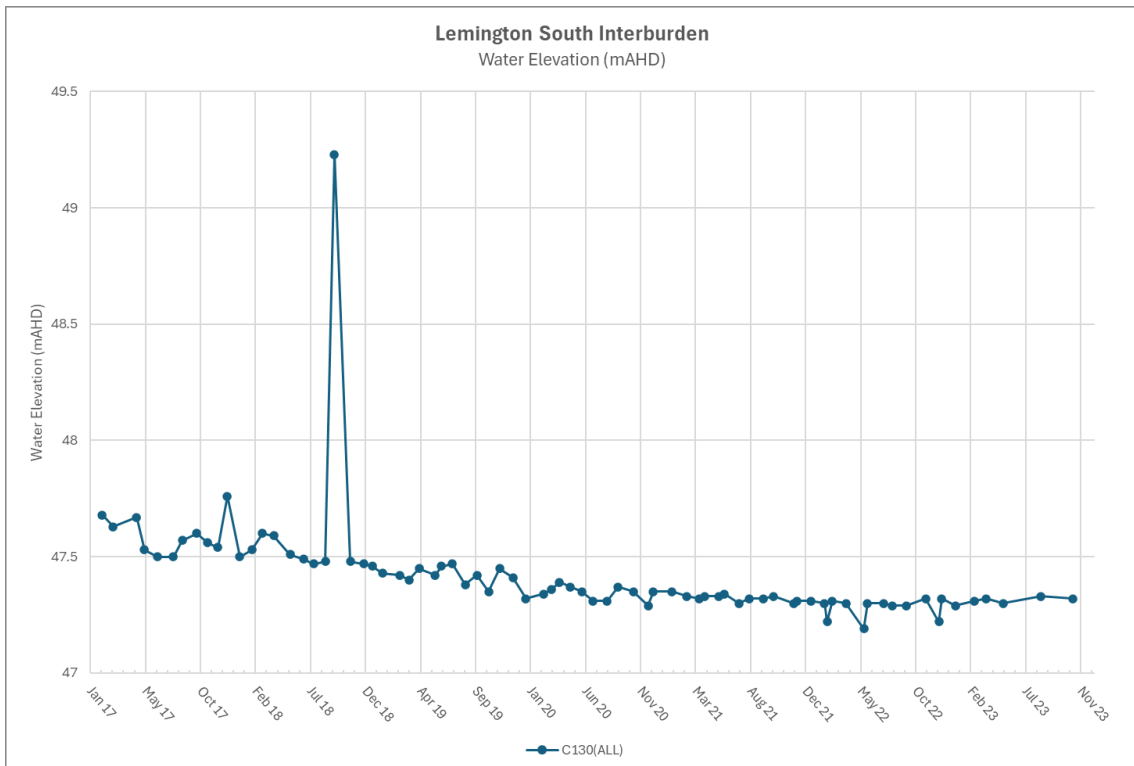
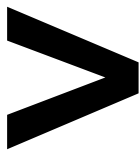


Figure 7-57: Lemington South Interburden Groundwater SWL Trends 2017 - 2023



7.5.17 | LEMINGTON SOUTH WOODLANDS HILL

The pH, EC and SWL trends for 2017 to 2023 are shown in Figure 7-58 to Figure 7-60. Water quality results were generally consistent with historical trends, with no measurements outside of trigger limits for three (3) consecutive monitoring events or greater.

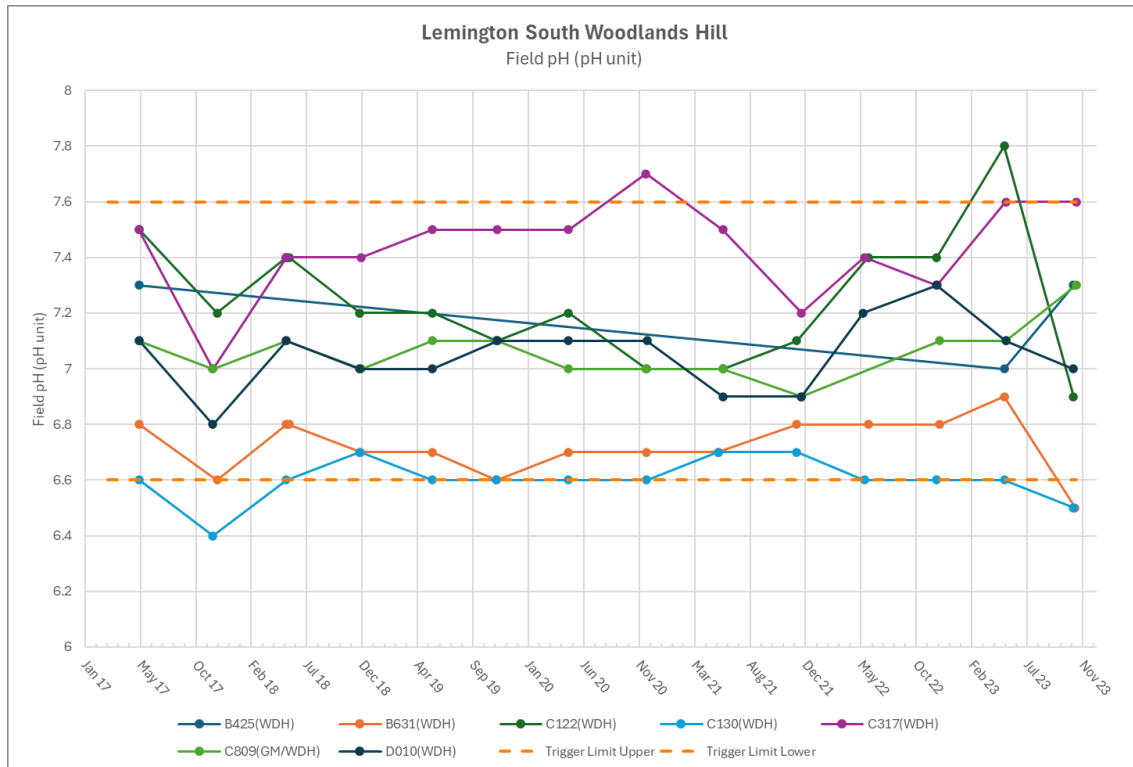


Figure 7-58: Lemington South Woodlands Hill Groundwater pH Trends 2017 – 2023

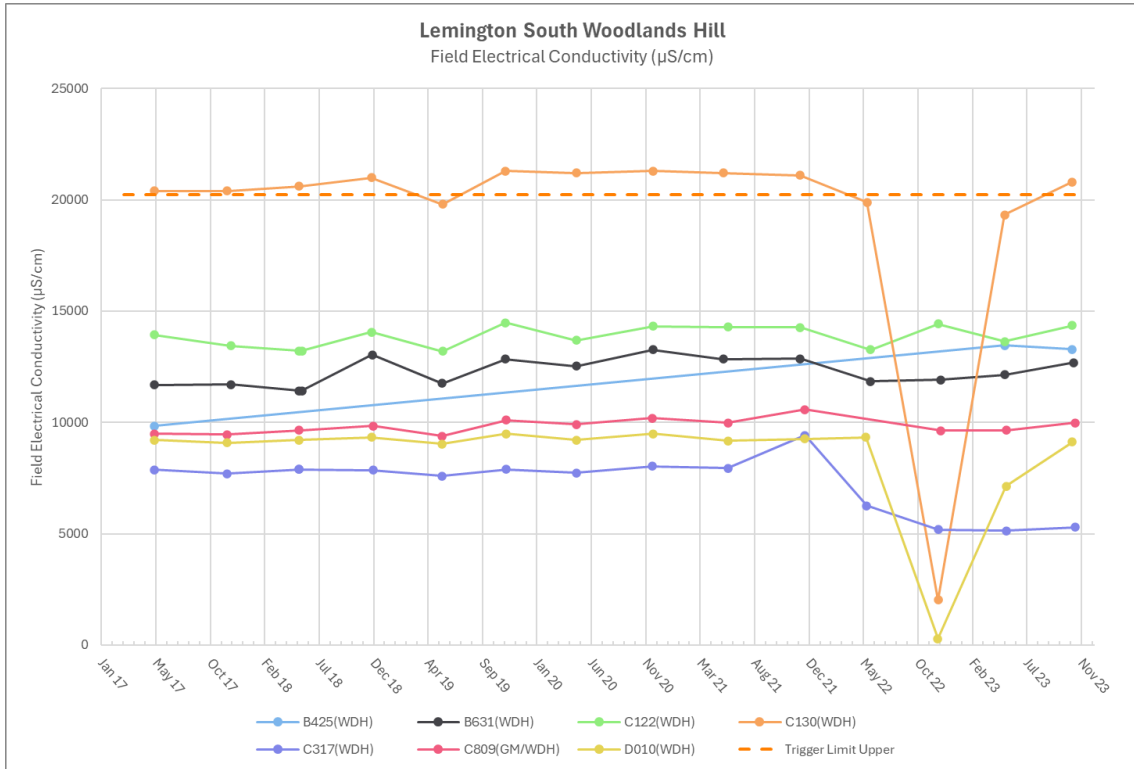


Figure 7-59: Lemington South Woodlands Hill Groundwater EC Trends 2017 - 2023

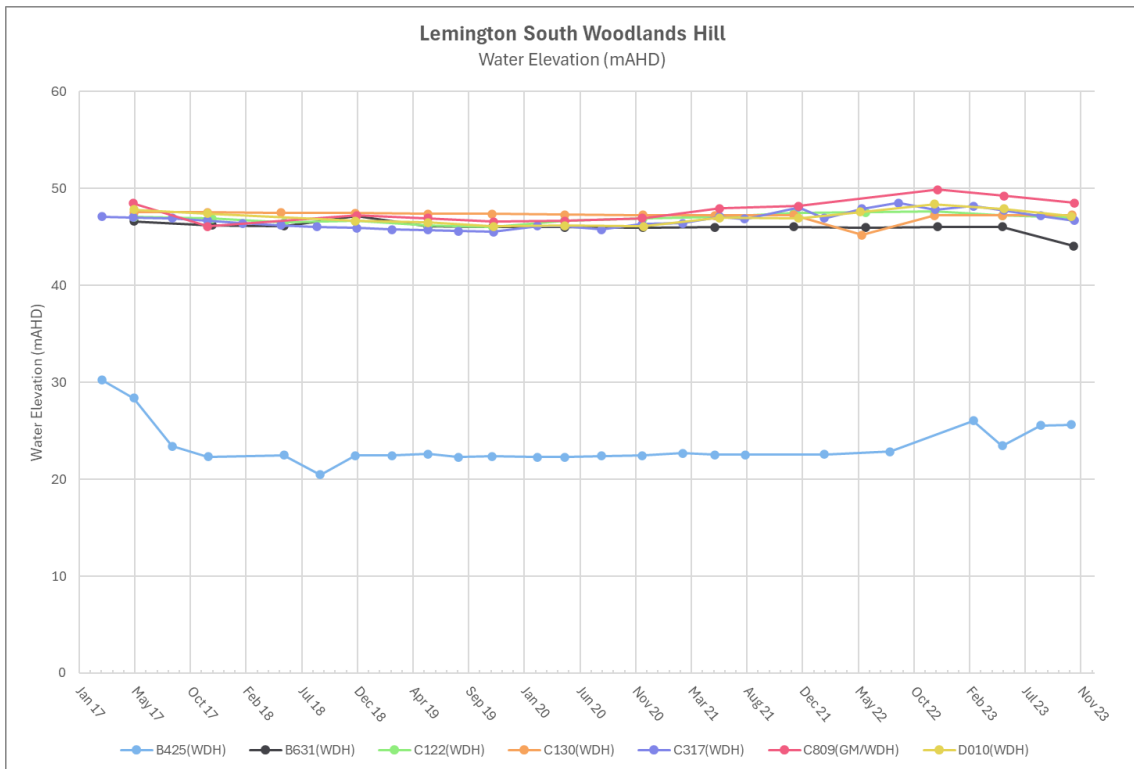
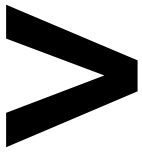


Figure 7-60: Lemington South Woodlands Hill Groundwater SWL Trends 2017 - 2023



7.5.18 | LEMINGTON SOUTH GLEN MUNRO

pH, EC and SWL trends at Lemington South Glen Munro from 2017 to 2023 are shown in Figure 7-61 to Figure 7-63. Water quality results were generally consistent with historical trends.

The assignment of trigger values has been removed for bore D010(GM) in the draft WMP that has been submitted to DPHI for approval.

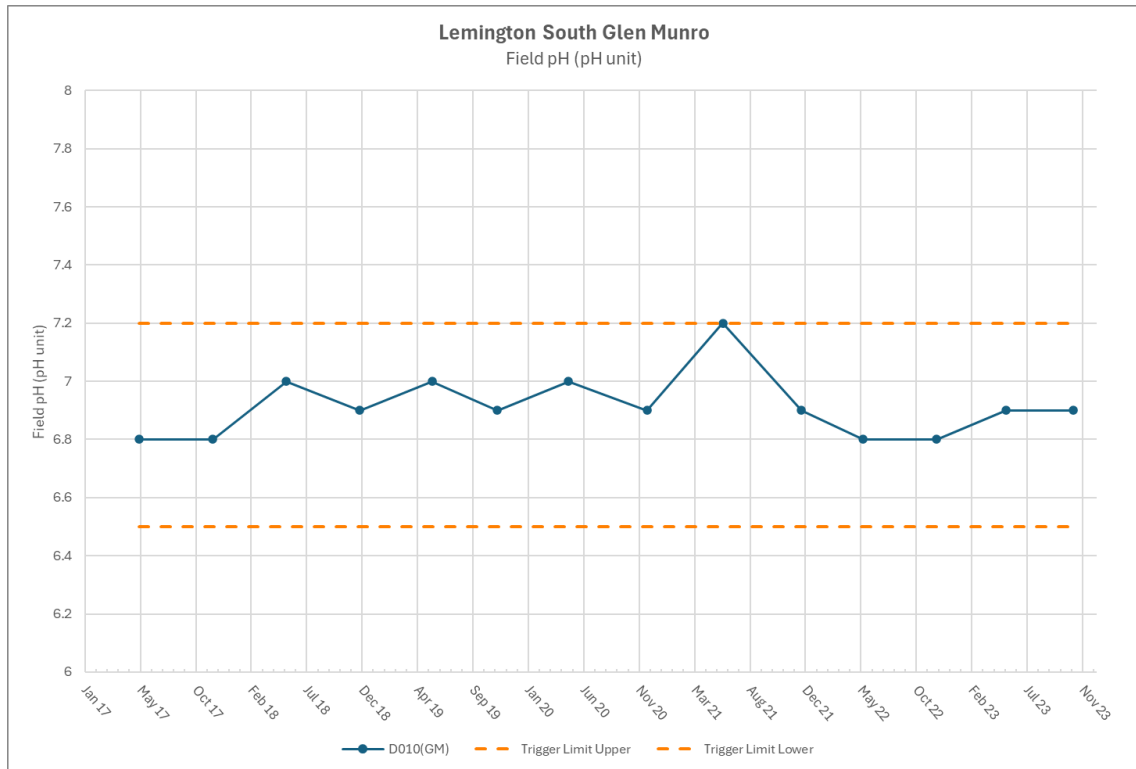


Figure 7-61: Lemington South Glen Munro Groundwater pH Trends 2017 - 2023

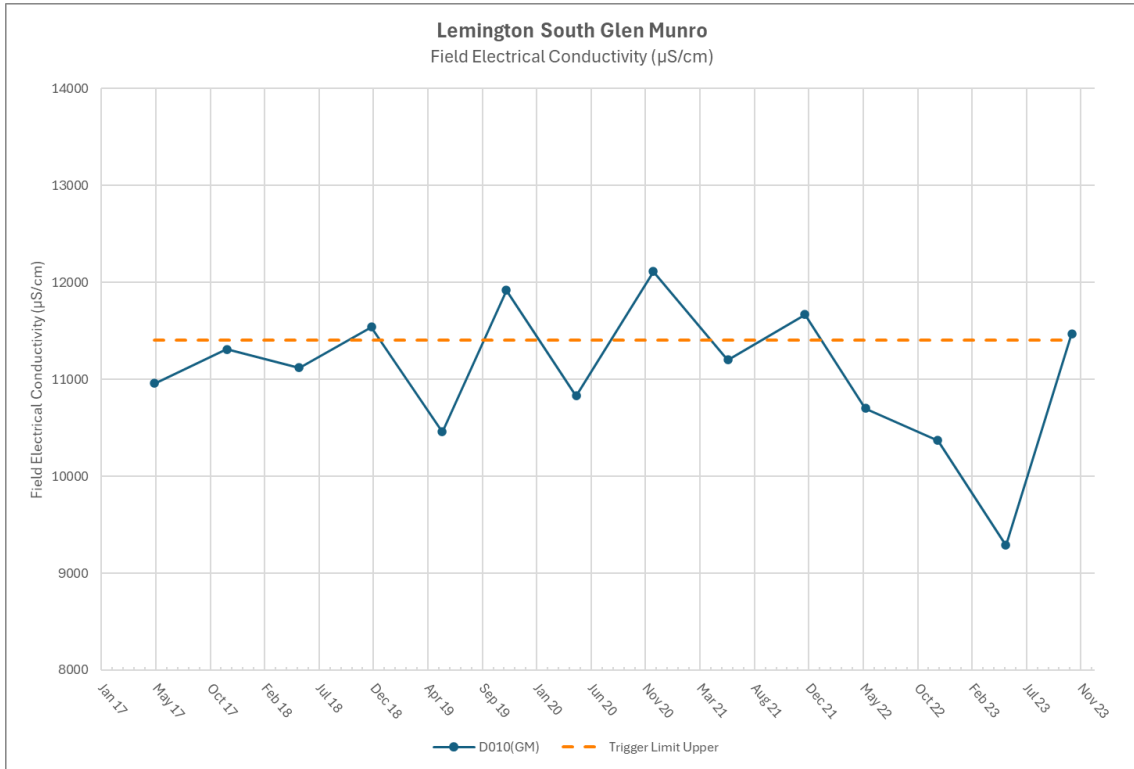
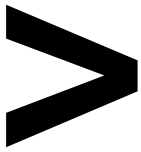


Figure 7-62: Lemington South Glen Munro Groundwater EC Trends 2017 - 2023

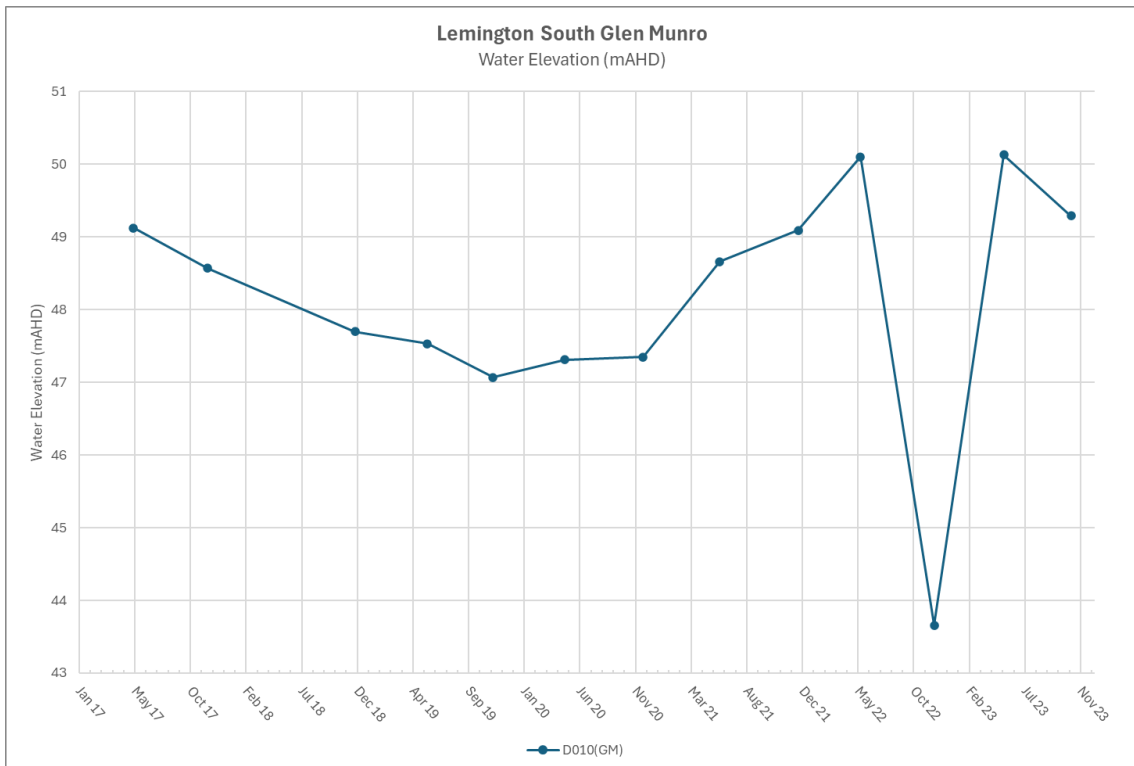
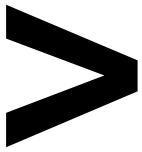


Figure 7-63: Lemington South Glen Munro Groundwater SWL Trends 2017 - 2023



7.5.19 | NORTH PIT SPOIL

The pH, EC and SWL trends for 2017 to 2023 are shown in Figure 7-64 to Figure 7-66. Groundwater within the spoil flows from northern-most bore DM1 in a southerly direction towards the southern-most bore MB14HVO03. EC and pH was found to generally be within historical levels.

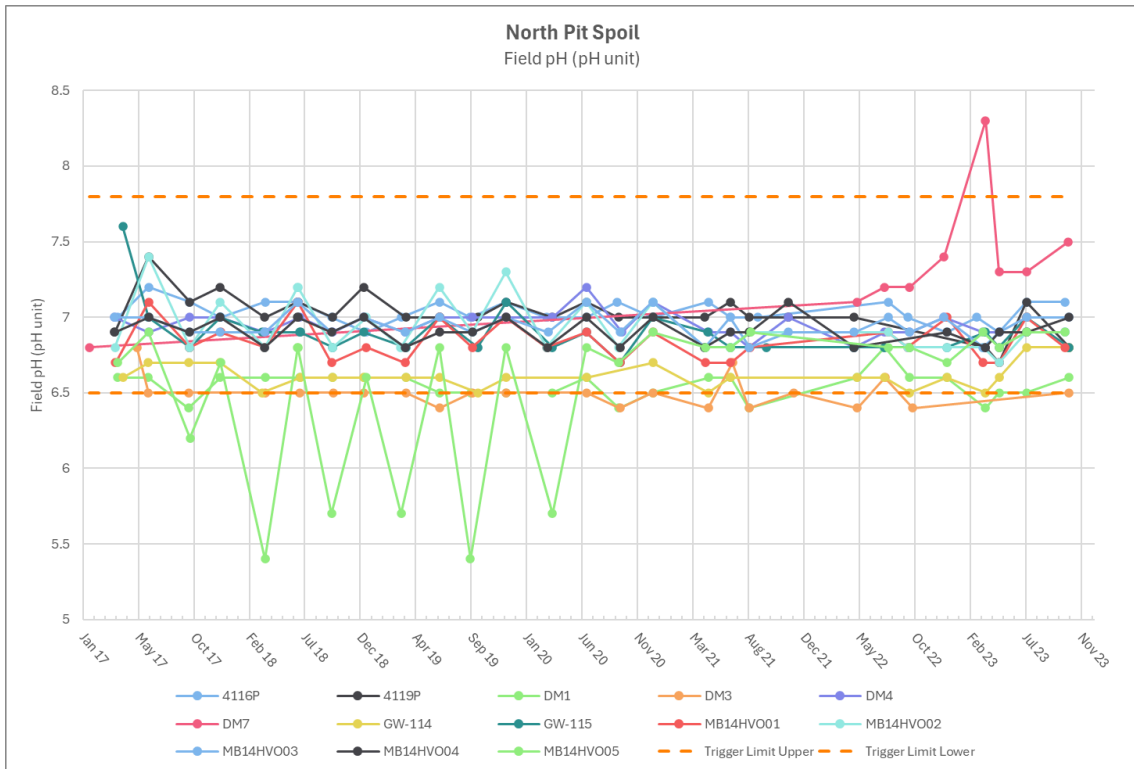


Figure 7-64: North Pit Spoil Groundwater pH Trends 2017 - 2023



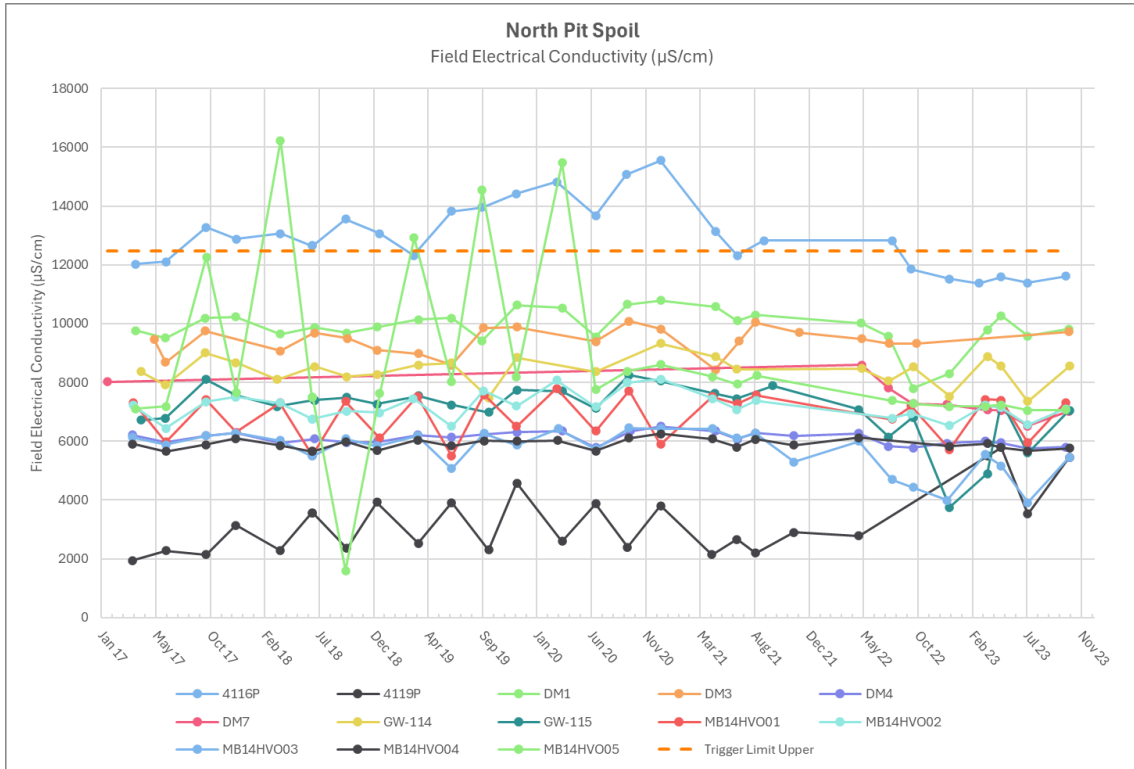
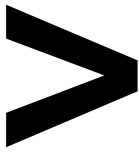


Figure 7-65: North Pit Spoil Groundwater EC Trends 2017 – 2023

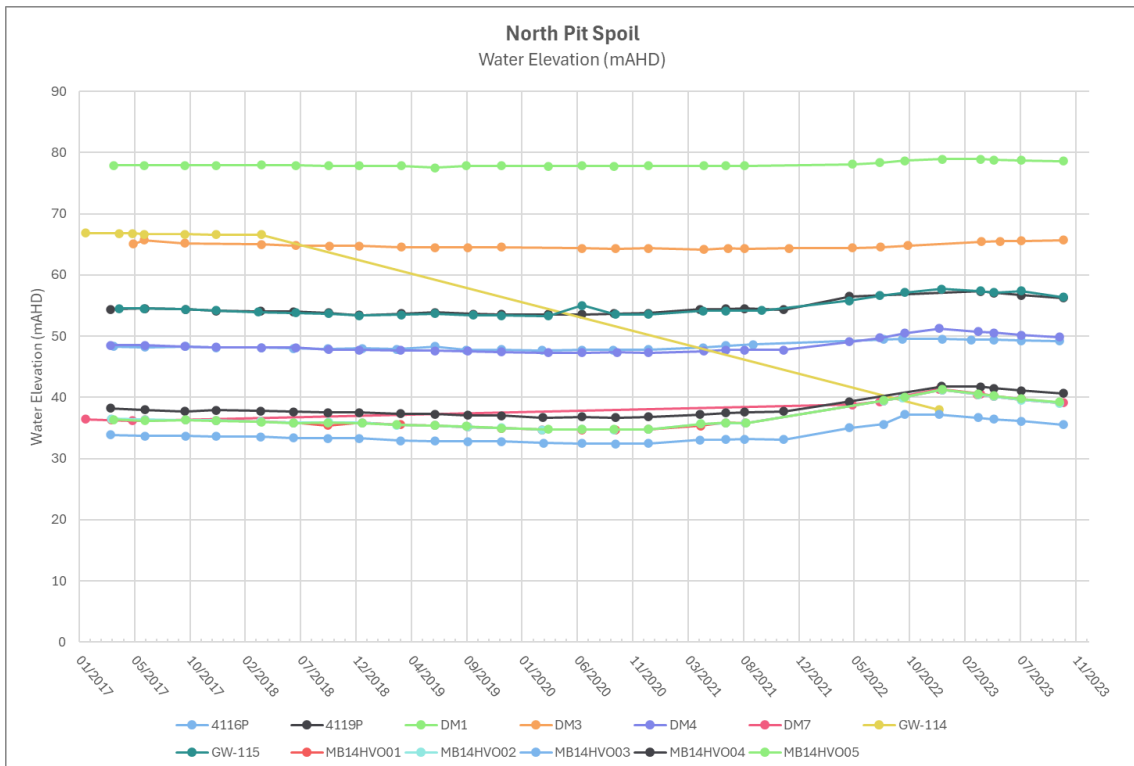


Figure 7-66: North Pit Spoil Groundwater SWL Trends 2017 - 2023



7.5.20 | WEST PIT ALLUVIUM

The pH, EC and SWL trends for 2017 to 2023 are shown in Figure 7-67 to Figure 7-69. Bore GW-101 was unable to be sampled due to insufficient water and lack of access throughout 2023. Water quality results were generally consistent with historical trends.

Bores G1, G2 and G3 continued to be monitored on a monthly basis during the reporting period. Monitoring in bores GW-100 and GW-101 was undertaken quarterly in accordance with the HVO Groundwater Monitoring Programme.

Bore GW-100 recorded consecutive EC readings above the trigger level from April to December 2023 (Q2, Q3 and Q4). Prior to 2023 EC concentrations remained relatively stable. The EC exceedances are understood to be due to declining groundwater levels. Trends will continue to be monitored to determine if they are related to mining activities. Further detail on this exceedance is presented in Table 6.2 of Appendix B. Water levels at GW-100 were rising during 2023 but are within trigger limits.

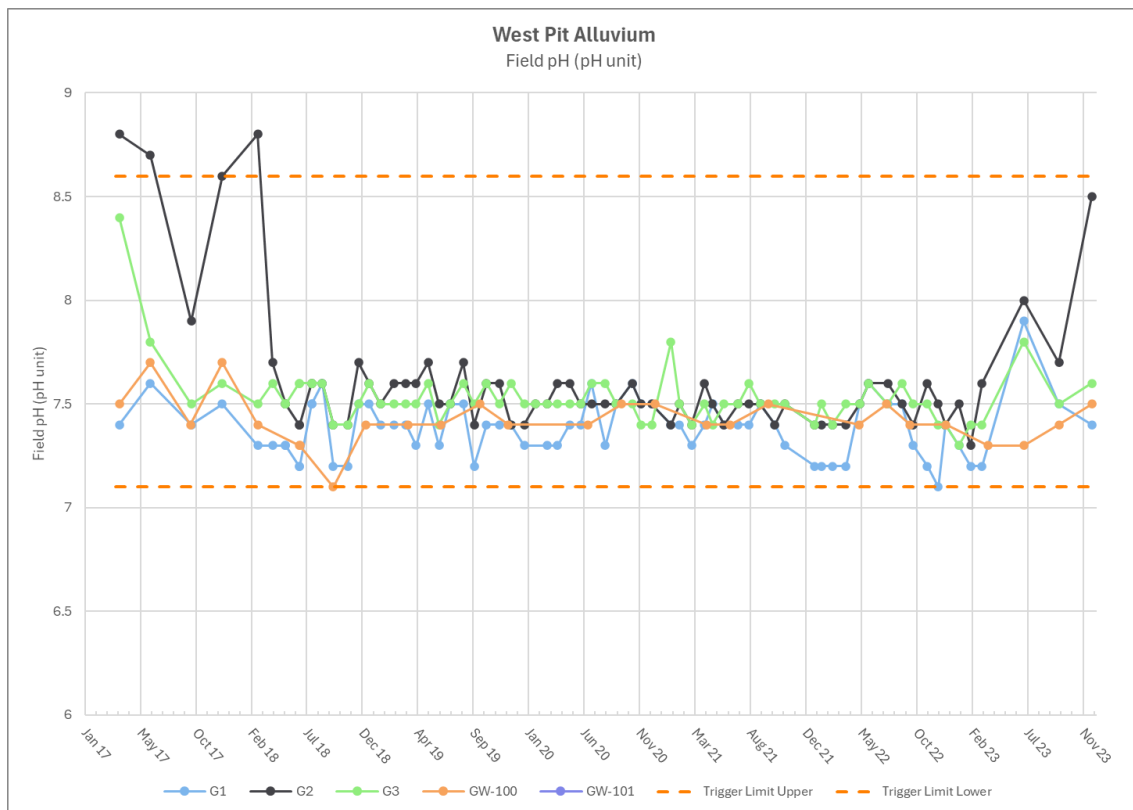


Figure 7-67: West Pit Alluvium Groundwater pH Trends 2017 - 2023

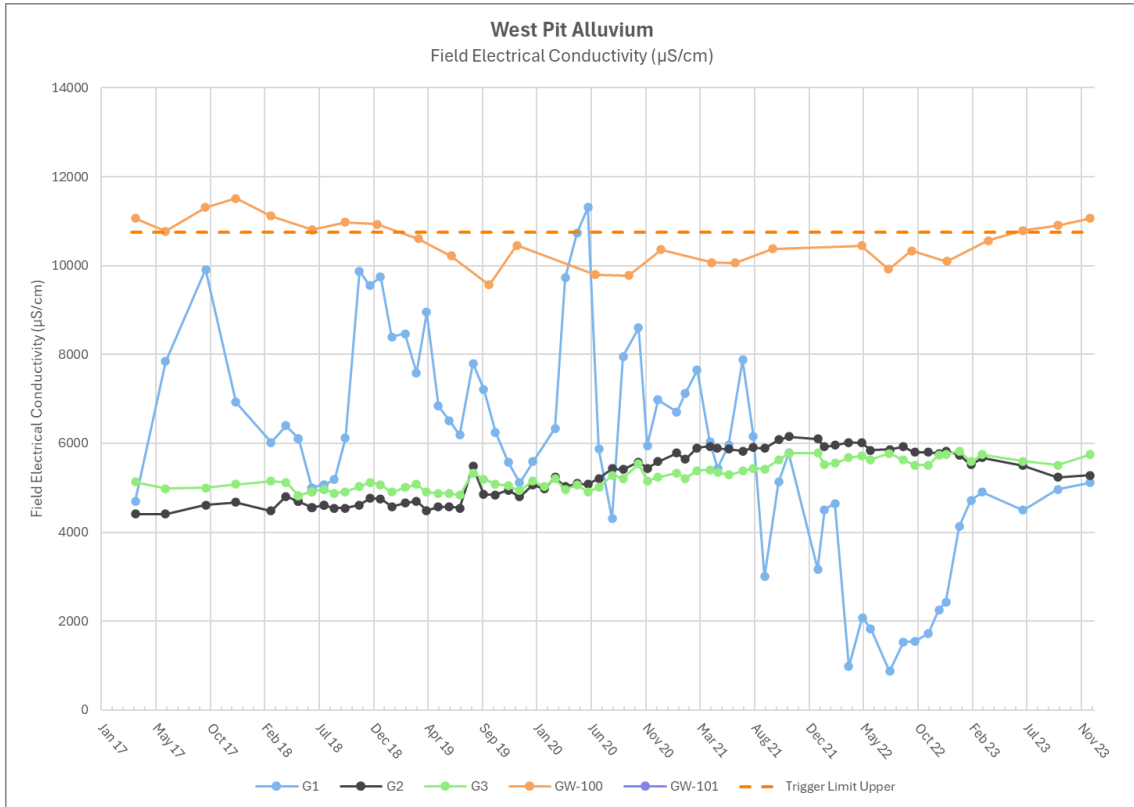
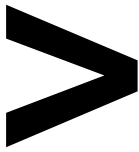


Figure 7-68: West Pit Alluvium Groundwater EC Trends 2017 - 2023

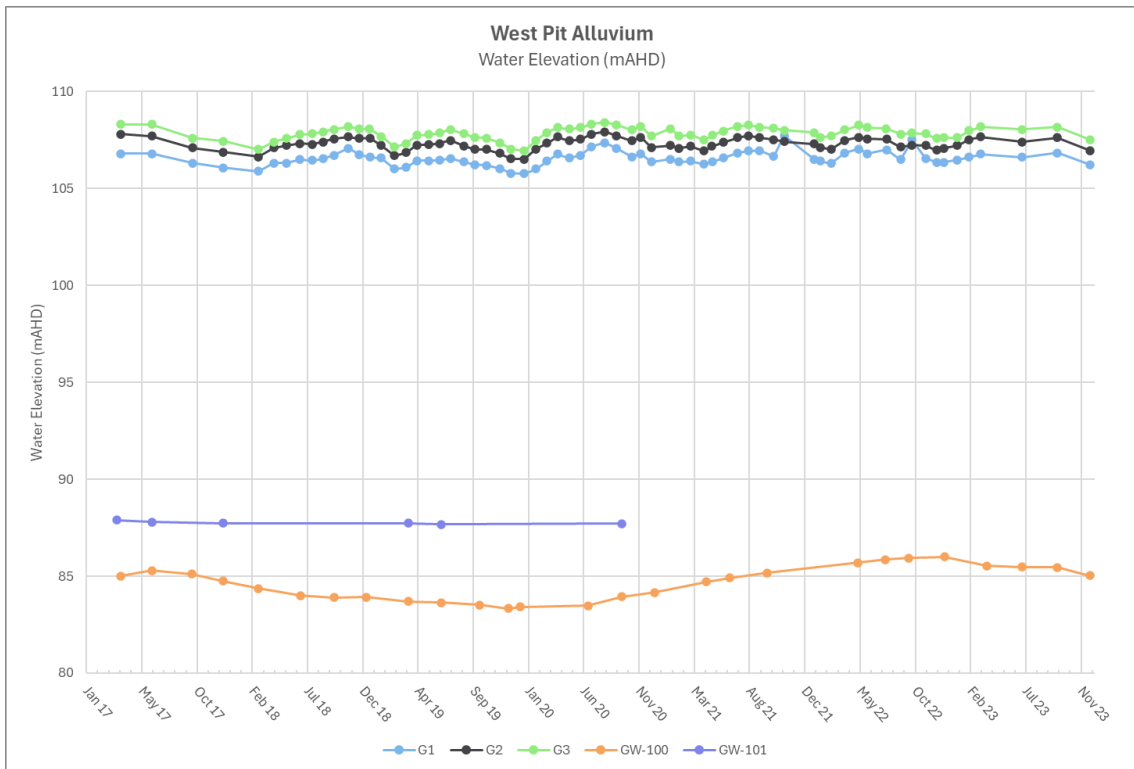
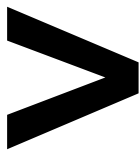


Figure 7-69: West Pit Alluvium Groundwater SWL Trends 2017 - 2023



7.5.21 | WEST PIT SANDSTONE/SILTSTONE

The pH, EC and SWL trends for 2017 to 2023 are shown in Figure 7-70 to Figure 7-72. Water quality results were generally consistent with historical trends.

EC was above trigger limit at NPZ2 for all readings during the monitoring period. NPZ2 is located northwest of West Pit beyond the outcrop of coal seams mined at West Pit and intersects Interburden sequences beneath the coal seams. EC readings range from 12,590 µS/cm (December 2014) and 19,400 µS/cm (December 2009). The 2023 readings are consistent with historical concentrations. The 2019 Groundwater Network Review (SLR, 2019a) noted that the bore is unlikely to detect relevant site impacts and recommended removal from the compliance monitoring network but kept in operational monitoring network for future work. The bore has already been removed from the compliance monitoring network in version 3.4 of the WMP which is currently with DPHI for approval.

Further discussion of NPZ2 levels is presented in Table 6.2 of Appendix B.

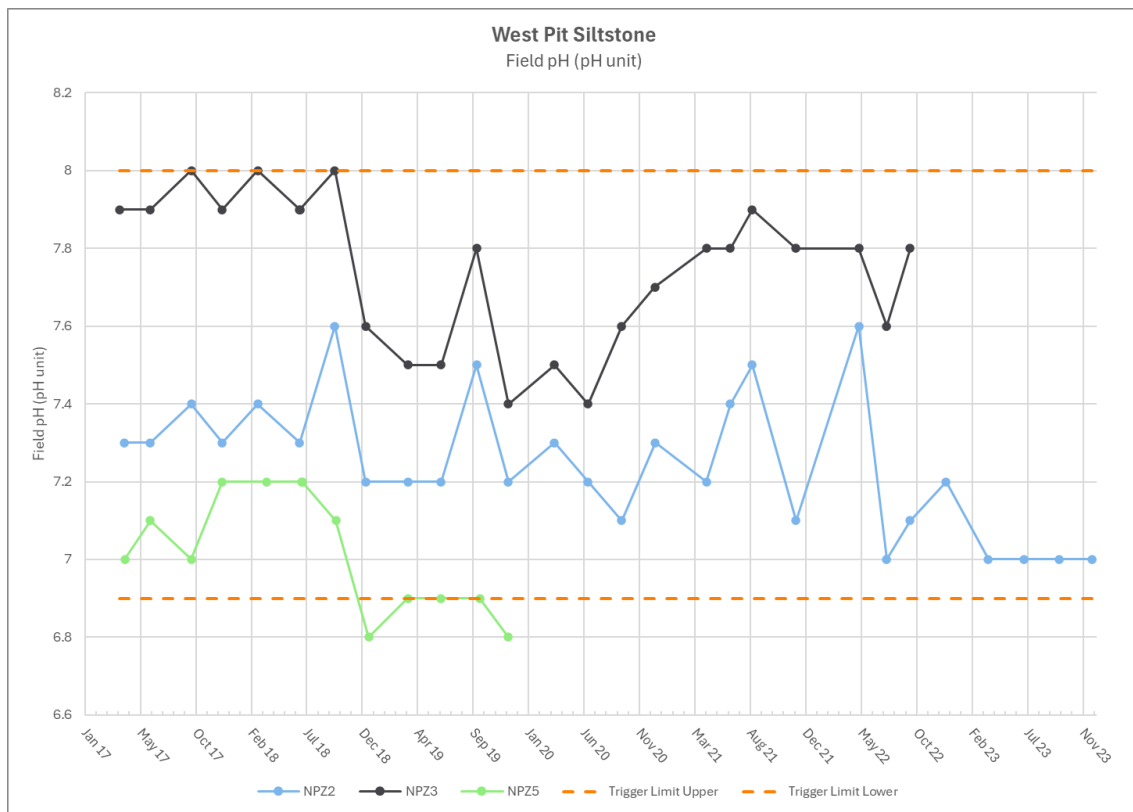


Figure 7-70: West Pit Sandstone/Siltstone Groundwater pH 2017 - 2023.

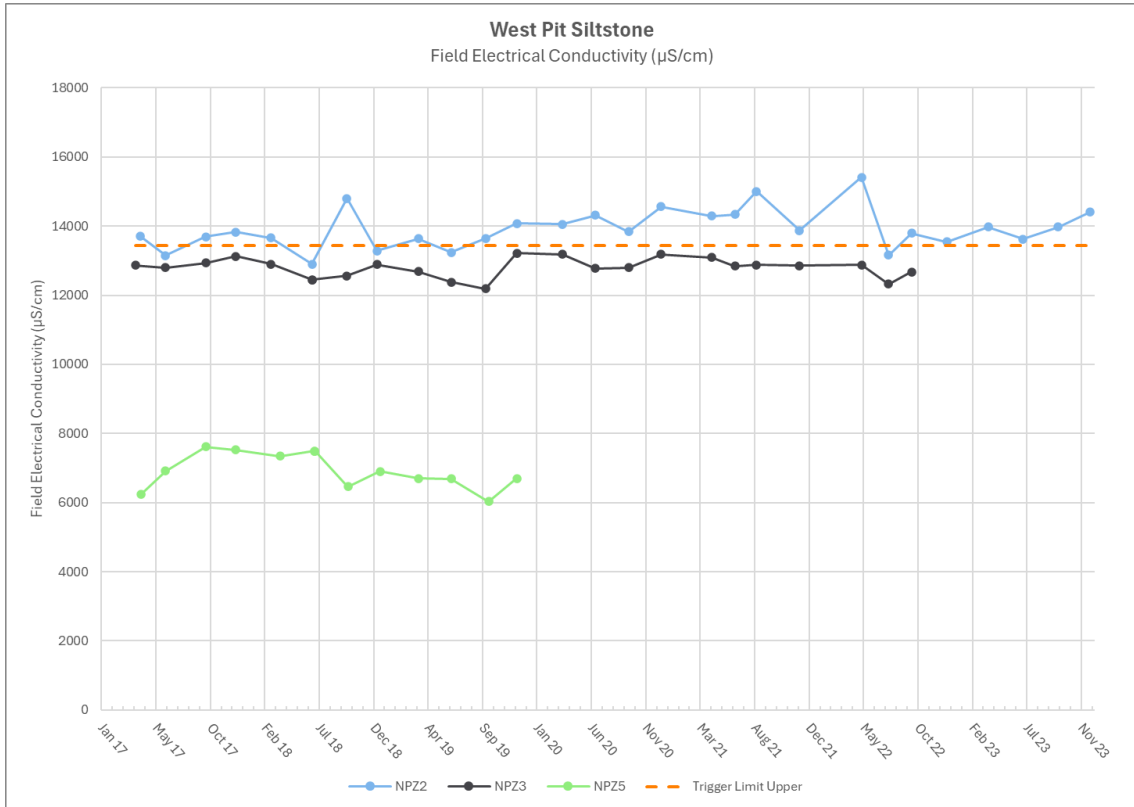
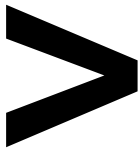


Figure 7-71: West Pit Sandstone/Siltstone Groundwater EC Trends 2017 - 2023

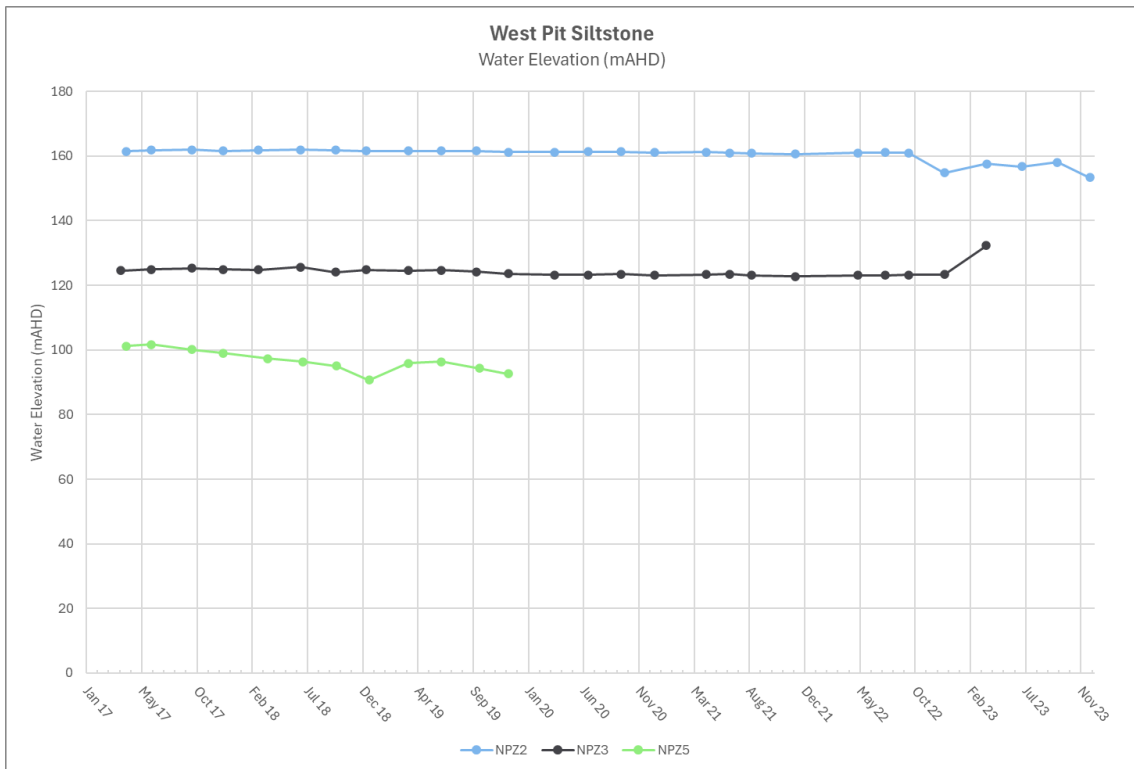
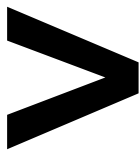


Figure 7-72: West Pit Sandstone/Siltstone Groundwater SWL Trends 2017 – 2023



7.5.22 | CARRINGTON WEST WING BAYSWATER

The pH, EC and SWL trends for 2017 to 2023 are shown in Figure 7-73 to Figure 7-75. Water quality results showed a drop in EC and SWL. Bore CGW46 recorded pH below the lower trigger level in Q1, Q2 and Q4. Historical pH readings for the bore since 2005 show regular fluctuations of between 7.1 and 7.8. The 2023 readings ranging from 7.0 to 7.3 are considered consistent with historical concentrations, with no adverse impacts identified. The bore was cleaned and purged by AECOM in 2023 and will be reassessed using a borehole camera in 2024.

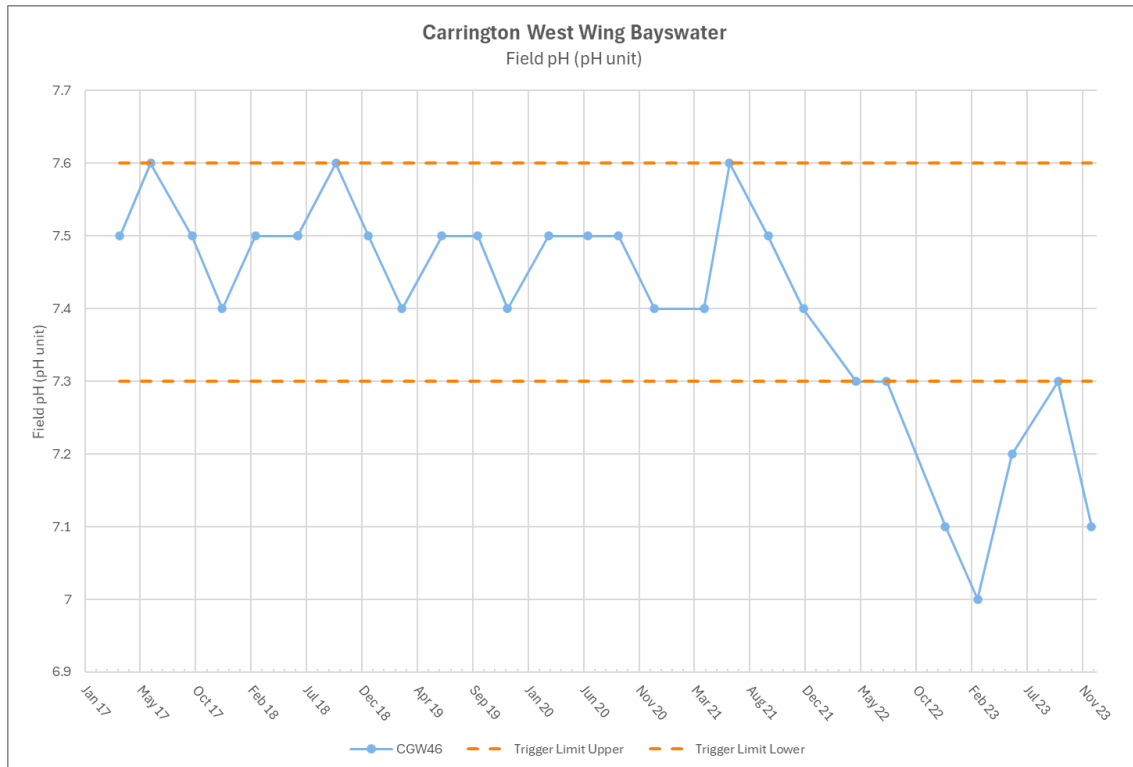


Figure 7-73: Carrington West Wing Bayswater Groundwater pH Trends 2017 to 2023

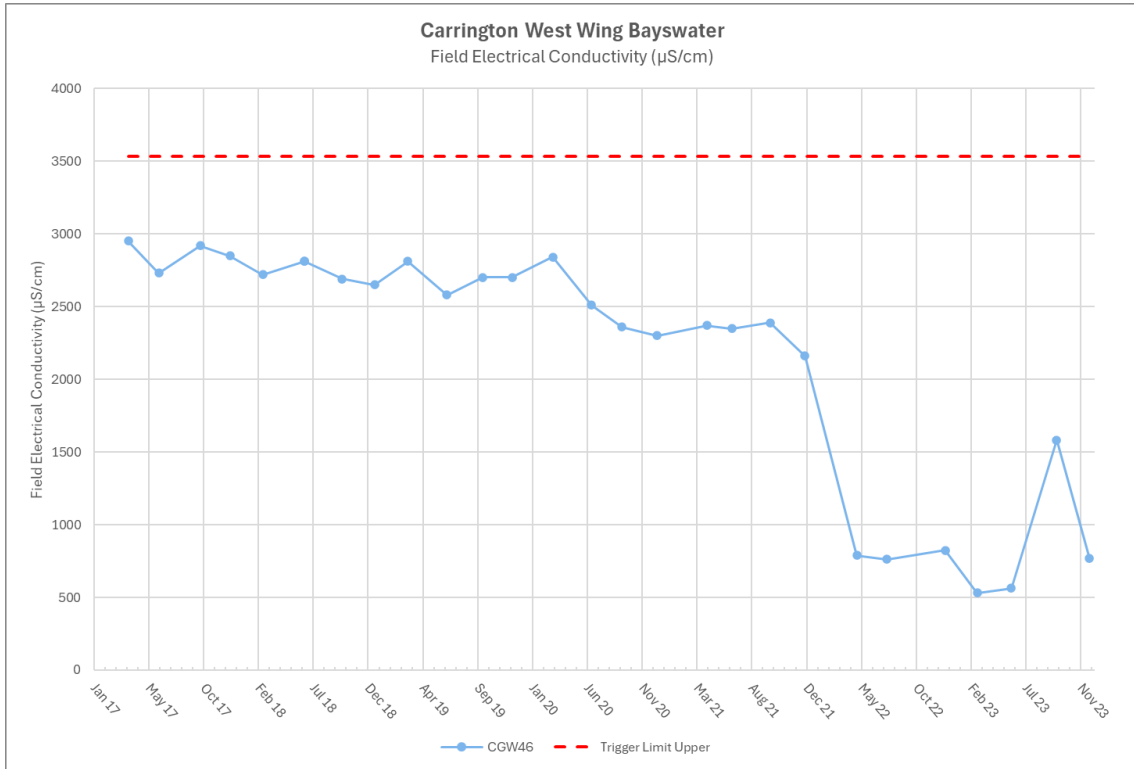
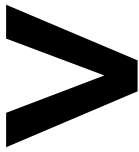


Figure 7-74: Carrington West Wing Bayswater Groundwater EC Trends 2017 to 2023

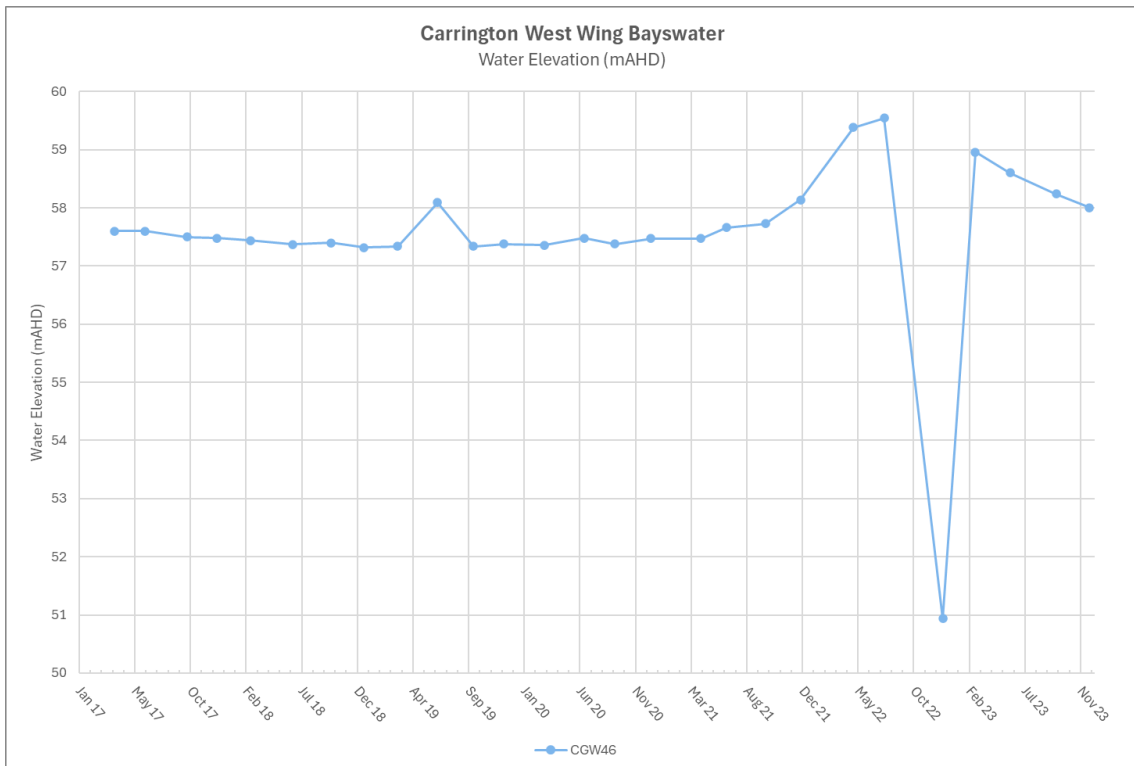
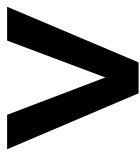


Figure 7-75: Carrington West Wing Bayswater Groundwater SWL Trends 2017 to 2023



## 7.6 | COMPENSATORY WATER SUPPLY

During 2023 HVO did not provide compensatory water supply or alternate compensation in lieu of compensatory water supply under any new or existing agreements, and circumstances which may trigger a requirement to provide a compensatory water supply were not identified.

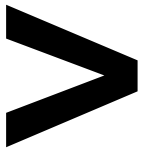
## 7.7 | PROGRESS AGAINST RECOMMENDATIONS IN 2022 ANNUAL GROUNDWATER REVIEW

A number of recommendations were made in the Annual Groundwater Monitoring Review produced by Umwelt (Appendix B of the 2022 Annual Review) in Section 9. Progress against these actions is shown in Table 7-8.

*Table 7-8: Progress Against Recommendations in 2022 Annual Groundwater Review*

Recommendation	Progress in 2023
4051C - Bore is blocked. Recommend the condition of the bore is checked with a downhole camera and if bore is irreparable, it should be removed from the WMP.	Borehole unblocked, purged and remediated Q1 2023
B425(WD) - Verify the depth of the base of screen and total depth. If current bore details are correct the bore should be removed from the WMP, and ongoing monitoring be conducted at nearby bore C130(WDH). Groundwater levels have been below the base of the screen at B425(WDH) since 2017.	Cleaned and Purged November 2023. Depth of base of screen and total depth to be verified in 2024.
BZ2A(1) - Water quality exceedance during the reporting period. Recommend the bore condition and construction details are checked and the pH trigger levels be reviewed. Comprehensive water quality analysis should be undertaken to help determine the cause of the declining pH trend.  It is noted that the bore has already been removed from the compliance monitoring network in version 3.4 of the WMP which is currently with DPHI for approval.	Updated in revised WMP. Awaiting DPHI approval.
BZ3-1 - Bore blocked in June 2022. Check condition of bore and casing with a downhole camera. If unable to be remediated, remove from the WMP.	Bore unblocked August 2023.
BZ3-3 - Water quality exceedance during the reporting period. Recommend the bore condition and construction details are checked and the pH trigger levels be reviewed. Comprehensive water quality analysis should be undertaken to help determine the cause of the declining pH trend.  It is noted that the bore has already been removed from the compliance monitoring network in version 3.4 of the WMP which is currently with DPHI for approval.	Updated in revised WMP. Awaiting DPHI approval.
BZ4A(2) - Water quality exceedance during the reporting period. Recommend that the depth of the base of screen and total depth be verified. If current bore details are correct the bore should be removed from the WMP but kept as part of the operational monitoring network for ongoing monitoring of groundwater recovery post mining. Water quality samples should not be collected if the groundwater level is below the base of the screen.	Depth of base of screen and total depth confirmed. Water level below screen, water samples not taken as too low. To be removed from WMP.

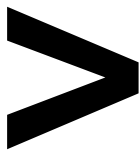




Recommendation	Progress in 2023
C130(WDH) - Revise EC and pH trigger levels in the draft WMP as water quality data trends indicate the trigger will continue to exceed the trigger levels in the draft WMP which is currently with DPHI for approval.	Updated in revised WMP. Awaiting DPHI approval.
C630(BFS) - Water quality exceedance during the reporting period. Recommend that the proposed pH and EC trigger levels are revised before finalising version 3.4 of the WMP which is currently with DPHI for approval.	PH & EC trigger levels revised by Groundwater specialist prior to submitting WMP v3.4.
CFW55R - Groundwater level trigger exceedance during the reporting period. Revised water level trigger level already updated in version 3.4 of the WMP, which is currently with DPHI for approval.	Updated in revised WMP. Awaiting DPHI approval.
CFW55R - Water quality exceedance during the reporting period. It is noted that the trigger level has already been reviewed and updated to 11,510 µS/cm in version 3.4 of the WMP which is currently with DPHI for approval. Current EC readings will be below the revised trigger level.	Updated in revised WMP. Awaiting DPHI approval.
CFW57 - Groundwater level trigger exceedance during the reporting period. Revised water level trigger level already updated in version 3.4 of the WMP, which is currently with DPHI for approval.	Updated in revised WMP. Awaiting DPHI approval.
CGW39 - Check the condition and location of the bore and confirm if it is screened within alluvium or spoil.	Bore to be inspected with camera in 2024.
CGW45 - Bore has been blocked and unable to be monitored since 2018. Bore has been checked and an extension has been added to increase the height of the casing above the ground surface to avoid further blockages. Work is continuing to clear the existing blockage and reinstating the bore.	Bore condition assessed in 2023 and unable to be unblocked. Further assessment required in 2024.
CGW51a - Bore CGW51a should be decommissioned to minimise potential mixing due to the construction of the bore and a new bore be installed within the spoil material to replace CGW51a. It is noted that bore CGW51a has been removed from the draft WMP which is awaiting approval.	Updated in revised WMP. Awaiting DPHI approval.
CGW53a - Groundwater level trigger exceedance during the reporting period. Revised water level trigger level already updated in version 3.4 of the WMP, which is currently with DPHI for approval.	Updated in revised WMP. Awaiting DPHI approval.
CGW55a - Groundwater level trigger exceedance during the reporting period. Revised water level trigger level already updated in version 3.4 of the WMP, which is currently with DPHI for approval.	Updated in revised WMP. Awaiting DPHI approval.
D510(AFS) - Bore blocked in May 2022. Check condition of bore and casing with a downhole camera. If unable to be remediated, remove from the WMP.	Bore blocked and damaged. Remove from WMP.
G1 - The condition of bore G1 is checked to determine the cause of the water quality fluctuations.	Water quality results have been stable since January 2023. Potentially impacted previously to increased rainfall in 2022.
GW-103 - The sensors have been checked and are irreparable. The VWP will be removed from the draft WMP.	Updated in revised WMP. Awaiting DPHI approval.
GW-105 - Check the VWP sensors as the deepest sensor has failed and is no longer recording data.	The deepest sensor (VW3) has failed due to an open circuit and is no longer recording data. The sensor should be removed from the revised WMP and the monitoring schedule.



Recommendation	Progress in 2023
<p>GW-106 - Water quality exceedance during the reporting period. It is noted that the bore has already been removed in version 3.4 of the WMP, which is currently with DPPI for approval.</p>	<p>Updated in revised WMP. Awaiting DPPI approval.</p>
<p>GW-109 - Check the VWP sensors as the deepest sensor (VW3) has failed and no longer recording data.</p> <p>Local site conditions and the condition of the GW-109 should be reviewed, and groundwater conditions within the spoil in Carrington Pit continue to be monitored to determine if the difference between sensors VW1 and VW2 is due to sensor drift or an additional source of recharge to the shallow stratigraphy.</p>	<p>Status of VW3 and site condition to be assessed in 2024.</p>
<p>GW-110 - Calibration data from VWP installation required, if available, to convert raw data to water levels.</p>	<p>Calibration data unavailable for conversion. To be decommissioned as per recommendation in Annual GW Report Appendix</p>
<p>NPz2 - Water quality exceedance during the reporting period. It is noted that the bore has already been removed from the compliance monitoring network in version 3.4 of the WMP which is currently with DPPI for approval.</p> <p>Bores NPz2 and NPz3 remain in the monitoring program to assist with future assessments and assessment of post closure groundwater conditions.</p>	<p>Updated in revised WMP. Awaiting DPPI approval.</p>



## 8 | REHABILITATION AND LAND MANAGEMENT

### 8.1 | SUMMARY OF REHABILITATION

Rehabilitation at HVO is undertaken in accordance with commitments made in 2023-2025 Forward Works Program (FWP) and Rehabilitation Management Plan (RMP). During December 2022, HVO gained approval from the Resources Regulator to re-align to a calendar year period for the FWP from 2023 onward. The updated RMP was provided to the Department during August 2022 to satisfy the requirements of both development consents and remains pending approval. This rehabilitation management plan was resubmitted to the department in August 2023.

A summary of the key rehabilitation performance indicators is shown in **Table 8-1**. Please note this table has been updated to reflect the 2022 Annual Rehabilitation Report.

Table 8-1: Key Rehabilitation Performance Indicators

Mine Area Type	Previous Reporting Period (Actual) Year 2022 (ha)	This Reporting Period (Actual) Year 2023 (ha)	Next Reporting Period (Forecast) Year 2024 (ha)
A. Total mine footprint <sup>2</sup>	6910.4	6965.3	7349.84
B. Total Active Disturbance <sup>3</sup>	4160.7	4154.31	4397.84
C. Land being prepared for rehabilitation <sup>4</sup>	235.79	138.69	50.19
D. Land under active rehabilitation <sup>5</sup>	2753.72	2803.91	2944.92
E. Completed rehabilitation <sup>6</sup>	0	0	0

\*Large land being prepared for rehabilitation figures is due to reclassification of areas previously reported as under active rehabilitation. These require remedial actions prior to being re-sown to final vegetation (i.e. reclassified to Growth Medium Development phase).

<sup>2</sup> **Total mine footprint** includes all areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities. As such it is the sum of total active disturbance, decommissioning, landform establishment, growth medium development, ecosystem establishment, ecosystem development and relinquished lands (as defined in DRE MOP/RMP Guidelines). Please note that subsidence remediation areas are excluded

<sup>3</sup> **Total active disturbance** includes all areas ultimately requiring rehabilitation such as: on-lease exploration areas, stripped areas ahead of mining, infrastructure areas, water management infrastructure, sewage treatment facilities, topsoil stockpiles areas, access tracks and haul road, active mining areas, waste emplacements (active/unshaped/in or out-of-pit), and tailings dams (active/unshaped/uncapped).

<sup>4</sup> **Land being prepared for rehabilitation** – includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development (as defined in DRE MOP/RMP Guidelines).

<sup>5</sup> **Land under active rehabilitation** – includes areas under rehabilitation and being managed to achieve relinquishment – includes the following rehabilitation phases as described in the DRE MOP/RMP Guidelines – “ecosystem and land use sustainability” (revegetation assessed as showing signs of trending towards relinquishment OR infrastructure development).

<sup>6</sup> **Completed rehabilitation** – requires formal sign off by DRE that the area has successfully met the rehabilitation land use objectives and completion criteria.



## 8.2 | REHABILITATION OVERVIEW

A summary of rehabilitation completed in 2023 is shown in **Table 8-2**.

Table 8-2: Summary of New Rehabilitation Completed in 2023

Rehabilitation Site Name	Rehabilitation Type	Seed Mix	Area (ha)	Summary
HVOWES202301	New Rehabilitation	Pasture / Woodland	1.24	Final landform sown with final cover
HVOCAR202301	New Rehabilitation	Pasture	0.56	Final landform sown with final cover
HVORIV202301	New Rehabilitation	Pasture / Woodland	7.02	Final landform sown with final cover
HVORIV202302	New Rehabilitation	Pasture	9.56	Final landform sown with final cover
HVORIV202303	New Rehabilitation	Pasture	10.47	Final landform sown with final cover
HVORIV202304	New Rehabilitation	Pasture	5.32	Final landform sown with final cover
HVOCHE202301	New Rehabilitation	Woodland	0.78	Final landform sown with final cover
HVOCHE202303	New Rehabilitation	Woodland	3.30	Final landform sown with final cover
HVOCHE202305	New Rehabilitation	Woodland	14.09	Final landform sown with final cover
HVOCHE202306	New Rehabilitation	Woodland	1.09	Final landform sown with final cover
HVOCHE202307	New Rehabilitation	Woodland	2.45	Final landform sown with final cover
HVOCHE202308	New Rehabilitation	Woodland	1.85	Final landform sown with final cover
HVOCAR202302	GMD	Woodland	4.00	Final landform sown with final cover
HVOCHE202302	GMD	Pasture	43.39	Final landform sown with final cover
HVOCHE202304	GMD	Pasture	50.84	Final landform sown with final cover
HVOWES202302	GMD	Pasture	0.44	Final landform sown with final cover
<b>TOTAL REHABILITATION</b>			<b>156.40</b>	

## 8.3 | REHABILITATION PERFORMANCE

A total of 156.40 ha rehabilitation was undertaken during 2023, including 57.73 ha of new rehabilitation, and 98.67 ha of Growth Media Development (GMD) progression. Details of the rehabilitation areas completed during 2023 are provided in **Figure 8-1** and **Figure 8-2**.

**Table 8-3** details the amount of rehabilitation and disturbance completed during the reporting period compared with proposed area in the respective FWP.

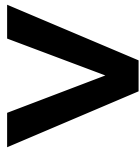


Table 8-3: Summary of Rehabilitation and Disturbance Completed in 2023

FWP	2023 Totals (ha)	
	Actual	Proposed FWP (2023)
<b>Rehabilitation</b>		
HVO North	1.80	1.06
HVO South	55.93	42.97
GMD North	4.44	0
GMD South	94.23	94
<b>HVO Total</b>	<b>156.40</b>	<b>138.03</b>
<b>Rehabilitation Disturbance</b>		
HVO North	79.0	145.87
HVO South	16.9	34.60
<b>HVO Total</b>	<b>95.9</b>	<b>180.46</b>
<b>New Disturbance</b>		
HVO North	54.9	319.05
HVO South	0.00	0.00
<b>HVO Total</b>	<b>54.9</b>	<b>319.05</b>
<b>Net Rehabilitation (Rehabilitation minus Rehabilitation Disturbance)</b>		
HVO Total (Rehab)	HVO Total (Rehab Disturbance)	HVO Total
156.40	95.9	60.50

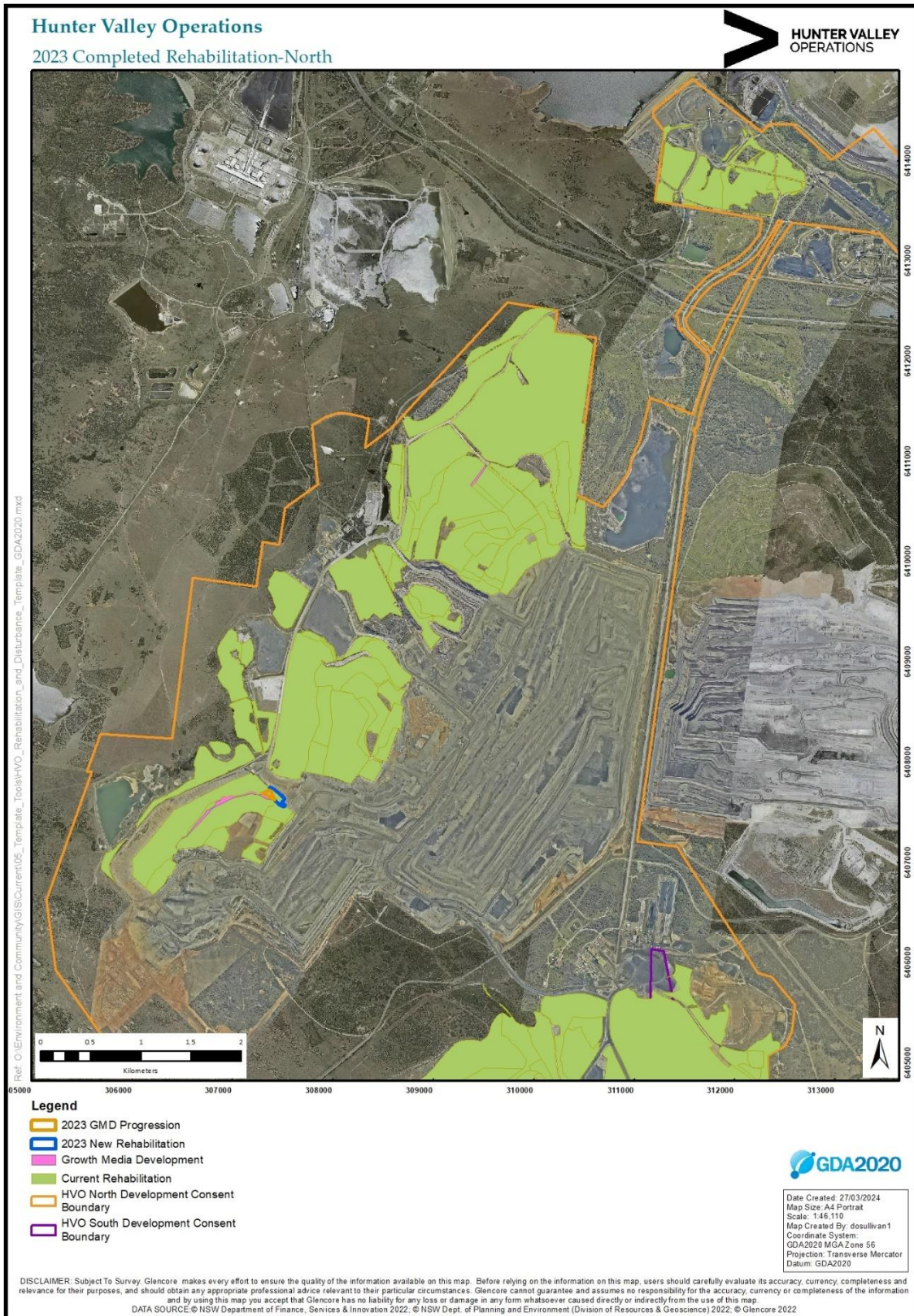


Figure 8-1: HVO Rehabilitation Areas - North.

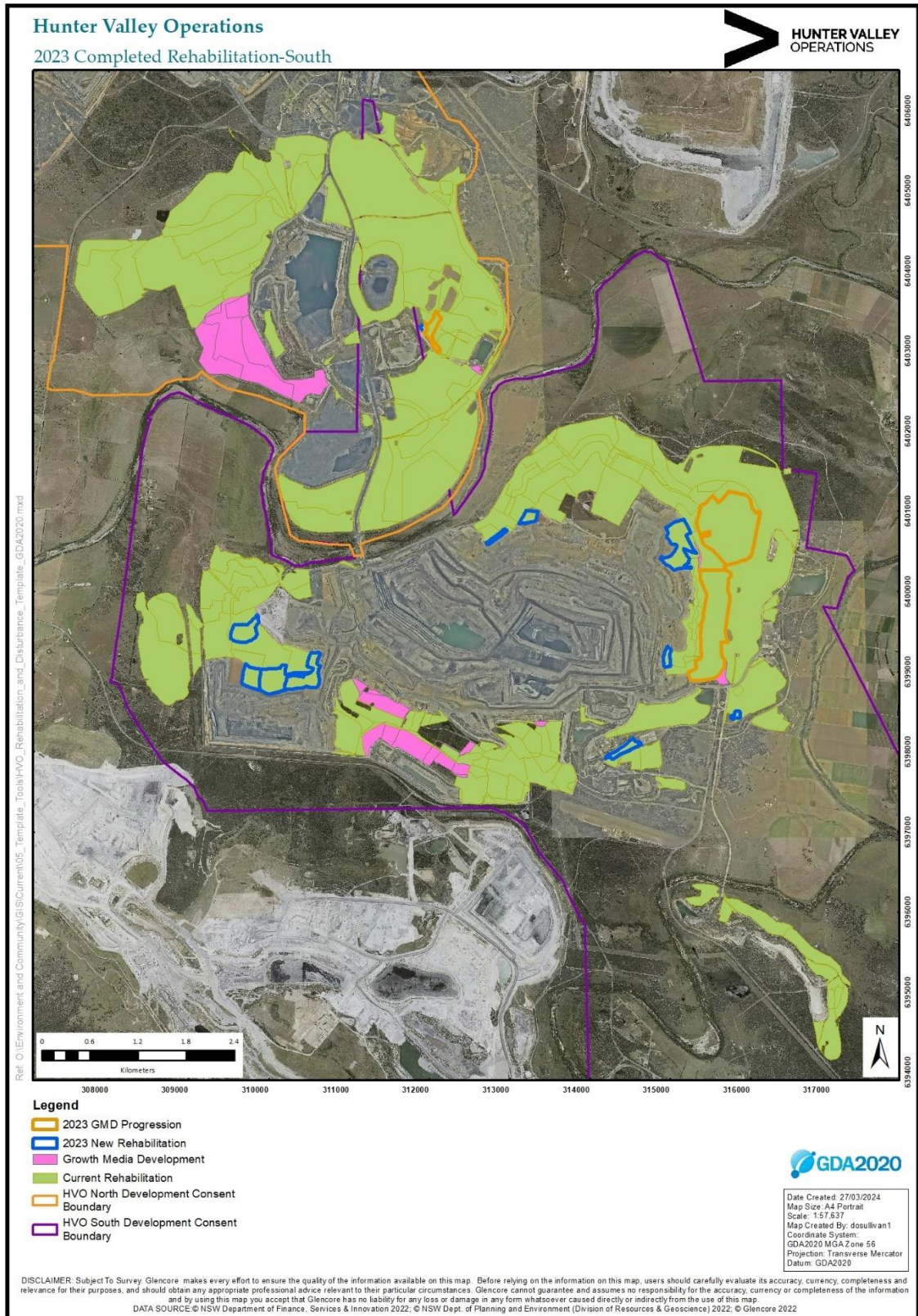
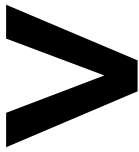
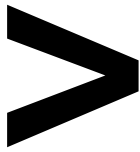


Figure 8-2: HVO Rehabilitation Areas – South



A comparison of rehabilitation progression against predictions in the *HVO West Pit Extension and Minor Modifications Environmental Impact Statement (EIS) (October 2003)* and subsequent modifications to the HVO North approval (DA 450-10-2003) indicates that rehabilitation progression is generally consistent with EIS predictions. Planning approval modifications that changed the rate of rehabilitation progression at HVO North include: Carrington East Extension (Modification 2 - 2006); Carrington Out-of-Pit TSF (Modification 4 - 2014); and Carrington In-Pit TSF (Modification 6 - 2014). When the modifications listed above are taken into account the EIS projection for cumulative rehabilitation area at the end of 2018 was 1,766.9 hectares. The EIS projection for average annual rehabilitation between 2018 (Year 14) and 2024 (Year 20) is 26.2 hectares hence projected rehabilitation at the end of 2023 was 1,924.10 hectares. Land under active rehabilitation at HVO North at the end of 2023 totalled 1,710.91 hectares. A further 92.18 hectares are classified as within growth medium development phase representing a total rehabilitation management footprint at end of 2023 of 1,803.09 hectares. Although this is below EIS predictions 33 ha of new rehabilitation and 88.5 ha of GMD is forecast in HVO North for 2024. Rate of mining progression in HVO North is slower than forecast in the EIS and effects areas available for rehabilitation.

As at the end of 2023, rehabilitation progress for HVO South is consistent with the predictions in the HVO South Coal Project Environmental Assessment Report (January 2008), although with similar considerations to HVO North with respect to current rehabilitation phase classifications. EIS rehabilitation progression at the end of 2023 shows 956 hectares of rehabilitation completed. Land under active rehabilitation at the end of 2023 was 1,093.00 hectares in association with 46.51 hectares in growth medium development phase. Total rehabilitation management footprint at end 2023 is therefore 1,139.51 hectares and consistent with EIS progression to the end of Stage 1.





### 8.4 | REHABILITATION PROGRAMME VARIATIONS

The 2023 variations to the rehabilitation programme are summarised in **Table 8-4**.

*Table 8-4: Variations to the Rehabilitation Program in 2023*

FWP	Has rehabilitation work proceeded generally in accordance with the conditions of an accepted Rehabilitation Management Plan?	Comment
HVO South	Yes	<p>HVO South net rehabilitation (net rehabilitation = rehabilitation minus – rehabilitation disturbance) completed during period 2023 was 133.26.</p> <p>HVO North net rehabilitation (net rehabilitation = rehabilitation minus – rehabilitation disturbance) completed during period 2023 was -137.66.</p> <p>Both areas have progressed ahead of FWP/RMP forecasts due to additional GMD being completed, as well as new disturbance being delayed (54.9 ha completed against a FWP plan of 319ha)</p>
HVO North	Yes	<p><b>Historic rehabilitation</b></p> <p>Following receipt of a Section 240 notice issued 18/7/19 from the Resources Regulator, rehabilitation in the GMD phase that was only sown with a cover crop was re-classified from completed to temporary rehab. HVO has since commenced a program of re-sowing these areas with its final cover.</p> <p>During 2023, 94.23 ha of GMD was progressed to final cover in HVO South , and 4.4 ha was progressed in HVO North.</p>

### 8.5 | REHABILITATION TRIALS

No rehabilitation trials were conducted during 2023.



### 8.6 | KEY ISSUES THAT MAY AFFECT REHABILITATION

HVO has conducted several risk assessments relating to rehabilitation, including during the preparation of the RMP to identify the main risks to rehabilitation establishment. The key risks to rehabilitation at HVO include:

- Exotic weeds;
- Having insufficient biological resources (topsoil, vegetation, seeds etc);
- Weather and climatic influences (high rainfall or extended dry conditions); and
- Erosion and sedimentation.

These key risks have been addressed in a rehabilitation Trigger Action Response Plan (TARP) within the HVO RMP. The TARP identifies the required management actions in the event of impacts to rehabilitation, or where rehabilitation outcomes are not achieved in an acceptable timeframe. An assessment of the 2023 rehabilitation monitoring results against the TARP is included in **Section 8.7**.

### 8.7 | REHABILITATION MONITORING

HVO adopted the revised GCAA rehabilitation monitoring program to monitor rehabilitation areas and trajectory towards meeting the rehabilitation objectives and performance and closure criteria. The monitoring framework comprises Initial Establishment Monitoring (IEM) and Long Term Monitoring (LTM) depending upon the age of the rehabilitation area. Additionally, a walkover assessment is completed whereby the full extent of each monitoring block included in the annual program is assessed for maintenance requirements.

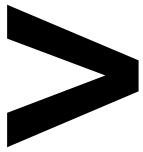
IEM is a rapid style assessment of young ( $\leq 3$  years old) rehabilitated areas, principally to determine germination success and landform stability, and describes differing methods for HVO’s key final land uses of grazing and non-specific woodland.

LTM utilises the Biodiversity Assessment Methodology (BAM) to compare rehabilitation areas with analogue site results. The objective of the LTM program (areas  $\geq 4$  years old) is to evaluate progress of rehabilitation towards fulfilling completion criteria and, ultimately, the targeted post-mining land use. Like methods apply for LTM of both rehabilitation and reference monitoring sites.

Monitoring during 2023 represented a continuation of this ecological monitoring program adopted during 2020. During the 2023 monitoring, 118 sites were monitored and these comprised:

- 30 IEM Non-specific Woodland sites;
- 35 LTM Non-specific Woodland sites;
- 24 IEM Pasture sites; and
- 29 LTM Pasture sites.

The results of the annual rehabilitation monitoring, combined with the annual walkover, are utilised to assess rehabilitation performance against the sites closure criteria, the RMP TARP and GCAA’s Rehabilitation Report Card. An overview of TARP triggers and closure criteria performance are presented in this section.



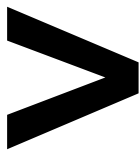
**8.7.1 | IEM PASTURE RESULTS**

The newly established pasture rehabilitation sites generally recorded a high ground cover percentage (average of 69%) with only minor rilling or sheet erosion being observed. Preferred pastures species cover averaged 67%, whilst priority weed cover ranged from 0-11% (average 3%). Overall the priority weed cover in the IEM pasture sites decreased from 2022 (average 12.7%) which is attributed to early intervention (maintenance) of juvenile pasture rehabilitation areas.

An assessment of IEM pasture rehabilitation blocks against the RMP TARP triggers is presented in **Table 8-5**.

*Table 8-5: Assessment of IEM Pasture Monitoring Blocks against RMP TARP*

Block Code	Erosion Control	Surface Cover	Species Composition	Weeds
HVOCAR20210101	Green	Green	Amber	Green
HVOCAR20210102	Green	Green	Green	Green
HVOCAR20210103	Green	Green	Green	Green
HVOCAR20220201	Green	Green	Green	Green
HVOCAR20220202	Green	Green	Green	Green
HVOCAR20220203	Green	Red	Red	Green
HVOCAR20220301	Green	Red	Amber	Green
HVOCAR20220302	Green	Red	Amber	Green
HVOCAR20220303	Green	Red	Red	Green
HVOCAR20220401	Green	Amber	Green	Green
HVOCAR20220402	Green	Red	Green	Green
HVOCAR20220403	Green	Red	Green	Green
HVOWES20210101	Green	Green	Green	Green
HVOWES20210102	Green	Green	Green	Green
HVOWES20210201	Green	Amber	Green	Green
HVOWES20210202	Green	Green	Red	Green
HVOWES20210203	Green	Green	Amber	Green
HVOWES20220201	Green	Green	Amber	Green
HVOWES20220202	Green	Green	Amber	Green
HVOWES20220203	Green	Green	Amber	Green
HVOWES20220204	Green	Green	Amber	Green
HVOWIL20220101	Green	Green	Amber	Green
HVOWIL20220102	Green	Green	Amber	Green
HVOWIL20220103	Green	Green	Green	Green



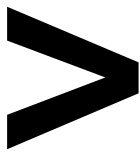
**8.7.2 | LTM PASTURE RESULTS**

The LTM pasture rehabilitation blocks exhibited a higher ground cover percentage (averaged 94%), along with improved pastured composition (averaged 65%) and priority weed species ranged from 0-25% (average 6.1%). Pasture biomass ranged from 0– 2710 kg DM/ha. Only minor rilling or sheet erosion was observed in these blocks, similar to the IEM sites.

An assessment of LTM pasture rehabilitation blocks against the RMP TARP triggers is presented in **Table 8-6**.

*Table 8-6: Assessment of LTM Pasture Monitoring Blocks against RMP TARP*

Block Code	Erosion Control	Surface Cover	Species Composition	Weeds
HVOALL20000101	Green	Green	Amber	Green
HVOALL20000102	Green	Green	Green	Green
HVOALL20000103	Green	Green	Green	Green
HVOALL20000104	Green	Green	Green	Green
HVOALL20000105	Green	Green	Amber	Green
HVOALL20000106	Green	Green	Amber	Green
HVOCHE20010701	Green	Green	Amber	Green
HVOCHE20010702	Green	Green	Amber	Green
HVOCHE20010703	Green	Green	Amber	Green
HVOCHE20010704	Green	Green	Amber	Green
HVOCHE20010705	Green	Green	Green	Green
HVOCHE20010706	Green	Green	Amber	Green
HVORIV20170101	Green	Green	Amber	Amber
HVORIV20170201	Green	Green	Amber	Green
HVORIV20170202	Green	Green	Amber	Green
HVORIV20170601	Green	Green	Green	Green
HVOWES19990101	Green	Green	Green	Green
HVOWES19990102	Green	Green	Amber	Green
HVOWES19990103	Green	Green	Green	Green
HVIWES20000101	Green	Green	Amber	Green
HVOWES20000102	Green	Green	Green	Green
HVOWES20000103	Green	Green	Amber	Green
HVOWES20000104	Green	Green	Green	Green
HVOWES20000805	Green	Green	Amber	Green
HVOWES20000806	Green	Green	Green	Green
HVOWES20000807	Green	Green	Green	Green
HVOWES20000808	Green	Green	Amber	Green
HVOWES20000810	Green	Green	Amber	Green
HVOWES20140101	Green	Green	Amber	Amber



**8.7.3 | IEM WOODLAND RESULTS**

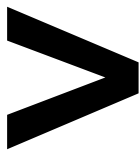
Observations from the LTM non-specific native vegetation rehabilitation blocks include:

- Erosion was relatively low across all sites, with most sites recording only minor rills or sheeting (<100mm). There were 8 sites that had riling between 100m-300mm.
- Percentage of bare ground ranged from 0 to 60%
- The total priority weed cover ranged from 0.1 to 81%;
- Native species richness ranged from 60 to 94%; and
- Tree stem density ranged from 0 to 1,175.

An assessment of IEM non-specific native vegetation rehabilitation blocks against the RMP TARP triggers is presented in **Table 8-7**.

*Table 8-7: Assessment of IEM Non-specific Native Vegetation Monitoring Blocks against RMP TARP*

Block Code	Erosion Control	Surface Cover	Species Composition	Weeds
HVOCAR20210101	Green	Green	Green	Green
HVOCAR20210102	Green	Green	Green	Red
HVOCAR20210103	Green	Green	Green	Amber
HVOCHE20210101	Green	Green	Green	Green
HVOCHE20210102	Green	Green	Green	Green
HVOCHE20210103	Green	Green	Green	Green
HVOCHE20210201	Green	Green	Green	Green
HVOCHE20210202	Amber	Amber	Green	Green
HVOCHE20210301	Green	Green	Green	Amber
HVOCHE20210302	Green	Green	Amber	Green
HVOCHE20210303	Green	Green	Green	Green
HVOCHE20220101	Amber	Green	Amber	Green
HVOCHE20220102	Green	Green	Green	Red
HVOCHE20220103	Amber	Amber	Amber	Green
HVOCHE20220301	Amber	Green	Green	Green
HVOCHE20220302	Amber	Green	Green	Green
HVOCHE20220303	Amber	Green	Green	Green
HVORIV20200101	Green	Green	Green	Green
HVORIV20220201	Green	Amber	Amber	Green
HVORIV20220202	Green	Amber	Green	Green
HVORIV20220203	Green	Amber	Green	Green
HVORIV20220301	Green	Green	Green	Green
HVORIV20220302	Green	Green	Green	Green



Block Code	Erosion Control	Surface Cover	Species Composition	Weeds
HVORIV20220303	Green	Green	Green	Green
HVOWES20210401	Green	Green	Green	Red
HVOWES20210402	Green	Green	Green	Amber
HVOWES20210403	Green	Green	Green	Amber
HVOWES20220101	Amber	Amber	Green	Green
HVOWES20220102	Amber	Amber	Green	Green
HVOWES20220102	Green	Amber	Green	Green

### 8.7.4 | LTM WOODLAND RESULTS

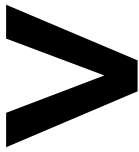
Observations from the LTM non-specific native vegetation rehabilitation blocks include:

- Erosion was relatively low across all sites, with most sites recording only minor rills or sheeting (<10 cm) with one site having rill 100mm – 300mm
- Percent bare ground ranged from 0 to 30%;
- The total priority weed cover ranged from 1.1 to 96.10%
- Native species richness ranged from 60% to 92.30%
- Tree stem density ranged from 0 to 1,550 stem/ha; and
- Canopy cover ranged from 0 to 60%.

An assessment of LTM non-specific native vegetation rehabilitation blocks against the RMP TARP triggers is presented in **Table 8-8**.

Table 8-8: Assessment of LTM Non-Specific Native Vegetation Monitoring Blocks Against RMP TARP

Block Code	Erosion Control	Surface Cover	Species Composition	Weeds	Habitat Corridors
HVOCHE20180201	Green	Green	Green	Amber	Amber
HVOCHE20180202	Green	Green	Green	Green	Amber
HVOLEM20030101	Green	Green	Green	Red	Green
HVOLEM20030102	Green	Green	Amber	Green	Green
HVOLEM20030103	Green	Green	Green	Green	Green
HVOLEM20150101	Green	Green	Amber	Red	Amber
HVOLEM20150102	Green	Green	Green	Green	Amber
HVOLEM20150103	Green	Green	Green	Green	Amber
HVOLEM20150104	Green	Green	Green	Green	Green
HVOLEM20160101	Green	Green	Green	Green	Green
HVORIV20180201	Green	Green	Green	Red	Amber
HVORIV20180202	Green	Green	Green	Red	Amber
HVORIV20180203	Green	Green	Green	Amber	Amber



Block Code	Erosion Control	Surface Cover	Species Composition	Weeds	Habitat Corridors
HVORIV20180205	Green	Green	Green	Amber	Amber
HVORIV20180403	Green	Green	Amber	Red	Amber
HVORIV20180404	Green	Green	Amber	Red	Amber
HVORIV20180405	Green	Green	Green	Green	Amber
HVORIV20180406	Green	Green	Green	Green	Amber
HVORIV20191201	Green	Green	Green	Amber	Amber
HVORIV20191202	Green	Green	Green	Red	Amber
HVORIV20191203	Green	Green	Green	Amber	Amber
HVOWES20000201	Green	Green	Green	Red	Amber
HVOWES20000202	Green	Green	Amber	Red	Amber
HVOWES20000203	Green	Green	Amber	Red	Amber
HVOWES20000801	Green	Green	Amber	Red	Amber
HVOWES20000809	Green	Amber	Amber	Amber	Amber
HVOWES20010303	Green	Green	Green	Amber	Amber
HVOWES20010304	Green	Green	Green	Red	Amber
HVOWES20160501	Green	Green	Green	Red	Amber
HVOWES20160502	Green	Green	Green	Green	Amber
HVOWES20160503	Amber	Amber	Green	Green	Amber
HVOWES20170201	Green	Green	Green	Amber	Amber
HVOWES20170301	Green	Green	Green	Amber	Amber
HVOWES20170302	Green	Green	Green	Amber	Amber
HVOWES20170303	Green	Green	Green	Green	Amber

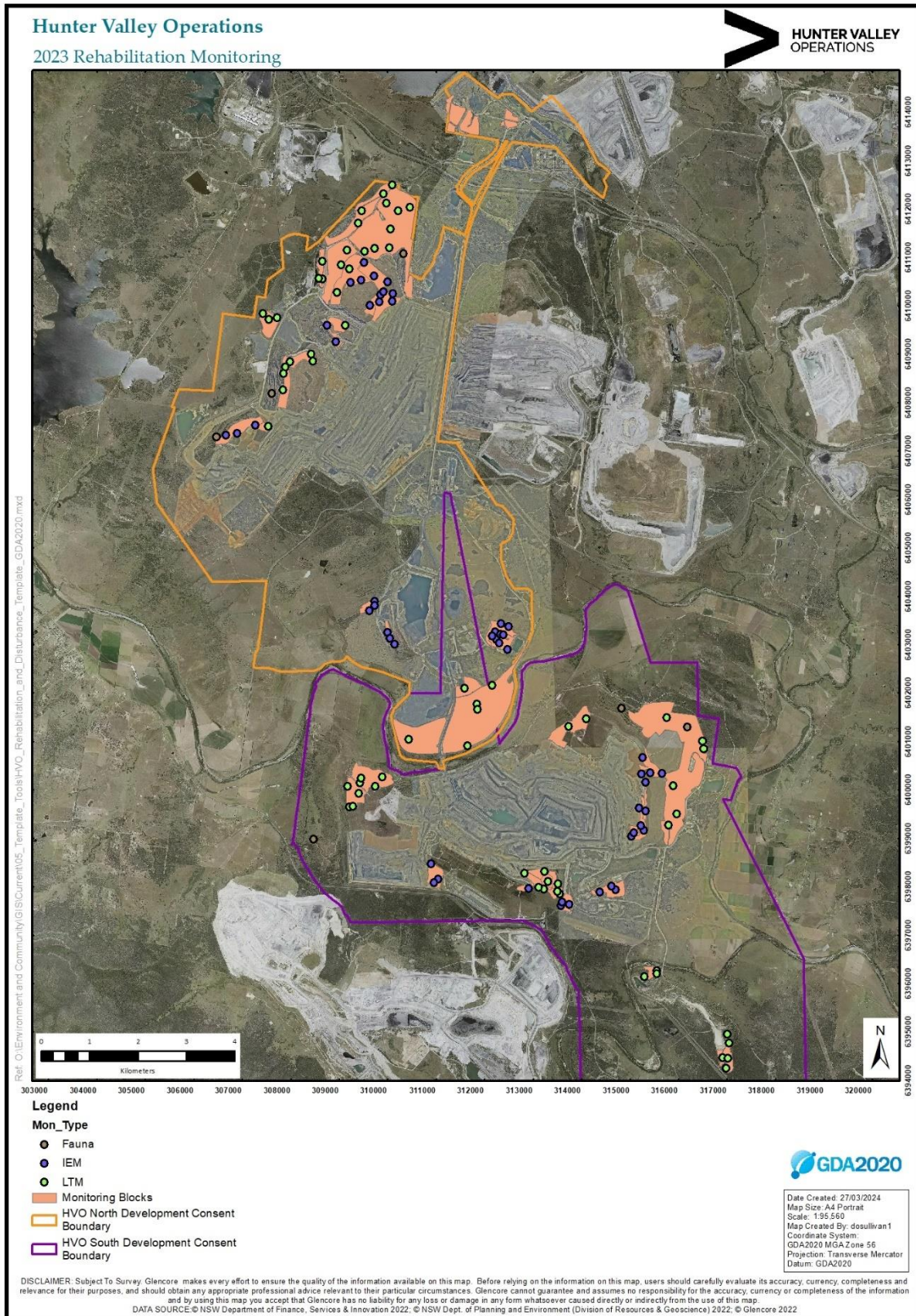


Figure 8-3: Overview of 2023 Rehabilitation Monitoring Locations





## 8.8 | OVERVIEW OF REHABILITATION TRAJECTORY

The objective of rehabilitation monitoring is to assess the progression of rehabilitation areas towards relevant criteria and commitments and to facilitate continuous improvements in rehabilitation practices.

In line with the GCAA's Rehabilitation Report Card, performance against key rehabilitation metrics was assessed for each rehabilitation polygon. Each polygon is assigned one of four performance rankings as per the criteria in **Table 8-9**.

Table 8-9: GCAA Rehabilitation Report Card Criteria

Category	Criteria
Rework	<ul style="list-style-type: none"> <li>Does not meet completion criteria.</li> <li>Extensive rework required that would not typically form part of a rehabilitation maintenance program; e.g. slopes do not comply with approval requirements, large bare areas &gt;0.1ha, very severe and widespread erosion, etc.</li> <li>TARP condition red.</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>Does not meet completion criteria.</li> <li>Routine rehabilitation maintenance works required (e.g. weed control, infill seeding/plantings, repair of minor erosion, fertiliser application).</li> <li>TARP Condition Amber.</li> </ul>
Monitor	<ul style="list-style-type: none"> <li>Trending towards completion criteria but does not meet all criteria.</li> <li>No intervention required other than ongoing routine land management, but continued monitoring required (e.g. ecologically young areas, variable results).</li> <li>TARP condition Green.</li> </ul>
Acceptable	<ul style="list-style-type: none"> <li>Rehabilitation objectives and completion criteria are generally met, and the area is ready for sign off by regulators.</li> <li>Routine management and monitoring should be continued to maintain status until relinquishment process is sought.</li> <li>TARP Condition Green.</li> </ul>

A summary of rehabilitation performance as determined through rehabilitation monitoring during 2023 is shown in **Figure 8-4**.

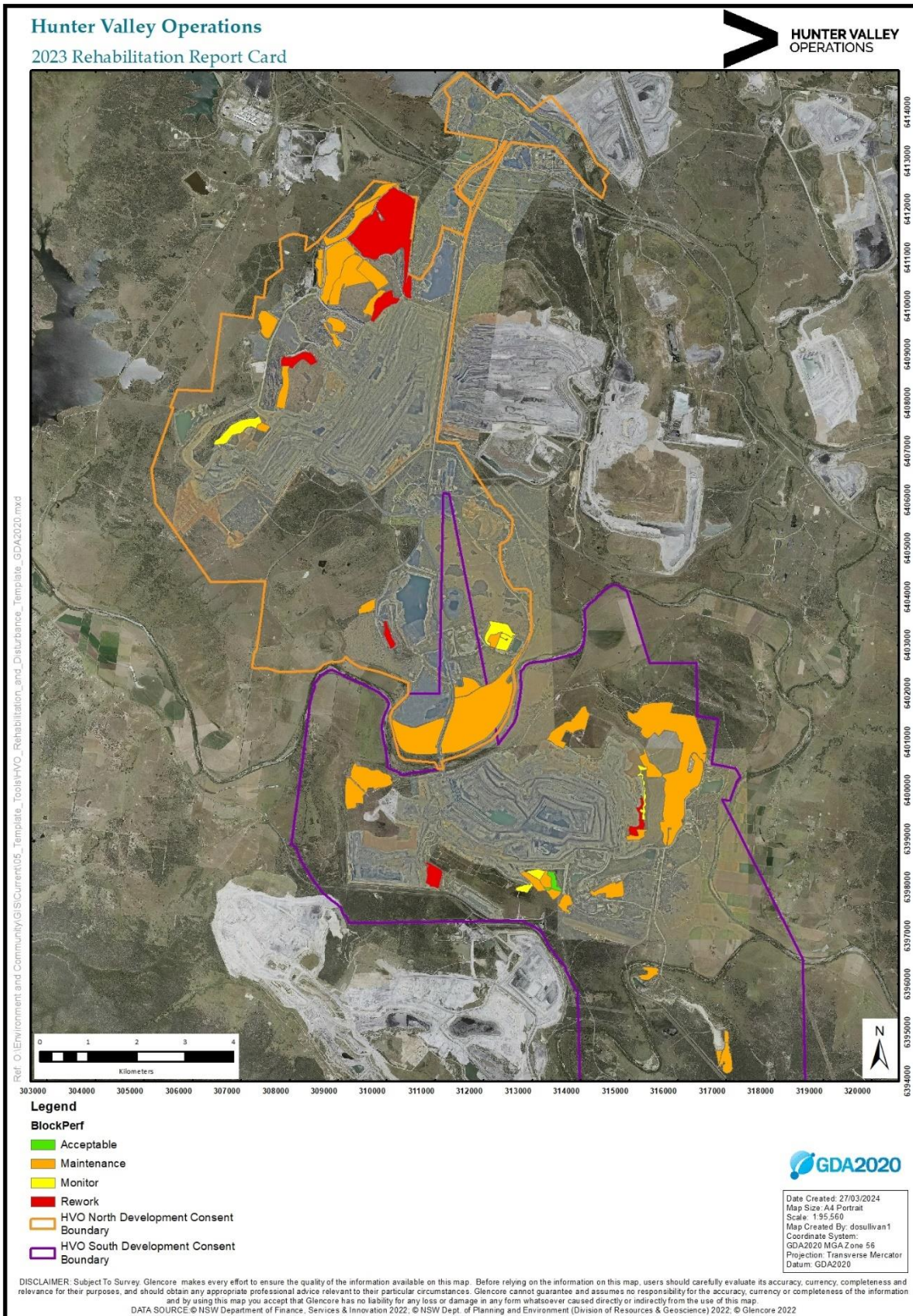


Figure 8-4: Overview of Rehabilitation Monitoring Performance Trajectory

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## 8.9 | REHABILITATION MAINTENANCE

Management of rehabilitated areas is undertaken proactively to assist in initial establishment and when issues are identified through monitoring, auditing or inspections.

An overview of key rehabilitation maintenance activities is shown in **Figure 8-4** and detailed below.

### 8.9.1 | SECTION 240 MAINTENANCE PROGRAM

In July 2019 the DP&E – Resources Regulator issued HVO with Notice 3259 under Section 240(1)(c) of the Mining Act (1992) (Section 240 Improvement Notice) requiring HVO to outline measures or actions to improve progressive rehabilitation performance across the site. This follows an earlier similar notice received during 2018 which was limited to 12 initial sites of concern. In response to these notices HVO has developed and committed to a rehabilitation maintenance and improvement program across the site as detailed in Appendix C (the s240 Maintenance Plan). This plan integrates and prioritises rehabilitation maintenance activities across the site to progress areas of rehabilitation initially sown to cover crop, manage weed competition, and encourage vegetation establishment. An overview of work from the plan undertaken during 2023 is presented in **Figure 8-7**, in addition to being detailed further below.

### 8.9.2 | WEED CONTROL

Broadacre weed treatment within rehabilitation areas is undertaken using agricultural methods comprising boom sprays, wick wipers and slasher/mulchers. In existing rehabilitation areas boom spraying is primarily used to manage cover crop and fallow areas prior to sowing to final native seed mixes. Pre-emergent application of herbicide is used when appropriate and necessary to control emerging weeds in the period between sowing and germination of the desired species. Wick wiping targets rapidly growing exotic grasses and other erect growing weeds in the period following native germination while desirable species remain below the wiper target zone. Slashing and mulching is also used to remove rank pasture grasses and stimulate fresh growth. In 2023, HVO completed a target campaign to mulch Acacia Saligna with 8.7ha of thick Acacia Saligna mulched using a forestry mulcher which can be seen below in **Figure 8-5**. This campaign will continue to be implemented in 2024.

Hand spraying and manual removal of weeds is undertaken in rehabilitation areas with early stage and establishing native vegetation that would be likely to be damaged or destroyed should broadacre methods be used.

During 2023 rehabilitation blocks totalling 374ha were boom sprayed, wick wiped, slashed/mulched or spot sprayed. The key weed species targeted in 2023 maintenance works were galenia (*Galenia pubescens*), Saligna (*Acacia saligna*), Blue Heliotrope (*Heliotropium amplexicaule*) Rhodes grass (*Chloris gayana*) and mustard weed (*Brassica juncea*).



Figure 8-5: Mulching of Acacia Saligna at HVORIV202002

8.9.3 | EROSION REPAIRS

Drainage structures such as contour banks, drop structures and sediment dams are largely functioning as designed and require little to no maintenance, particularly in more recently established rehabilitation areas. Erosion repairs were conducted across the site in 2023 in line with the annual rehabilitation maintenance plan including drainage repair, contour re shaping and desilting. An example of contour repair conducted at HVO WES202201 is provided in Figure 8-6.

Coir logs are also placed in new rehabilitation areas as required to limit erosion in early-stage rehabilitation and sediment and erosion plans developed for individual rehabilitation areas as required.

The 2023 Annual Walkover and Ecological monitoring reports identified some contour failures in historical areas which had mainly stabilised, along with some minor rilling and gulying in newer rehabilitation areas. These have been prioritised and incorporated into HVO’s detailed rehabilitation maintenance plan.

In response to S240 notices NTCE 0009902 and NTCE 0009942 covering contour bank failure, tunnelling and gulying on HVO’s Western Out of Pit (WOOP) emplacement HVO finalised a remediation plan for the area in consultation with Local Land Services in 2023. This remediation plan includes a detailed water management design and contour repair plan to ensure long term stability of the area. The tender for execution of these works has been awarded and works are due to be complete in June 2024, subject to landowner approvals.



Figure 8-6: Erosion repair at HVOWES202201

### 8.9.4 | GRAZING OF REHABILITATION AREAS

Grazing of rehabilitation areas is utilised to encourage and maintain pasture diversity, encourage nutrient cycling, and assist in fuel load management. A licence agreement is in place for grazing 666ha of HVO North rehabilitation area, with temporary fuel load licences across a further 394ha of rehabilitated land around HVO North and 210ha around HVO South. Opportunities to integrate grazing to assist rehabilitation progression continues to be assessed.

In 2023, HVO undertook an assessment of the Alluvial Lands Rehabilitation Area which included engaging an agronomist to undertake a land capability assessment and complete gap analysis to understand what is needed for the site to reach relevant completion criteria. Outcomes from this gap analysis will begin to be implemented during 2024 including developing a drainage and cropping plan for the area.

### 8.9.5 | VEGETATION ENHANCEMENT

In addition to the progression of GMD areas throughout the year, HVO undertakes regular re-seeding and planting of tube-stock in rehabilitation areas that have been identified as failing or requiring additional species diversity. The need for these interventions, and the most appropriate method, are identified during the Annual Walkover, Ecological monitoring and internal monthly inspection of rehabilitation areas. During 2023, erosion repairs were re-seeded and no tube-stock planting occurred.

### 8.9.6 | TOPSOIL MANAGEMENT

Prior to topsoil stripping occurring, soil profiling and testing is completed to understand amelioration required and topsoil stripping depth. If possible, topsoil is directly placed on rehabilitation areas. If this cannot occur the soil is placed in a topsoil stockpile, where it is shaped and seeded with a target species for its intended land use (pasture/woodland).

Regular inspections of topsoil stockpiles are completed to identify required maintenance activities. An annual inspection of HVO topsoil stockpiles was completed in 2023 which identified a number of maintenance works including weed control, mulching and re-seeding (if weed species have dominated). These maintenance activities will be completed as part of the 2024 rehabilitation maintenance plan.

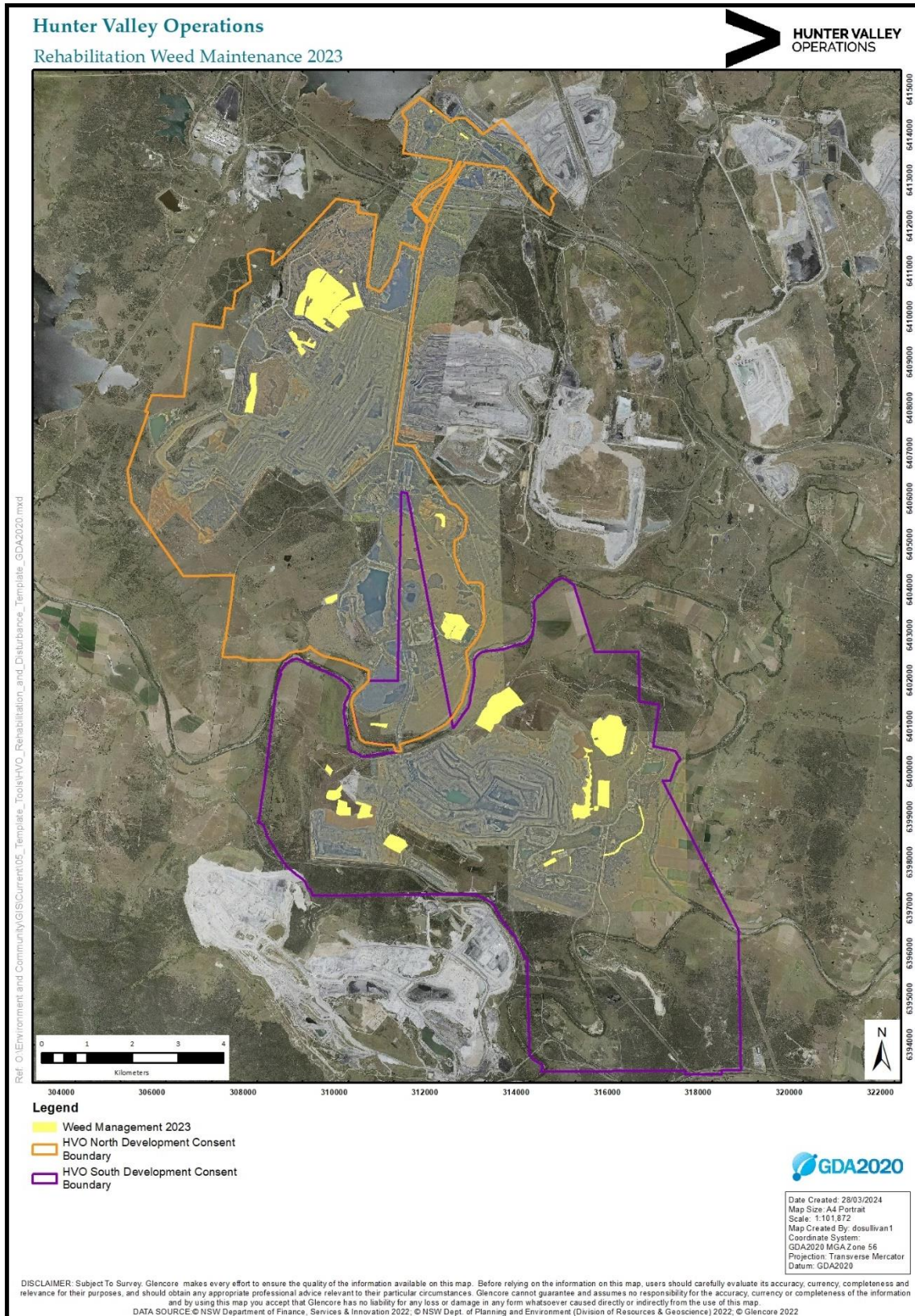


Figure 8-7: Weed Management Activities Conducted in 2023



**8.10 | VERTEBRATE PEST MANAGEMENT**

A number of baiting programs are carried out on a seasonal basis as part of the HVO Vertebrate Pest Action Plan. These programs are conducted at a level of frequency designed to disrupt pest species breeding/colonisation cycles and employ a variety of methodologies including baiting, trapping and ground based shooting.

**8.10.1 | WILD DOG AND FOX BAITING PROGRAMS**

Three 1080 ground baiting programmes targeting wild dogs and foxes were implemented across operational and biodiversity areas. These were undertaken during summer, winter, and spring. Each programme consisted of approximately 60 bait sites utilising meat and ejector baits. Baits were checked over a three week period and replaced each week when taken. The winter and spring baiting programmes were synchronised to coincide with neighbouring mine operations programs, with the timing of these events coordinated with and by Hunter Local Land Services.

**8.10.2 | PIG TRAPPING AND BAITING**

One pig baiting program using Sodium Nitrite ‘Hoggone’ baiting systems was implemented at HVO during Autumn. The program resulted in 31 pigs being controlled across 5 bait stations. An additional 88 pigs were controlled by rural licensees using a combination of pig traps, shooting and ‘Hoggone’ baiting systems on buffer properties over the course of the year. The programs undertaken throughout the year resulted in 119 pigs being controlled.

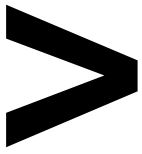
**8.10.3 | GROUND BASED SHOOTING**

HVO has three shooters attending the site on a regular basis opportunistically controlling feral pest species. Feral species controlled include pigs, wild dogs, foxes, hares/ rabbits, deer, and cats.

**Table 8-10** summarises the results from the programmes carried out at HVO during 2023 with wild dog and fox baiting locations and results for the programs illustrated in **Figure 8-8** to **Figure 8-11**.

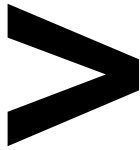
*Table 8-10: Summary of Vertebrate Pest Management 2023*

	1080 Baiting		Takes by Fox	Hoggone Baiting	Trapping		Shooting			
	Total Lethal Baits Laid	Takes by Wild Dog		Takes by Feral Pig	Wild Dog	Feral Pig	Feral Pig	Wild Dog/Fox	Feral Cat	Hares & Rabbits
Summer	116	44	10	0	0	15	0	0	0	0
Autumn-Winter	120	54	7	31	0	16	18	0	0	0
Spring	204	22	39	14	0	0	15	0	0	0
<b>Total</b>	<b>440</b>	<b>120</b>	<b>56</b>	<b>45</b>	<b>0</b>	<b>31</b>	<b>33</b>	<b>0</b>	<b>0</b>	<b>0</b>



**Table 8-11** provides a comparison of results from the last 22 baiting programmes undertaken at HVO. Results reported indicate the majority of takes by dogs or foxes. Sighting reports also confirm that a high number of wild dogs rapidly re infiltrate the area after programs complete. The number of takes by dogs in spring has dropped (22 takes in spring compared to 54 in the autumn program), and by foxes has increased (39 in spring compared to 7 in autumn). The results validate recommendations by the current vertebrate pest control contractor to extend the length of baiting programs to catch new dogs entering the territory vacated by dogs terminated. Programs in 2024 will be extended by several weeks to see if this results in a greater proportion of dog takes in the latter weeks of the program.





# REPORT | 2023 ANNUAL ENVIRONMENTAL REVIEW

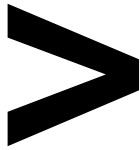
Table 8-11: Comparison of Results Between Baiting Programmes at HVO

Baiting Program	No of Baiting Sites	Baiting Opportunities	Baits taken by Dogs	Dog (%)	Baits Taken by Foxes	Fox (%)	Baits Taken by Non Target Species	Other (%)	Total No. of Baits Taken	No Sites Where Baits Taken At Least Once	Represented as Percentage (%)	No. Sites with Baits Taken on All Occasions	No. Sites With No Baits Taken	No. Baits Disturbed Not Taken	No. Baits Taken Alternatively by Dog or Fox	Baiting Efficiency %	Baiting Efficiency Excluding Other
1606 HVO	60	180	94	96%	4	4%	0	0	98	54	90%	10	6	6	4	54%	54%
1609 HVO	60	180	83	94%	5	6%	0	0%	88	49	82%	11	11	12	3	49%	49%
1702 HVO	59	117	58	84%	10	14.5%	1	1.5%	69	49	87%	20	11	7	5	59%	58%
1705 HVO	60	120	70	95%	4	5%	0	0%	74	51	85%	23	9	3	0	62%	62%
1709 HVO	60	120	67	96%	3	4%	0	0	70	48	80%	22	12	5	2	58%	58%
1803 HVO	60	120	69	90%	6	8%	2	2%	77	49	82%	31	11	7	0	64%	63%
1806 HVO	60	120	77	94%	5	6%	0	0%	82	50	83%	32	10	8	4	68%	68%
1809 HVO	61	122	73	87%	10	12%	1	1%	84	50	82%	34	11	2	6	69%	68%
1905 HVO	64	124	61	85%	10	14%	1	1%	72	50	78%	22	17	8	8	64%	63%
1910 HVO	60	120	66	93%	4	6%	1	1%	71	48	80%	23	12	9	2	59%	58%
2002 HVO	60	140	72	94%	4	5%	1	1%	77	48	80%	2	12	9	2	55%	54%
2005 HVO	60	118	44	71%	15	24%	3	5%	62	41	68%	21	19	12	6	53%	50%
2010 HVO	60	120	56	89%	4	6%	3	5%	63	43	72%	20	17	7	2	53%	50%

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Baiting Program	No of Baiting Sites	Baiting Opportunities	Baits taken by Dogs	Dog (%)	Baits Taken by Foxes	Fox (%)	Baits Taken by Non Target Species	Other (%)	Total No. of Baits Taken	No Sites Where Baits Taken At Least Once	Represented as Percentage (%)	No. Sites with Baits Taken on All Occasions	No. Sites With No Baits Taken	No. Baits Disturbed Not Taken	No. Baits Taken Alternatively by Dog or Fox	Baiting Efficiency %	Baiting Efficiency Excluding Other
2102 HVO	60	113	51	65%	16	21%	11	14%	78	53	80%	26	7	12	5	69%	59
2105 HVO	60	119	65	72%	16	18%	11	12%	90	55	92%	37	5	8	7	76%	66%
2110 HVO	63	119	47	61%	15	19%	15	19%	77	51	81%	26	12	4	5	65%	52%
2202 HVO	60	118	48	71%	7	10%	14	21%	68	46	77%	22	14	2	4	58%	46%
2205 HVO	60	119	48	74%	9	14%	8	12%	65	45	75%	20	15	2	6	55%	48%
2210 HVO	60	117	49	59%	6	9%	21	32%	66	45	75%	21	15	1	4	56%	38%
2302 HVO	60	116	44	51%	10	12%	32	37%	86	49	82%	36	11	5	3	74%	47%
2305 HVO	60	120	54	68%	7	9%	18	23%	79	52	87%	27	8	5	3	66%	51%
2310 HVO	55	204	22	32%	39	56%	8	12%	69	50	91%	5	8	8	*	34%	30%

\*Data no longer recorded

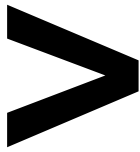


Figure 8-8: HVO Vertebrate Pest Management Bait Locations – Summer 2023

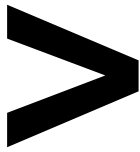


Figure 8-9: HVO Vertebrate Pest Management Bait Locations – Autumn 2023

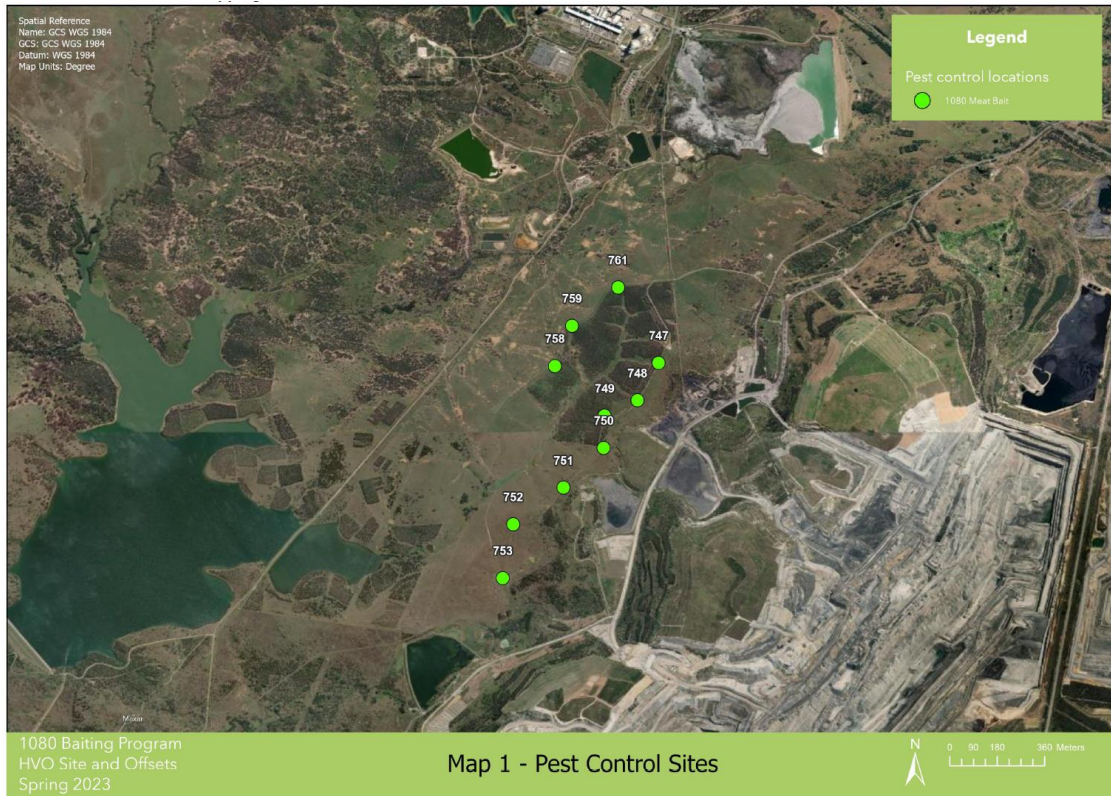
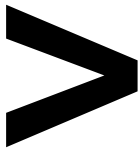


Figure 8-10: HVO Vertebrate Pest Management Spring 2023 Howick Bait Locations



Figure 8-11: HVO Vertebrate Pest Management Spring 2023 Wandewoi and Carrington Bait Locations

## 8.11 | RENOVATIONS

No renovations were completed in 2023.

### 8.11.1 | DERELICT RURAL BUILDINGS

HVO did not demolish any derelict rural buildings located within its rural property portfolio in 2023.

## 8.12 | TAILINGS MANAGEMENT

- Key tailings management activities in 2023 included:
- Continued Secondary Flocculent dosage into Carrington In Pit TSF was made, to improve beaching;
- Temporary cessation of deposition into Dam 6W TSF has been extended, allowing time for consolidation prior to final top up deposition.
- Ongoing implementation of the North Void TSF Management Plan to manage and mitigate any potential impacts from an identified seepage pathway. Provision of quarterly and annual analysis reports to EPA; and
- Design of the first capping stages of Bob’s Dump completed; ready for implementation in 2024.

Table 8-12 outlines the current state of Tailings Storage Facilities across HVO that are still active or pending decommissioning.

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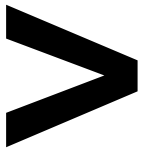
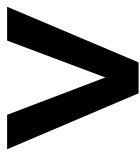


Table 8-12: HVO Tailings Storage Facilities

Facility	Status	Decant System
North Void	Inactive	Decant pumps in place, pumping as required.
Dam 6W	Inactive	Decant pumps in place, pumping as required.
Cumnock Void	Active	Decant pump in place, regular pumping when deposition occurring.
Bob's Dump	Inactive; preparation for decommissioning	Pump in place, pumping as required.
Southeast TSF	Decommissioned and rehabilitated	N/A
Central TSF	Inactive	No pumps required due to drying after rainfall (small catchment reporting to TSF).
Carrington In-pit TSF	Active	Decant pumps in place, regular pumping.



8.13 | RIVER RED GUM RESTORATION AND REHABILITATION

8.13.1 | RIVER RED GUM OVERVIEW

Eucalyptus camaldulensis (River Red Gum) populations have become increasingly rare and degraded in the Hunter Valley, and the entire population occurring within the Hunter catchment is now listed as an Endangered Population under the NSW Biodiversity Conservation Act 2016. There are a number of River Red Gum sites across HVO North and South. HVO manages the River Red Gum stands on lands that it owns in accordance with the HVO River Red Gum Restoration and Rehabilitation Strategy (Strategy) (HVO 2020) which is a compliance requirement under Sch 3, Condition 31 of DA 450-10-2003.

The sites at HVO have been categorised into a high level of management at the Carrington Billabong, intermediate level at the priority sites and low level at the low priority sites. Each level has been allocated varying amount of monitoring and maintenance as outlined in the Strategy.

As the site with the highest priority, the objectives of the monitoring program at Carrington Billabong are to:

- determine if there is any improvement or deterioration in RRG within Carrington Billabong
- determine if there is any improvement or deterioration of the natural habitat at Carrington Billabong
- provide management recommendations to achieve further improvements in the ecological management of the site to assist in the recovery of RRG and their habitat.
- remove any potential influence that mining activities at HVO may have on the population. The monitoring results are compared to a reference site to the north of HVO that is not within a mining area.

The locations of the River Red Gum stands at HVO are shown in **Figure 8-12**.

The Strategy has an established monitoring programme of the river red gum subpopulations and vegetation communities in Carrington Billabong and priority sites on the Hunter River and Wollombi Brook in HVO North and South. The Reference Site is located between Scone and Aberdeen (NSW).

Ecological monitoring occurred in 2023. The locations of the sampling points are shown in **Figure 8-13 to Figure 8-15**.

Above average rainfall in 2020 to 2022 following years of below average rainfall contributed to landscape scale change to environmental conditions. Flooding at Carrington Billabong and the Reference Site continued into 2023, however, by the middle of the year, flood waters had receded. The effects of sustained flooding were evident in the 2023 monitoring period, despite the absence of surface waters.

In previous years, tubestock plantings have been undertaken to reduce the linear influence of the billabong on the existing mature *E. camaldulensis*, and contribute towards the development of a vegetated corridor representing the Hunter Floodplain Red Gum Woodland community, connecting the Hunter River populations with the stands in the Billabong. Over time, the new plantings should offer some protection to the mature individuals from storm events and assist to reduce the competitive advantages of the annual weeds on recruiting native species.

The vast majority of the tubestock have survived through 2023 and are getting taller. Few losses have occurred due to native herbivore grazing, insects or other means.



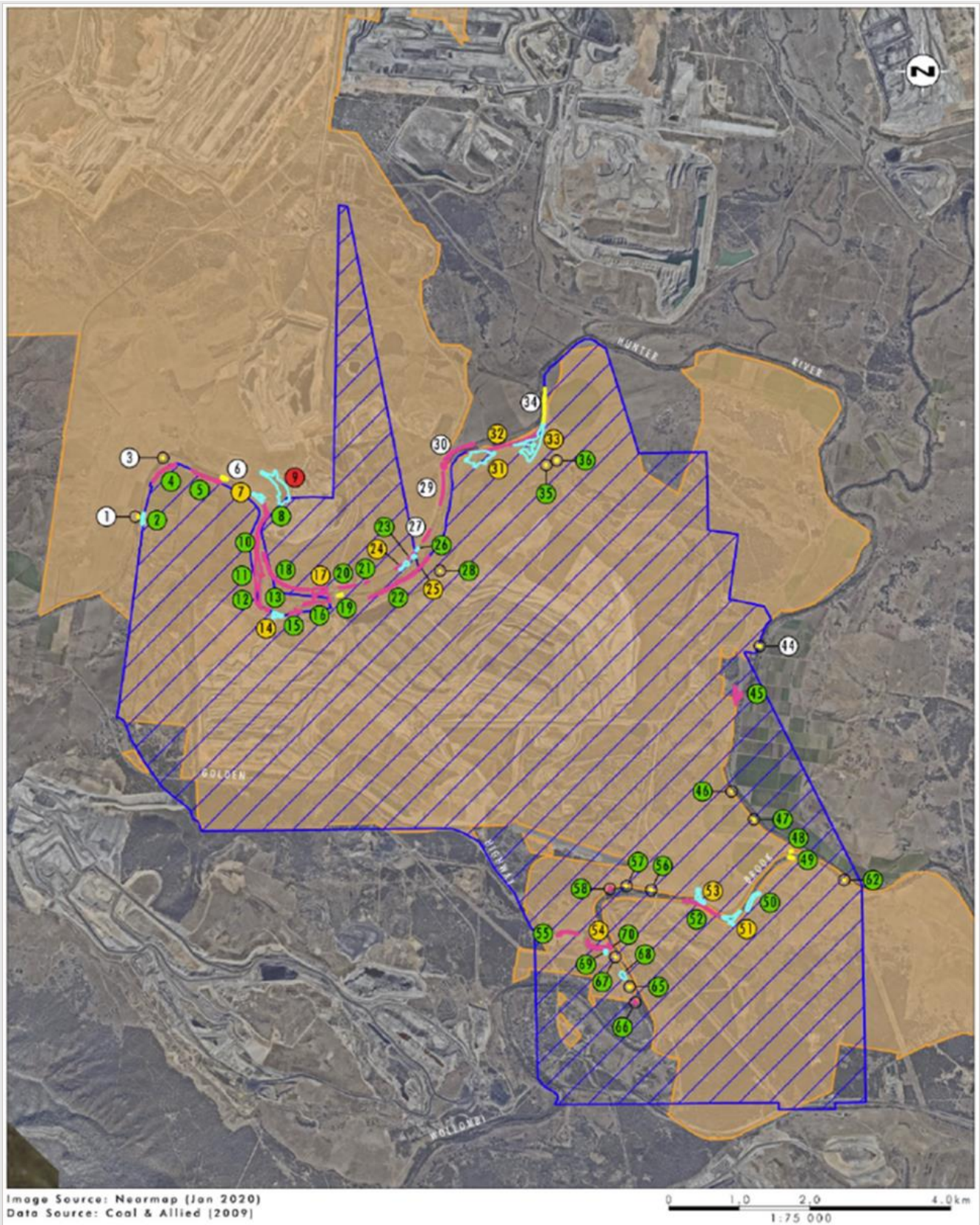


Figure 8-12: Eucalyptus camaldulensis stands being managed at HVO



Figure 8-13: *Eucalyptus camaldulensis* Monitoring Sites at Carrington Billabong



Figure 8-14: *Eucalyptus camaldulensis* Priority Site Monitoring Locations

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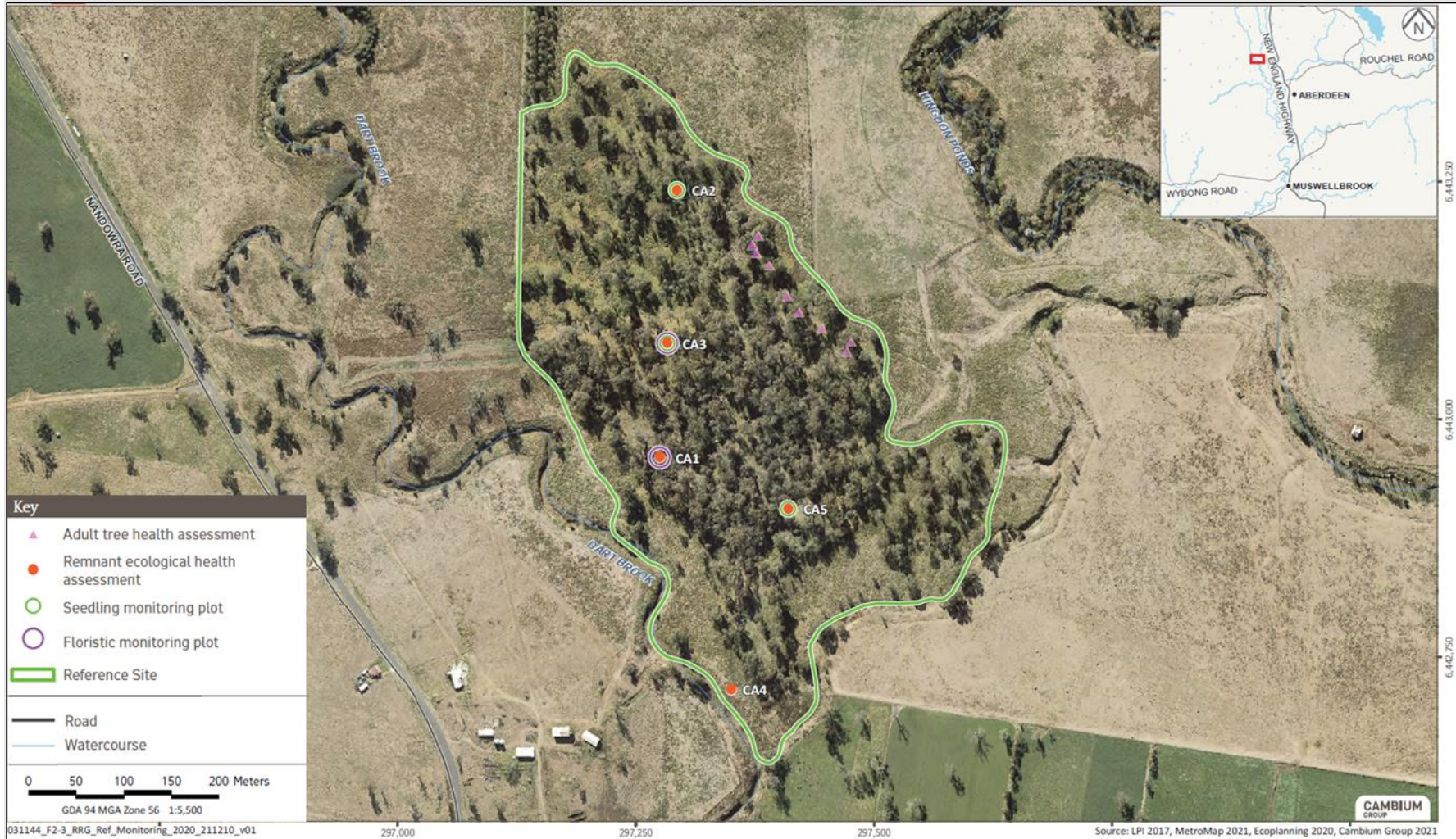
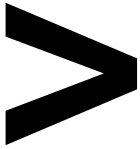
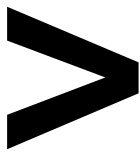


Figure 8-15: *Eucalyptus camaldulensis* Monitoring Locations at the Reference Sites



### 8.13.2 | RRG MONITORING ACTIVITIES

#### 8.13.2.1 | RAINFALL AND RECRUITMENT

With the decline in the La Nina weather patterns of previous years, the rainfall received in 2023 was below the average for HVO (**Figure 8-16**). The total rainfall for the year at HVO (Corp) was 459 mm, which was a large decrease on 2022.

A consequence of the decreased rainfall was a decline in the germination of both weed and native vegetation within remnant areas observed across site. Weed management was still required, but the widespread flush of particular species across broad areas did not occur as in previous years. This provided the opportunity for the tubestock plantings within the Billabong to further consolidate within the planted alluvial areas without the need to compete with taller weed species for light.

The flood waters in the Carrington Billabong receded providing a low-competitive, high-nutrient environment for weeds to germinate within the mud. These germinating weeds were managed and are addressed in other sections of this report.

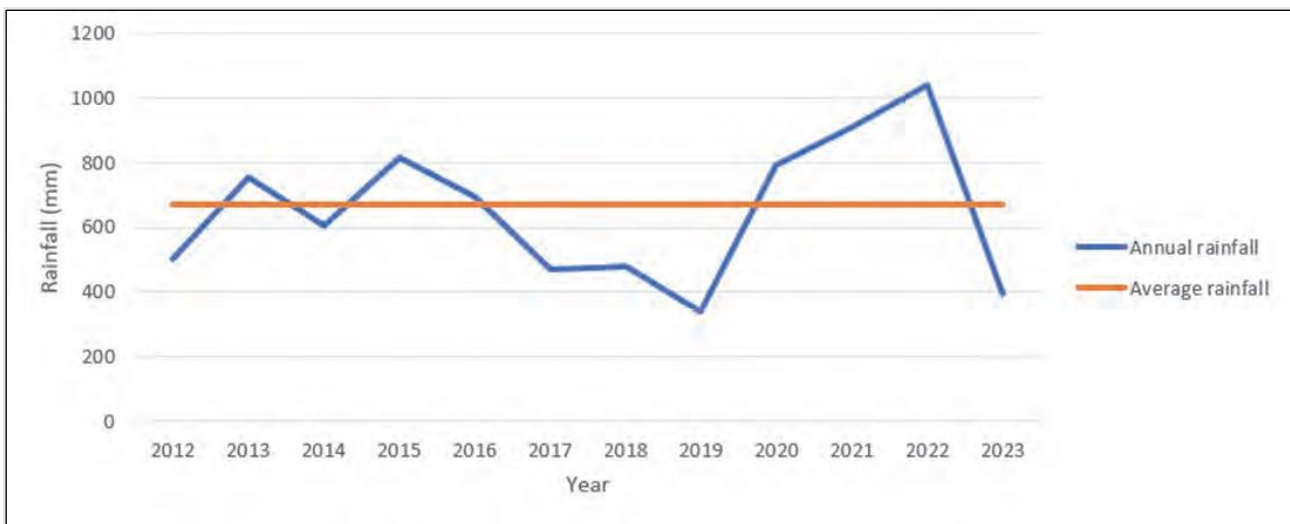


Figure 8-16: Annual rainfall at HVO Lemington since 2012 (to 15/12/2023)

#### 8.13.2.2 | FLORISTIC SURVEY

A full floristic survey was conducted within set quadrats in the Carrington Billabong and the Reference Site. The 2023 monitoring identified 78 species across all sites composed of 30 (38%) native species and 48 (62%) exotic species. Within the floristic plots at Carrington Billabong 25 (37%) native species and 42 (63%) exotic species were recorded, while within the two plots from the Reference Site 12 (50%) native species and 12 (50%) exotic species were recorded.

Common ground cover natives at Carrington Billabong were *Cynodon dactylon*, *Einadia nutans* subsp. *nutans*, *Einadia trigonos*, *Juncus* spp. and *Paspalidium* spp.

There are several factors that influence the diversity, cover and abundance of flora. This includes rainfall incidence and site characteristics e.g. local catchment and run-on areas. **Figure 8-17** illustrates the trends in floral diversity over time for Carrington Billabong and the Reference site. In general, there has been a gradual increase in the diversity of native and exotic species over time, with a minor increase in diversity of

exotics and minor decrease in native species compared to last year. Since 2008, there has been a greater diversity of exotic species compared to natives, with exotic species representing 63% of species recorded at Carrington Billabong in 2023. However, this is mostly influenced by CB5, as native and exotic species diversity were equal at CB1 and CB2. CB5 occurs on the adjacent floodplain, which is open and drier than the other monitoring locations. CB5 has not been planted, received supplementary seeding or subject to specific weed control other than slashing, and the plot is more representative of the adjacent agricultural landscape. At CB5, exotics species comprise 79% of the total species which is a trend that has occurred at most years within CB5.

With the tubestock planting that is planned for 2024 to connect the Billabong with the River Red Gum population occurring along the Hunter River, CB5 will become a managed area where weeds are targeted to a higher level to reduce competition for the planted tubestock. Although a significant weed seed bank is likely to remain within CB5, it is hoped that the management efforts will see a decline in weed species numbers.

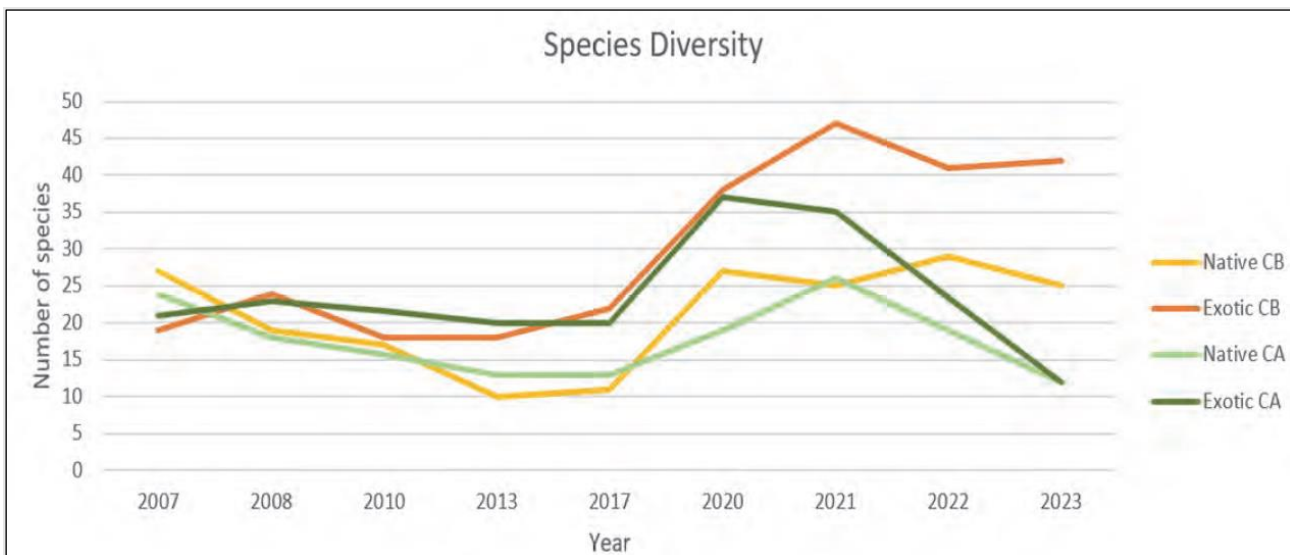


Figure 8-17: Change in Species Diversity Over Time at Carrington Billabong (orange) and the Reference Site (green)

A decrease in species diversity has occurred since 2021 at the Reference Site. This is likely due to the flood event in 2022 and early 2023, where the billabong was flooded for most of 2022 and the first few months of 2023, resulting in no data captured in 2022. Long periods of inundation have resulted in the death of most plants and the data captured in 2023 shows early recovery since floodwaters have receded, with low species diversity, equally represented by native and exotic species.

### 8.13.2.3 | SEEDLING SURVEY

Both the Carrington Billabong and the Reference Site were flooded in 2021/22 and early in 2023. The Strategy (HVO 2020) requires an assessment of the response of River Red Gums post-flooding, which includes documenting natural, native recruitment. This assessment was undertaken in June 2023.

It was hoped that, as the water receded, a new cohort of River Red Gum seedlings would establish. However, high soil moisture, warm weather, and the low competition within the exposed mud, encouraged



a flush of weeds and colonising flora that could out-compete the River Red Gum seedlings. While these weed species were managed as delicately as possible, an examination of the seedling survey plots did not record any flood-induced recruitment of River Red Gums.

Results of the seedling surveys undertaken at Carrington Billabong (CB3, CB4 and CB6) and the Reference Site (CA2, CA3 and CA5) are presented below. The number of seedlings within each site compared to previous years is shown in **Table 8-13**. The number of seedlings has increased slightly at CB3, CB4, and CA5, remained constant at CA2 and CA3 and decreased slightly at CB6.

*Table 8-13: Change in seedling numbers over time*

Site	Change in Number of Seedlings							
	2007	2010	2013	2017	2020	2021	2022	2023
CB3	12			11	9	9		10
CB4	25			8	4	4		7
CB6	100			105	36	32	33	27
CA2						5		5
CA3						8		8
CA5						20		28

Note: CB = Carrington Billabong, CA = Reference Site.

There was no evidence of recent recruitment events within (or outside) the monitoring plots, with recruitment recorded in previous years now reaching more than 2 m in height. The average condition of seedlings within the plots has decreased at all plots except for CB6 where there was an increase in condition. The density of these earlier seedlings is such that, it is anticipated in future years, increased competition amongst the individual recruits will increase resulting in these areas thinning out naturally.

Insect attack was most evident in plants at the Reference Site, but in few trees. However, at Carrington Billabong, a number of trees were subject to ongoing defoliation by insects, potentially as a secondary response to a fungal infection, particularly at CB3 and CB4. At CB4, all seven individuals were dead compared to being slightly stressed in 2021.

Patterns in the density of seedlings were noted in the field and reviewed against contour data derived from Digital Elevation Models (Geoscience Australia, 2023) (**Figure 8-18** and **Figure 8-19**).

At Carrington Billabong, seedlings were most evident within the lower parts of the site, predominantly below the 68 m contour. All three seedling monitoring plots at Carrington Billabong (CB3, CB4 and CB6) are located below the 68 m contour and seedling plot data were extrapolated within this area to estimate the total number of seedlings at Carrington Billabong. As with previous surveys, there were few naturally occurring seedlings outside this area. When dead seedlings are removed from the data, the estimated number of seedlings at Carrington Billabong has decreased.

At the Reference Site, seedling densities were also higher in the lower parts of the site (below the 173.5 m contour), with fewer seedlings on higher ground. Data from seedling monitoring plot CA5 was used to estimate seedling numbers in the lower parts of the site, while the average of CA2 and CA3 was used to extrapolate seedling numbers in the higher areas. The number of seedlings estimated in the Reference Site has decreased.



Figure 8-18: Contour Elevations within the Carrington Billabong





Figure 8-19: Contour Elevations within the Reference Site

### 8.13.2.4 | RIVER RED GUM HEALTH MONITORING

The health of adult trees was assessed using a representative sampling method using thirteen attributes to score and monitor the overall condition of each tree. One hundred and forty (140) trees were originally tagged in the Carrington Billabong in 2007. In assessments during previous years, the health of 63 adult river red gum trees were assessed across the site. These trees had retained tags from previous monitoring enabling comparison with prior datasets. As five of these trees had fallen since 2022, only 58 trees were able to be assessed in 2023.

Changes to individual trees since 2022 have been recorded and colour coded to reflect either a decline or improvement in their health classification. At the Reference Site, 2023 data was compared to 2021 as flooding prevented the data from being collected in 2022.

At Carrington Billabong, the number and percentage of trees sampled in 2023 in comparison to 2022 within each condition score is provided in **Table 8-14**. Generally, trees decreased in condition compared to 2022 data, with five tree deaths, a decrease in the percentage of healthy trees and an increase in the percentage of stressed and slightly stressed trees.

In 2021, nine trees were monitored within the Reference Site. In 2023, these same nine trees were assessed. **Table 8-15** shows that there has been no change in the health of RRG at the Reference Site in 2023 compared to 2021.

Within the Carrington Billabong, the average canopy health score has fluctuated since 2017 but remains greater than the initial average score. The average canopy health score increased from 2.4 in 2017 to 3.8 in 2020, decreased to 3.5 in 2021, increased to 3.8 in 2022 and decreased to 3.40 in 2023. Last year, the majority of trees were given a “healthy” condition score. In 2023, trees given the “near dead” condition



score decreased from seven to three individuals, but there was an equivalent increase in the number of dead trees from seven to 11 individuals. Most of the trees given a “stressed” condition score had moderate to severe insect/fungal attack.

Of the trees monitored, 47% of trees recorded a reduced overall condition compared to 22% in the 2022 and 41% had the same condition compared to 2022 (however, this included five dead trees). Only six trees (10%) had an improved condition.

Data regarding canopy extent, crown growth and leaf die off growth showed a decline compared to 2022, with 33% of trees displaying a reduction in canopy extent, 59% trees with reduced crown growth and 84% of trees displaying leaf die-off. These results contrast with the 2022 data, where trees monitored at Carrington Billabong had improved in all aspects of canopy extent, new growth and levels of leaf die off compared to 2021 data, potentially as a result of the increased rainfall and soil moisture.

Table 8-14: Change in seedling numbers over time – 2022 compared to 2023

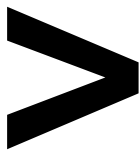
	Condition score									
	1 (Dead)		2 (Near dead)		3 (Stressed)		4 (Slightly stressed)		5 (Healthy)	
	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023
<b>Carrington Billabong</b>										
Number of trees	7	11	7	3	8	15	10	16	31	22
% of trees	11%	16%	11%	4%	13%	22%	16%	24%	49%	33%

Table 8-15: Change in seedling numbers over time – 2021 compared to 2023

	Condition score									
	1 (Dead)		2 (Near dead)		3 (Stressed)		4 (Slightly stressed)		5 (Healthy)	
	2021	2023	2021	2023	2021	2023	2021	2023	2021	2023
<b>Reference Site</b>										
Number of trees	1	1	0	0	0	0	1	1	7	7
% of trees	11%	11%	0	0	0	0	11%	11%	78%	78%

The decreased canopy density, canopy growth and a decrease in the overall condition of the mature trees and more recent recruits may be linked to the prolonged flooding of the Billabong. However, surveys in 2023 identified the presence of the soil borne pathogen *Phytophthora cinnamomi* from soil samples collected from the Billabong.

*Phytophthora cinnamomi* attacks the roots of susceptible plants and affects their ability to absorb water and nutrients (DOE 2015). It grows and reproduces in warm, moist conditions, and spreads through the



movement of spores that may swim to new hosts within the soil profile or be dispersed over large distances in flowing water. *Phytophthora cinnamomi* infects a large range of species. Susceptible species display a range of symptoms. Some are killed, others are damaged but can endure, while some can show no apparent symptoms. In some circumstances, *Phytophthora cinnamomi* may contribute to plant death where there are other stresses present (e.g. waterlogging or drought). Within a plant species, there may be a variable response to infection.

At present, the dead individuals are restricted to a specific area within the Billabong where water was retained during the flood. Observations identified that these trees were being defoliated by insects throughout 2022/3, yet the adjacent young saplings that were planted on the floodplain, and not in an area that was subject to the extended floods, were not subject to defoliation. As a preventative measure, the area enclosing and immediately surrounding the dead trees has been isolated. The track crossing the area has been redirected, signage installed and hygiene protocols developed. To determine whether *Phytophthora cinnamomi* is causing, or contributing to, the decline of River Red Gums at the Carrington Billabong, investigations are continuing.

### 8.13.2.5 | REMNANT ECOLOGICAL HEALTH MONITORING

Remnant Ecological Health Assessments (REHA) were conducted at sites at Carrington Billabong, the Reference Site and Priority Sites. The sum of scores from the REHA for 2023 and previous years are provided in **Table 8-16**. Sites with higher scores are in better condition (the maximum potential score is 39). Factors such as weed invasion, and native diversity in the mid and ground layers often scored values of 1, reducing over scores for each site.

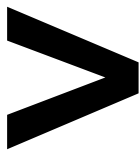
For the 2023 survey, the summed scores indicate that for Carrington Billabong, ecological health has improved for all sites monitored apart from CB5, which reduced from a score of 28 in 2022 to a score of 25 in 2023.

All of the Priority Sites have improved since 2022, apart from Wollombi Brook (WB1) which decreased from a score of 31 to 27. At the Reference Site, the ecological health scores decreased slightly at three sites (CA1, CA2 and CA3), remained constant at CA4 and improved at CA5. This overall reduction compared to 2021 data was most likely due to flooding in 2022, where high cover of weeds and low diversity in the mid and ground strata were affected by flooding, reducing these scores in 2023.

Overall, most sites improved in overall condition since 2021 data, and were also mostly in better or similar condition to 2022 observations apart from three of the Reference Sites. A high cover of weeds and low score for canopy plants age diversity/regeneration is a negative characteristic most sites have in common.

Table 8-16: A Comparison of the Remnant Ecological Health Assessment Scores Between Monitoring Events

Site	Remnant Ecological Health Assessment Score*								
	2007	2008	2010	2012	2017	2020	2021	2022	2023
CB1	21	25	27	24	28	28 (26)	27	30	32
CB2						28 (26)	28		30
CB3						31 (29)	28	NA	28
CB4						30 (28)	26	NA	28
CB5						27 (26)	25	28	25



Site	Remnant Ecological Health Assessment Score*								
	2007	2008	2010	2012	2017	2020	2021	2022	2023
HR1	25	21	25	26	26	27	25	26	27
HR2	32	32	28	25	25	25 (23)	25	29	32
HR8	23	23	2	25	24	28 (26)	24	25	29
HR11	26	28	25	25	26	26 (24)	27		31
HR13	24	26	26	24	24	26 (24)	22	27	31
WB1	28	28	27	29	26	29 (27)	25	31	27
CA1	29	27		31	31	31	32	NA	31
CA2	26	25		26	28	30	32	NA	29
CA3						30	31	NA	30
CA4						30	29	NA	29
CA5						30	33	NA	35

\* Out of a maximum of 39.

Note for 2020 scores, an adjusted score based on flood information provided in 2021 is in brackets.

Note: CB = Carrington billabong, HR = Hunter River sites, WB = Wollombi Brook sites, CA = Reference Site (Camyr Allen)

### 8.13.2.6 | GROUNDWATER MONITORING

The groundwater at key locations across HVO are monitored to determine the impact of mining and whether any reported seepage from the North Void tailings storage facility is having an impact on the Carrington Billabong. Various factors are assessed to determine whether any hydrological changes could be influencing the adjacent vegetation communities, such as the River Red Gum populations. Exceeding the trigger values that have been established require site to examine further likely causes of the values and/or report the exceedance in specified cases.

Bore monitoring has indicated that the groundwater levels within the vicinity of the Carrington Billabong typically reflect rainfall patterns. Fluctuations have occurred over several years with increased rainfall during the La Nina weather system increasing the groundwater levels, and decreased levels experienced during 2023 mirroring the below average rainfall that was received.

A recorded change in the sulphate and water level in some bores in the alluvium was identified in 2017 to be due to seepage from the adjacent North Void Tailings facility. As noted in the groundwater section of this report, management actions have been successful in lowering sulphate levels and these are now stable.



8.13.2.7 | SUMMARY OF RIVER RED GUM MONITORING

Above average rainfall in 2020 to 2021 following years of below average rainfall contributed to landscape scale changes to environmental conditions. Flooding at the Carrington Billabong and the Reference Site continued into 2023, however, by the middle of the year, flood waters had receded. The effects of sustained flooding were evident in the 2023 monitoring period, despite the absence of surface waters.

The factors that affect the health of River Red Gums have been subject to considerable study and monitoring.

Floristic data in 2023 showed a minor increase in the diversity of exotic species and a minor decrease in native species compared to previous monitoring events at the Carrington Billabong. The volume and timing of rainfall, combined with other climatic factors, can influence plant growth. It is difficult to identify a single factor that may have increased the diversity of weed species. In general, there has been a gradual increase in the diversity of native and exotic species over time. The diversity of exotic species to native species does, however, continue to increase, with exotic species representing 63% of species recorded at the Carrington Billabong in 2023.

At the Reference Site, long periods of inundation have resulted in the death of most understorey plants and the data from 2023 showed early recovery since floodwaters had receded, with the low species diversity, equally represented by native and exotic species.

New recruitment through the germination of seedlings was not recorded at the Carrington Billabong in 2023, despite a survey triggered by the flood event in 2021/22 and 2023. The average condition of existing recruits at both the Carrington Billabong and the Reference Site has declined since 2021, except for CB1, which was the only site accessible to survey in 2022, and had an increase in the average seedling condition.

Tree health at the Billabong appeared to be declining when examined against 2022. Overall, the trees monitored increased their stress categories since 2022, and five new tree deaths were recorded.

The River Red Gum tubestock that were planted within the open areas adjacent to the Carrington Billabong in 2021 are growing with great vigour. Continued growth of these trees will provide harbour for small passerines and leaf gleaners that will prey on the insects and their larvae that are devouring the canopies of older remnant eucalypts on site. Most of the planted trees have reached a height above the ground layer providing some certainty that they have overcome potential competition from plants within this stratum.

Monitoring observations that relate to the goals and objectives of the Rehabilitation and Restoration Strategy for Carrington Billabong are in **Table 8-17**.

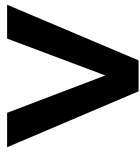
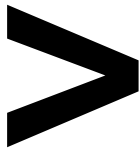
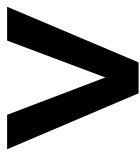


Table 8-17: Observations that Relate to the Monitoring Objectives Outlined in the Strategy

Goals	Objectives	2023 Observations
<p>To reduce the impacts of threatening processes on the stands</p>	<p>To suppress or eradicate the in situ environmental factors that are acting to reduce the viability of the remnant population</p>	<p>Weeds continue to dominate the species assemblage at Carrington Billabong. However, the previous 10 years of data suggests that active management and restoration should continue in order to “suppress and eradicate” this threat.</p> <p>The growth of planted RRG in cleared areas adjacent to the Billabong was noted in 2023. It is hoped that, while these trees may protect the remnant trees from climatic factors, that they may also provide habitat for birds and other species that may prey in the invertebrates that consume the eucalypt leaves.</p>
	<p>To improve the conditions within this population such that it can withstand reasonable periods of stress, predation and shortage of water supply</p>	<p>Flooding is required for germination of RRG, however no post-flood recruitment was recorded by Ecoplanning in June 2023. Average tree health and canopy condition data showed a decrease in tree health for 2023 within Carrington Billabong.</p> <p>Planted eucalypts (discussed above) also play a role in protecting the remnant from climatic and biotic threats.</p>
<p>To aid the establishment of the appropriate conditions to promote the health of the River Red Gum populations</p>	<p>To identify the likely <i>ex situ</i> factors that are contributing to the reduction in viability of this population and the health of the billabong and act, where possible, to control those factors or to take account of those factors in management approaches if they are not able to be directly controlled</p>	<p>The ERA outlines the groundwater exceedance issues around Carrington Billabong and ecological monitoring and triggers.</p>



Goals	Objectives	2023 Observations
	<p>To ensure that the results of ongoing monitoring are appropriately used to modify the management regime in response to new or unexpected information</p>	<p>This report is provided to HVO to inform ongoing management decisions.</p> <p>Supplementary planting of 80 tubestocks occurred in 2023 within existing planted areas to account for previous tubestock failures. Plantings aim to buffer the Billabong from wind events, and encourage bird diversity, over time.</p> <p>Further monitoring and planting is planned for 2024.</p>
<p>Increase the understanding of the water requirements of the River Red Gums</p>	<p>Develop an understanding of water requirements through the timely monitoring of responses of River Red Gums to flood and storm events</p>	<p>The Strategy requires additional monitoring to be undertaken when triggered by flooding. Monitoring of Carrington Billabong was undertaken by Ecoplanning in June 2023 after floodwaters had receded. No flood induced recruitment was recorded.</p> <p>Groundwater monitoring is undertaken at Carrington Billabong.</p>
<p>To enhance the River Red Gum population to enable it to persist as a viable functioning population</p>	<p>To assist this population to continue to self-propagate to ensure ample replacement of senescing trees with juvenile recruits.</p> <p>To support the establishment of a self-sustaining, functional and viable ecosystem that resembles</p>	<p>Weeds continue to dominate the RRG community and can limit natural regeneration of RRG. In 2023, targeted kikuyu spraying was undertaken under trees as well as general weed spraying in areas that had been flooded. Active weed management should continue in order to assist the community to become a self-sustaining population. However, it is also likely that, given the predominance of weeds in the area, flooding, wind and other vectors will affect ongoing weed management efforts.</p>

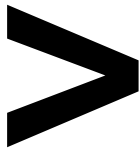


Goals	Objectives	2023 Observations
	what is likely to have been present in Carrington Billabong prior to European settlement	Native species diversity has decreased slightly at Carrington Billabong from 2022 to 2023.
	To support the establishment of a self-sustaining, functional and viable ecosystem	No recent recruitment is evident at Carrington Billabong. Remnant Ecological Health Assessments generally improved at Carrington Billabong and the Priority Sites, but reduced at the Reference Site slightly, most likely due to decreased species diversity from flooding.
To increase biodiversity including residence habitat, foraging habitat and native flora and fauna species	To increase habitat for the identified and potential native flora and fauna species	Tubestock plantings that occurred in 2021 and 2022 will increase the habitat area and local linkages once the tubestocks become established and develop with time. The trees are establishing and will provide effective habitat for small fauna in the future. Further tubestock plantings are planned for 2024.
To determine if there is any improvement or deterioration in RRG within Carrington Billabong		Data shows a slight decrease in RRG condition. Average canopy health decreased from 3.8 in 2022 to 3.40 in 2023. Most of the trees assessed as “stressed” had moderate to severe insect/fungal attack.
To determine if there is any improvement or deterioration of the natural habitat at Carrington Billabong		Data shows a slight improvement in the overall condition of remnant vegetation at Carrington Billabong and Priority Sites.
To provide management recommendations to achieve further improvements in the ecological management of the site to assist in the recovery of RRG and their habitat	<ul style="list-style-type: none"> <li>Continued weed management and reduce ground cover biomass.</li> <li>Record the extent and duration of flood events within Carrington Billabong to identify potential areas for recruitment events/actions.</li> <li>Continue to plant additional canopy and midstorey species in open areas.</li> </ul>	

**8.13.3 | ECOLOGICAL RISK ASSESSMENT**

HVO has a monitoring programme in place to monitor changes in groundwater quality due to seepage from the North Void TSF. Carrington Billabong is located adjacent to the North Void TSF.





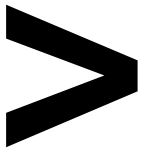
As part of Condition 8, E2.1 of EPL 640, HVO has implemented a monitoring program that includes an Ecological Risk Assessment (ERA) (Umwelt 2020) that assesses the impact to the RRG community from the North Void TSF seepage. The annual monitoring is required to detect any notable decline in ecological condition of RRG at the Carrington Billabong. Should ecological monitoring identify any of the following factors, additional investigations will be implemented to determine the cause:

- An increase in tree dieback of 10% or greater compared to the previous year;
- Adult tree death of 10% compared to the previous year;
- Remnant ecological health scores decline of 10% compared to the previous year; and
- Unforeseen event that indicates a relatively rapid decline in ecological health or function that can't be linked to catchment wide causes (such as drought).

The results of the 2023 monitoring relative to these ERA trigger values is presented in **Table 8-18**.

*Table 8-18: Factors to be Considered to Detect a Notable Decline in Ecological Condition of the RRG Community in Accordance with the ERA (Umwelt 2020)*

Trigger	Monitoring Outcome - 2023
Groundwater quality indicates an increase in seepage from NV TSF	<p>Three ground water level readings were recorded above the 95th percentile in Q3 at CGW53a, CGW55a and CFW57.</p> <p>Water quality (pH) exceedance was recorded at CGW51a.</p> <p>The following recommendations have been made Umwelt (2023) provided the following recommendations in relation to these exceedances:</p> <ul style="list-style-type: none"> <li>• CGW53a, CGW55a and CFW57– revised water level trigger already updated in the updated draft WMP, which is currently with DPHI for approval.</li> <li>• CGW51a – the Q3 reading is within the historical range with no adverse impacts identified. Previously recommended to be decommissioned as the bore is screened over two groundwater units. The bore has already been removed from the updated draft WMP, which is currently with DPHI for approval.</li> </ul>
An increase in tree dieback of 10% or greater compared to the previous year	<p>Data for 58 tagged RRG trees was collected. Canopy cover scores were compared to 2021 data for the same 58 RRG trees. Generally, trees decreased in condition compared to 2022 data, with four tree deaths; a decrease in the percentage of healthy trees and an increase in the percentage of stressed and slightly stressed trees.</p> <p>Data regarding canopy extent, crown growth and leaf die off growth showed a decline compared to 2022, with 33% of trees displaying a reduction in canopy extent, 59% of trees with reduced crown growth and 84% of trees</p>



Trigger	Monitoring Outcome - 2023
	<p>displaying leaf die-off. In 2022, most trees with no evidence of leaf dieoff.</p> <p>Most of the trees assessed as “stressed” had moderate to severe insect/fungal attack.</p> <p>The decrease in average canopy health from 3.8 in 2022 to 3.4 in 2023 represents a dieback of 10.53%</p>
Adult tree death of 10% compared to the previous year	Four trees have died since monitoring in 2022. This represents a 57% increase in tree death compared to 2022.
Remnant ecological health scores decline of 10% compared to the previous year	Remnant ecological health scores increased at all sites apart from CB5 and Wollombi Brook, where a 10.71% and 12.90% decline in remnant ecological health were recorded.
Unforeseen event that indicates a relatively rapid decline in ecological health or function that can’t be linked to catchment wide causes (such as drought)	A rapid decline has been observed in the seedling health CB4, with all seven individuals recorded as dead in 2022 compared with slightly stressed in 2021. Of the 58 trees monitored in Carrington Billabong in 2023, 47% of trees recorded a reduced overall condition compared to 22% in the 2022 and 41% had the same condition compared to 2022 (however this included five dead trees). Only six trees (10%) had an improved condition. This represents a rapid decline.

Due to the decline in condition and the increase in tree dieback within the Billabong, HVO is engaging specialists to undertake further investigations as to the cause of the decline.

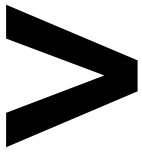
### 8.13.4 | MANAGEMENT ACTIONS

#### 8.13.4.1 | WEED MANAGEMENT

During 2023, weed management at HVO had a focus on riparian areas and along transport routes. These areas were targeted as they would afford benefits to the management of the River Red Gum populations, reducing pig habitat within riparian areas, improve the condition of areas that are assessed under the requirements of the HVO Riparian Vegetation and Stream Erosion Monitoring Program, and assist to reduce weeds, specifically Coolatai Grass (*Hyparrhenia hirta*), that is largely restricted along public transport corridors. Areas of known infestations of African olive (*Olea europaea subsp. cuspidata*) and Mother of millions (*Bryophyllum delagoense*) were also subject to weed management activities during 2023.

The primary weeds of concern within riparian and River Red Gum areas include the balloon vine (*Cardiospermum grandiflorum*) and castor oil plant (*Ricinus communis*), which can smother adult trees, outcompete juvenile regrowth via shading, and provide habitat for feral pig populations.

Kikuyu grass (*Pennisetum clandestinum*) was also targeted within the Carrington Billabong and Galenia (*Galenia pubescens*) within priority areas as they are listed as a threat in the endangered ecological



community listing: Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions.

With the floods that occurred in the Carrington Billabong during previous years having receded in 2023, extensive areas of Celery Buttercup (*Ranunculus sceleratus*) germinated from the mud. This herbaceous, exotic species is reported to be toxic to humans and stock and can displace native species (Weeds of Australia 2016). The population was managed within the Billabong and future inspections will examine for any recurrence of this species.

The areas along the Hunter River that were treated for riparian weeds are shown in **Figure 8-21**.

Within the Billabong, HVO has been concentrating efforts on regular slashing the open areas and the adjacent grazing paddock to reduce the possibility for weeds to establish and reseed. Previously, the density of exotic weeds smothered the shorter native species in the area. Slashing the open areas within the Billabong and priority areas did occur and the weeds did not obtain the height observed in previous years.

Coolatai grass predominately occurs along public and private roadside edges at HVO as the seeds are transported largely via traffic movement and slashing activities. The management of these areas is anticipated to reduce the seed set and ultimately reduce the potential for this species to disperse into rehabilitation areas.

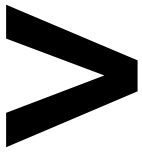




*Figure 8-20: Balloon Vine being managed within a Priority Location at HVO*



Figure 8-21: Riparian areas managed for weeds along the Hunter River and areas of treated Coolatai grass along Lemington Road



8.13.4.2 | VERTEBRATE PEST CONTROL

As part of HVO’s Vertebrate Pest Action Plan, programs are carried out on a seasonal basis and include sites where the River Red Gum populations are found. These programmes are conducted at a level of frequency designed to disrupt pest species breeding/colonisation cycles and employ a variety of methodologies including baiting, trapping and ground-based shooting. Feral pig control was undertaken in the Billabong and other RRG sites as a result of pig activity being observed. The focus on riparian weed management during 2023 was also intended to disrupt potential breeding sites for feral pigs. The removal of this habitat will open these areas, encourage native species recruitment and reduce the number of suitable areas for pigs to reside. Further detail on vertebrate pest control undertaken in 2023 is included in **Section 8.10**.

8.14 | BIODIVERSITY OFFSETS

8.14.1 | GOULBURN RIVER BIODIVERSITY AREA OVERVIEW

In accordance with condition 29 of HVO’s Project Approval, PA 06\_0261, Hunter Valley Operations are accountable for managing a 140ha offset at the Goulburn River Biodiversity Area (BA).

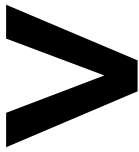
HVO manage a number of other offsets including the Wandewoi, Condon View, Crescent Head and Mitchelhill biodiversity areas, however, these are managed under EPBC approval 2016/7640, are subject to compliance reporting under that approval and are not subject to further discussion in this document.

The Goulburn River BA is located near the town of Merriwa and, when considered in combination with the adjoining offset for the Warkworth Mine, forms an area of protected vegetation extending from the Goulburn River National Park (**Figure 8-23**). The Goulburn River BA is managed according to the Goulburn River Management Plan that is available on the HVO website.

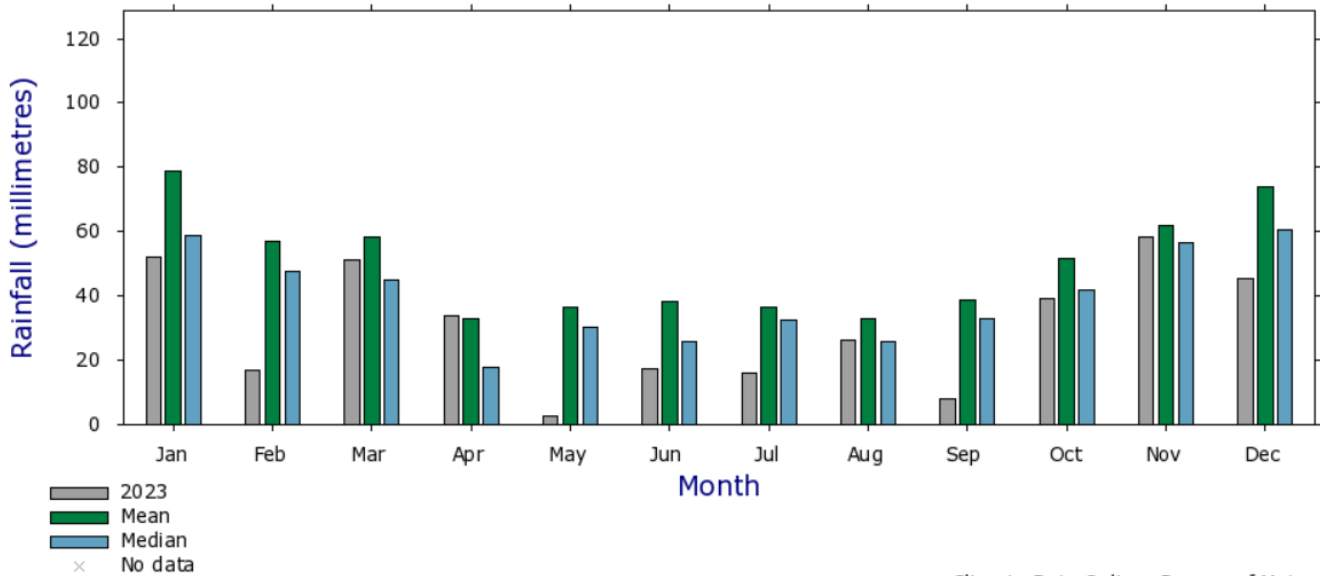
Given that the Goulburn River offsets for the Warkworth Mine and HVO are adjacent to each other, and both parties have a common managing partner in Yancoal, HVO and the Warkworth Mine have a commercial agreement for the HVO BA to be managed by the Warkworth Mine on its behalf. The benefit of this agreement is a reduction in duplication related to the management and monitoring activities that are undertaken by consultants and contractors. As such, while the figures presented below may include information relating to the Warkworth Mine, the text will focus on the data and activities originating from the HVO BA.

8.14.2 | WEATHER RECORDS

Overall, the rainfall recorded at the closest weather station to the Goulburn River BA exceeded the average total rainfall in 2023 (**Figure 8-22**). In this period, the Merriwa (Roscommon gauge) received 367.6 mm, which is below the mean average rainfall for the area (600 mm) and well below the rainfall received in 2022 (862.8 mm). A decline in the rainfall received was typical of records occurring across the Hunter Valley during 2023.



Merriwa (Roscommon) (061287) 2023 Rainfall (millimetres)



Climate Data Online, Bureau of Meteorology  
Copyright Commonwealth of Australia, 2024

Note: Data may not have completed quality control

Figure 8-22: Rainfall Records Recorded at the Merriwa (Roscommon) Gauge - 2023

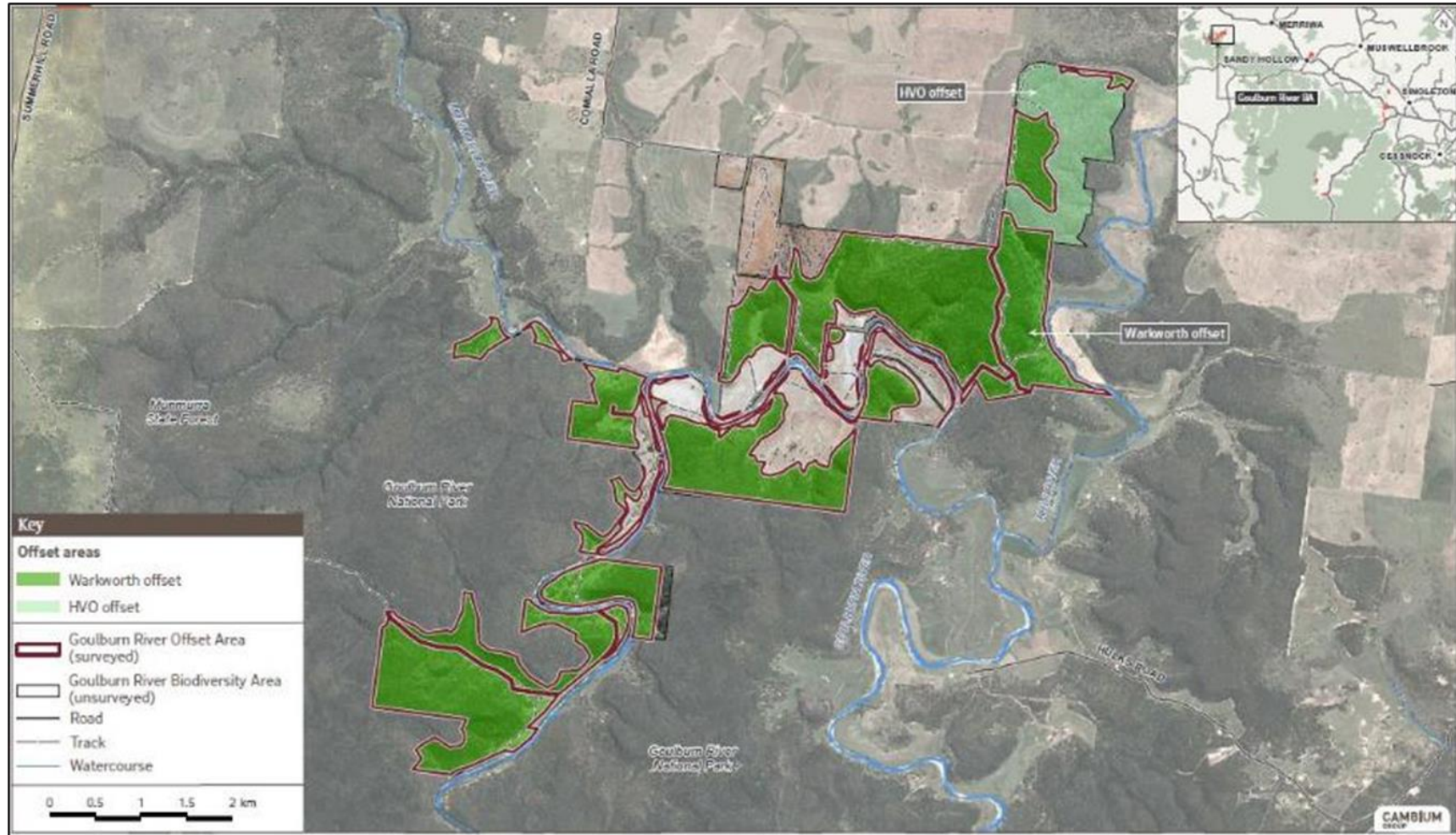
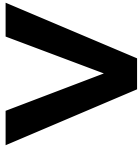
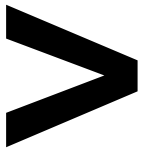


Figure 8-23: HVO's Goulburn River Offset and Adjoining Warkworth Mine Offset





**8.14.3 | BIODIVERSITY AREA MANAGEMENT ACTIVITIES**

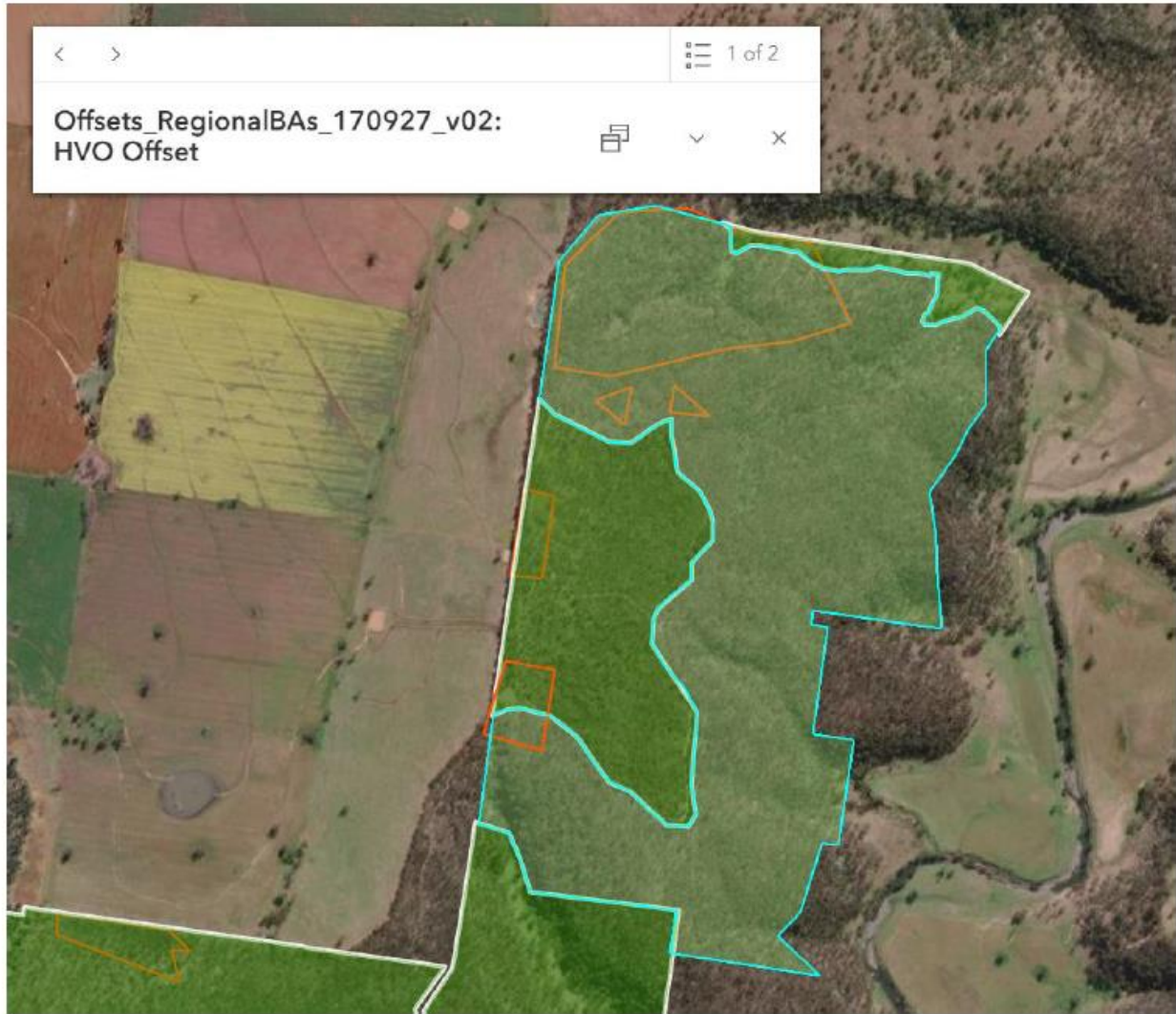
The management activities implemented within the HVO biodiversity offset during 2023 were largely restricted to weed management and feral animal control.

The tracks and fence lines were slashed during 2023 and the areas treated for weeds is shown in **Figure 8-24**. The majority of the HVO offset is in good condition with few weeds. The need for weed and feral animal intervention is assessed during the regular property inspections.

A summary of the key actions in the offset management plan and whether they occurred during 2023 is outlined in **Table 8-19** below.

*Table 8-19: Biodiversity Area Management Activities 2023*

<b>Activity</b>	<b>Description</b>
Weed Control	Focus on Prickly Pear and African Lovegrass.
Habitat Monitoring	Not required during 2023.
Bird Assemblage Monitoring	Not required during 2023.
Infrastructure Management and Improvement	Tracks and fence lines slashed for vegetation regrowth and fire management.
Vertebrate Pest Management	Autumn/Winter and the Spring vertebrate pest management (baiting) programmes undertaken. Pig baiting occurred late November/early December. Three targeted feral animal shooting campaigns were undertaken across the area that included the offset property.
Property Inspections	Property inspections occurred in Feb, April, June, Aug, Oct, Dec.



**Legend**

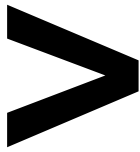


HVO offset



Area spot sprayed, Prickly pear and African lovegrass distribution.

Figure 8-24: Areas of weed control within HVO's Goulburn River Offset and adjoining Warkworth Mine Offset



**8.14.3.1 | PROPERTY INSPECTIONS AND RAPID CONDITION ASSESSMENT**

The HVO offset was assessed for the presence of weeds, native fauna, waste or stray stock, the state of the gates and fences and tracks, as well as any evidence of vertebrate pests or unauthorised activities during February, April, June, August, October and December 2023.

The reports were reviewed on receipt and any necessary actions undertaken or scheduled. In general, the site has limited weed issues despite the proximity to farmland, minor pig activities are typically detected during the inspections, and a variety of native fauna are observed commonly include kangaroos, wallabies and wallaroos, lace monitors and various species of native birds.

The tracks are typically in good condition and any fallen trees are removed during the inspection.

New signage has been installed on the gates into the HVO offset. These signs identify the HVO biodiversity offset and assist to delineate the boundary from the adjoining MTW biodiversity area.

The Rapid Condition Assessment was undertaken in December 2023 and the results are presented in **Table 8-20**. The results are consistent with the assessment for 2022, with both sites having a tally of 19 during both years.

*Table 8-20: Rapid Condition Assessment results for 2023*

**Rapid Site Assessment - Woodland**

**Biodiversity Area** Goulburn River  
**Date** December 1, 2023, and January 12, 2024  
**Auditor** J Blair

Note: True = 1, False = 0

Site #	R GR1	R GR2	R GR3	R GR4	R GR5	R GR6	R GR7	R GR8	R GR9	R GR10	R GR11	R HVO1	R HVO2	
Low grazing intensity - never farmed	1	1	Grassland	Grassland		1	1	1	1	1	1	1	1	
Tree and shrub regeneration present (<2m)	1	1				1	1	1	1	1	1	1	1	1
Infrequent fire regime (<5year intervals)	1	1				1	1	1	1	1	1	1	1	1
Healthy mature trees (no dieback)	1	1				1	1	1	0	1	1	1	1	1
Little to no evidence of rabbits	1	1				1	1	1	1	1	1	1	1	1
Little to no evidence of foxes/cats	1	1				1	1	1	1	1	1	1	1	1
Low abundance of weeds (most remnants contain some weeds)	1	1				0	1	1	0	0	1	1	1	1
No evidence of firewood collection	1	1				1	1	1	1	1	1	1	1	1
No obvious signs of erosion or salinity	1	1				0	1	1	1	1	1	1	1	1
Not susceptible to fertiliser application, herbicide or pesticide drift	1	1				1	1	1	1	1	1	1	1	1
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)	1	1				1	0	1	1	1	1	1	1	1
Few tracks, trails or fence lines	0	1				1	1	1	1	1	1	1	0	1
Presence of native shrubs	1	1				0	0	0	0	0	0	1	1	1
Presence of large, old growth trees with hollows	1	1				0	0	0	1	0	1	1	1	0
Dead timber is left standing	1	1				1	1	0	1	1	0	1	1	1
Fallen timber and logs are left on the ground	1	1				1	1	1	1	1	1	1	1	1
Abundance of native ground flora	1	1				0	1	1	1	1	1	1	1	1
Presence of litter, cryptogams, cracks and rocks	1	1				1	1	1	1	1	1	1	1	1
Remnant is large (> 5ha is optimum)	1	1				1	1	1	1	1	1	1	1	1
Connected to or in close proximity to other remnant vegetation	1	1				1	1	1	1	1	1	1	1	1

**Health Rating**

19	20			*	15	17	17	18	17	19	19	19
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\*Site was inaccessible

Note. The results relevant for the HVO offset are shown on the right side as HVO1 and HVO2.



8.14.3.2 | FERAL ANIMAL CONTROL

8.14.3.2.1 | WILD DOGS AND FOXES

HVO undertakes vertebrate pest management activities within the offset properties that it manages. The aim of the vertebrate pest management programme is to target wild dogs and foxes that have been reported in and around the BA. The programme involves 1080 ground baiting and ejector baiting in conjunction with the Hunter Local Land Services (HLLS), National Parks and Wildlife Services (NPWS) and local landholders. The Autumn/Winter and the Spring programmes were the 16th and 17th respective programmes to have occurred at the Goulburn River BA.

The ground baiting method used aligns with the *Humane pest animal control: Code of Practice and Standard Operating Procedures* produced by NSW Department of Primary Industry (DPI). An attractant was also added to lure wild dogs and foxes to the baiting sites to maximise the chances of the bait being detected and taken. The household grade fertilizer, *Charlie Carp* (seaweed extract) was used as an attractant in this program.

In accordance with the Pesticide Control (1080 Liquid Concentrate and Bait Products) Order 2020, neighbours were notified of the baiting program at least three days prior to the laying of the baits, by letter and / or public notice. In addition to the letter and public notices, 1080 poison notice signs were established on all properties that were baited.

During each programme, nine bait stations were established along with monitoring cameras to record the effectiveness of the stations. The locations and results of the Spring 2023 programme is shown in **Figure 8-25**.

During both programmes, each station recorded at least one bait taken during the two inspections to each site within the baiting period. The camera monitoring indicated that the baits were taken by either a dog, fox, pig or, less frequently, goannas.

For the HVO portion of Goulburn River BA during the winter programme, there were 14 takes recorded over nine bait sites: four by wild dogs, seven by foxes, two by feral pigs and one lace monitor. The Spring baiting programme recorded 14 takes over the nine bait sites, four by wild dogs, three by foxes, seven by feral pigs and lace monitors.

The results reflect seasonal change where the lace monitors become less active in cooler months and foraging decreases substantially. The results are welcomed as although research shows that Australian native fauna is naturally resistant to 1080 and concentrations in the meat bait need to be substantially higher to adversely affect the animals, any native species take is an undesirable outcome for baiting results. Therefore, continued baiting during this season is ideal to minimise lace monitor takes and optimise target species takes.

The motion sensor cameras established at the sites in photographic mode successfully captured images of foxes taking meat baits and an ejector bait. The images at Bait Site H27 was effective in demonstrating the shy and hesitant nature of foxes. Hundreds of photos were taken of one fox continually circling and intermittently approaching the bait site over several days before actually attempting to take the meat bait.

8.14.3.2.2 | PIGS

The broader Goulburn River Biodiversity Area that encompasses the HVO offset plus the adjoining MTW offset area was included in a ground and aerial shooting programme for the control of feral animals. While the focus was intended to be for feral pigs, any opportunistic sightings of wild deer, dogs, foxes, goats or cats would also be targeted. These programmes were undertaken by either NSW National Parks and Wildlife Service (NPWS) or the contractor, Australian Vertebrate Pest Management. The programmes occurred over three campaigns in 2023 and included the adjoining private and National Parks estates.

The success of the programme was not separated into individual properties, and given the HVO offset is elevated off the river floodplain, it is expected that greater numbers would occur offsite, however the comments were that during the three campaigns, despite the number of feral animals observed being lower than expected, 30 pigs and one cat were controlled within the two offset lands. A greater number and more species were removed when the adjoining estates were considered.

These targeted feral animal control programmes will be repeated during 2024.

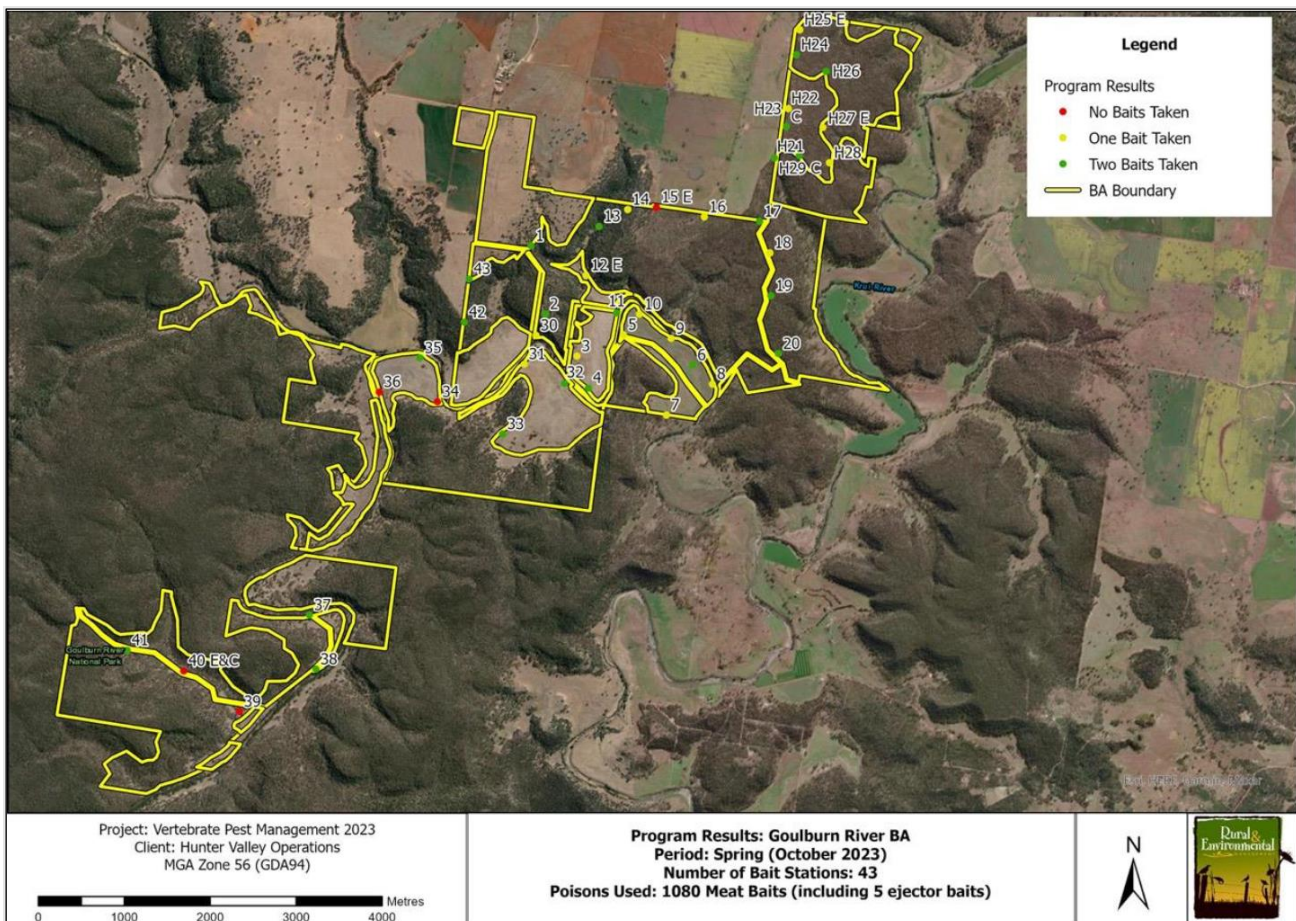
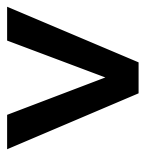


Figure 8-25: 2023 Vertebrate pest baiting locations and results at the Goulburn River Offset

Note: the HVO BA in the northeast corner contained nine baits.



## 9 | COMMUNITY

### 9.1 | COMPLAINTS

HVO provides a 24-hour Community Complaints Hotline (via freecall number 1800 888 733) for community members to comment on concerns relating to its operations. All complaint details are recorded in a database in accordance with Condition M6.2 of Environmental Protection Licence 640 and made available on HVO’s website (www.hvo.com.au).

A total of 9 complaints were received by HVO during 2023 (Figure 9-1) This represents a slight increase over 7 complaints for the previous year, however it is lower than typically received at HVO (Figure 9-3). Complaints were related to traffic, lighting, blasting and dust. Figure 9-2 provides further detail regarding the number of complaints per complaint type. Details of complaints received in 2023 are included in Table 9-1.

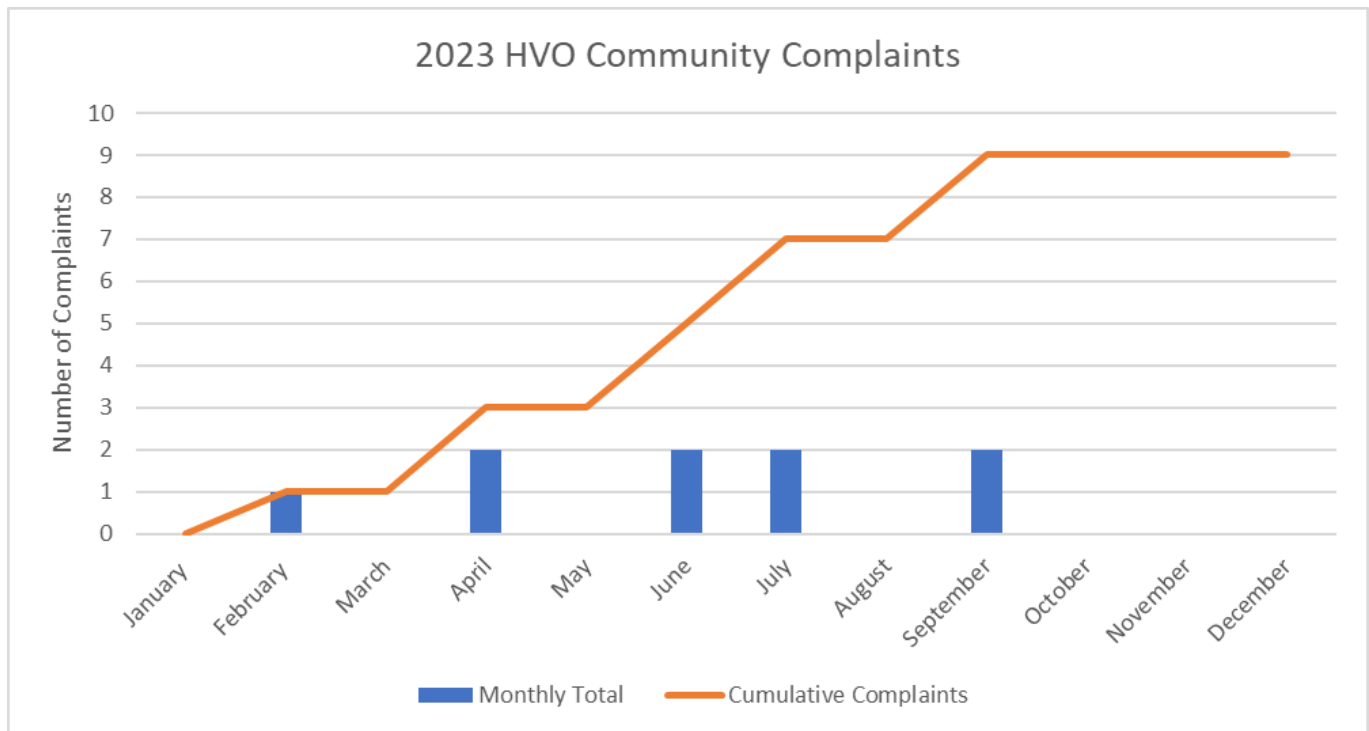


Figure 9-1: Summary of Community Complaints in 2023

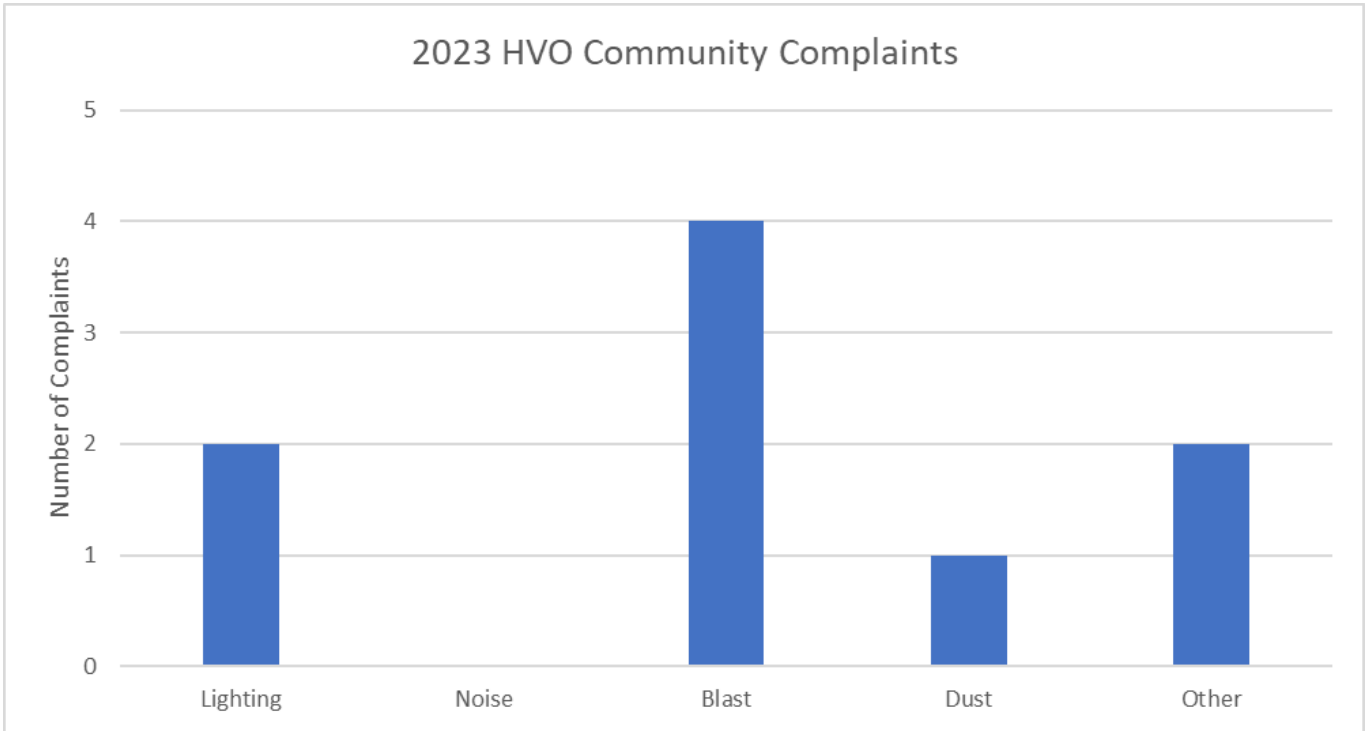
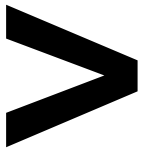


Figure 9-2: Number of Complaints per Type

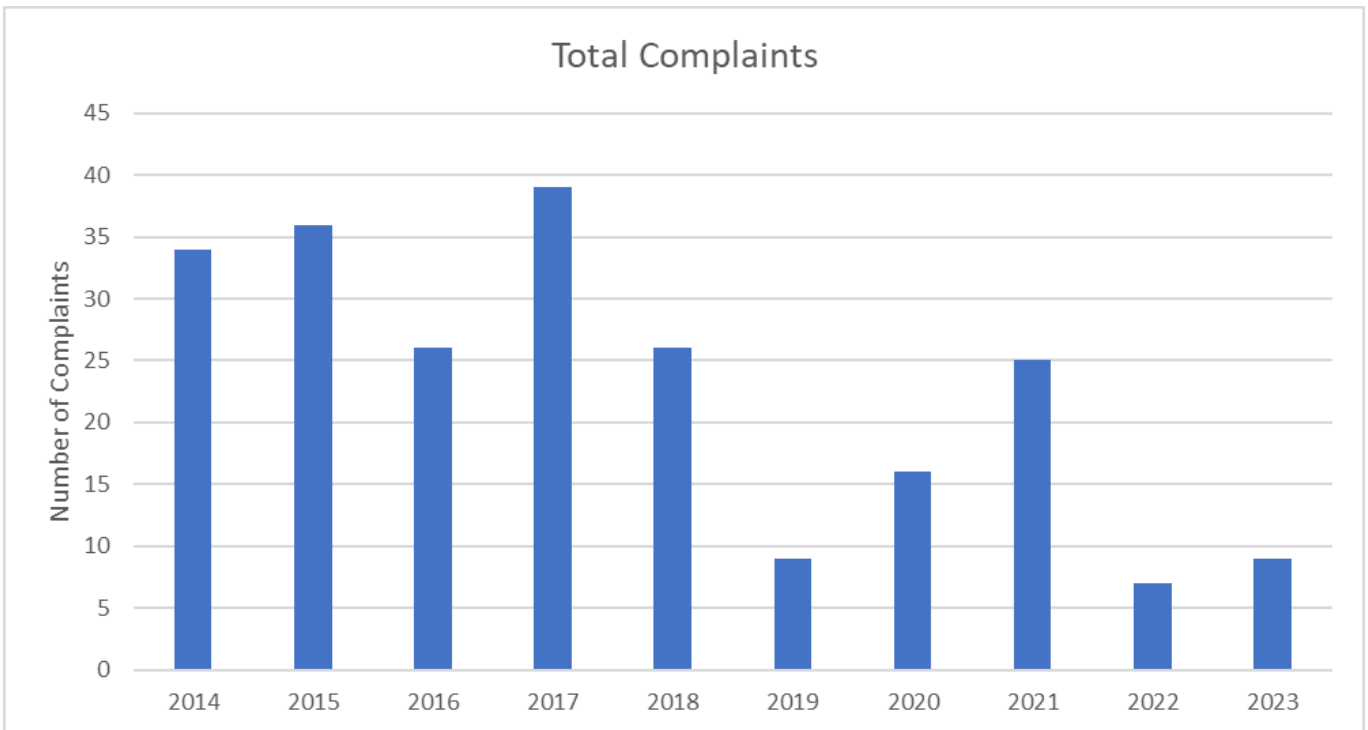
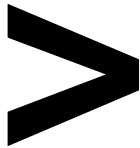


Figure 9-3: Community Complaints 2014-2023



# REPORT | 2023 ANNUAL ENVIRONMENTAL REVIEW

Table 9-1: Details of Complaints Received in 2023

Date	Time	Nature of Complaint	Description	Follow Up Action
1 February 2023	12:06 am	Lighting	A resident of Long Point called the Community Complaints Hotline regarding a lighting complaint, commenting that "light from HVO was shining directly into their house keeping their family awake".	The OCE contacted the resident at 12:27am and shutdown the lighting plant identified to be causing the disturbance. This was verified by the resident.  An internal investigation conducted following the complaint found that the light from the lighting plant was likely to be visible from the resident's location. Process changes have been made as a result of the complaint to close the identified gap in operational practices.
11 April 2023	7:11 am	Traffic	A member of the public was driving east along Golden Highway near the entrance to HVO South, when a train of four cars pulled out in front of them.  The resident reported that the last car to pull out failed to give way to them which forced them to flash their headlights, sound the horn and take evasive action and brake heavily causing his car's ABS system to engage to slow down and prevent a collision.	An internal investigation conducted following the complaint identified the driver of the vehicle. The employee's supervisor notified them of the complaint and the importance of safe driving practices when travelling to and from site.





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Date	Time	Nature of Complaint	Description	Follow Up Action
29 April 2023	1:40 pm	Blast dust	A resident of Long Point called the Community Complaints Hotline. The OCE contacted the resident who asked what was going on to create the dust they saw, the OCE advised that a blast had just taken place.	<p>The blast was fired in accordance with HVO blasting permissions for wind speed and direction. The wind direction and wind speed at the time of the blast was 2.7m/s and 268 degrees. The resident's property is located 8 kilometres from the blast location at a bearing of 295 degrees.</p> <p>The blast was fired in accordance with HVO blasting permissions for wind speed and direction. The wind direction and wind speed at the time of the blast was 2.7m/s and 268 degrees. The resident's property is located 8 kilometres from the blast location at a bearing of 295 degrees.</p> <p>A review of camera footage of the blast fired at approximately 1:30pm confirmed that a dust plume was produced but was not abnormal in its colour or volume. Low winds will have slowed the dissipation of the dust plume.</p> <p>The nearest real-time PM<sub>10</sub> monitor (Maison Dieu) located downwind of the blast, but north of the resident, issued a level 1 dust trigger (PM<sub>10</sub> 10-minute average &gt; 150µg/m<sup>3</sup>) at 2:10pm, the daily average was 27 µg/m<sup>3</sup> and below the criteria. A PM<sub>10</sub> High Volume Air Sampler is located within 150m of the residence and was monitoring particulates during the blast. The monitor reported a result of 24.6µg/m<sup>3</sup>, which is less than the criteria 24hr criteria of 50.0µg/m<sup>3</sup>.</p>

# REPORT | 2023 ANNUAL ENVIRONMENTAL REVIEW

Date	Time	Nature of Complaint	Description	Follow Up Action
1 June 2023	11:28 pm	Blast fume	A blast fume complaint was received by a resident who wished to remain anonymous following a blast fired at 1.18pm earlier that day in West Pit. The resident described the blast as “disgraceful” and also voiced their concern about roads being closed off and the impacts associated with blast fume.	<p>A review of the camera footage confirmed a fume blast which was reviewed and investigated by the Drill &amp; Blast team. The wind direction and wind speed at the time of the blast was 5.6m/s and 264 degrees. Blast fume travelled from WN47LLD02/03A post ignition across HC1 conveyor road and towards Ravensworth Open Cut where it dissipated.</p> <p>Pre-blast environmental assessment ranked the fume and dust risk as possible, and the blast was fired in accordance with blasting permissions for wind speed and direction.</p>
10 June 2023	1:09 pm	Blast dust	A resident called the HVO Hotline following a blast in Cheshunt Pit at 12:56pm. The resident was annoyed that dust from the blast had blown towards them.	<p>A review of camera footage of the blast fired confirmed that a dust plume did travel in the direction of the resident, no fume was observed.</p> <p>The dust plume was not excessive; however it was observed to travel lower to the ground before dispersing. The nearest real-time air quality monitor (Warkworth) recorded a maximum of 21 µg/m<sup>3</sup> in the hour following the blast against a criteria of 50 µg/m<sup>3</sup>.</p> <p>The wind direction and wind speed at 12:55pm was 4.3m/s and 314 degrees. Pre-blast environmental assessment ranked the fume and dust risk as unlikely and blast was fired in accordance with blasting permissions for wind speed and direction.</p>



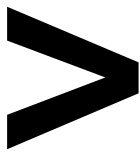
# REPORT | 2023 ANNUAL ENVIRONMENTAL REVIEW

Date	Time	Nature of Complaint	Description	Follow Up Action
10 July 2023	9:34 pm	Lighting	A resident of Long Point called the Community Complaints Hotline regarding a light shining directly into their house.	<p>The lighting plant identified as causing the disturbance was tilted downwards and checked via a phone call by OCE with the resident, but light was still visible by the resident. The same lighting plant was then turned off. The disturbance experienced by the resident was again checked by OCE via a phone call, which verified the disturbance to the resident had ceased.</p> <p>An internal investigation conducted following the complaint resulted in lighting tower operational practices being reviewed and updated.</p>
27 July 2023	5-6 pm	Traffic	<p>A member of the public reported that whilst driving west along the Golden Highway between 5 and 6 pm, another vehicle – a twin-cab utility – began to tailgate their vehicle (&lt; half a car length). Between the eastern entry to HVO South and Comleroi Road (HVO Souths western entry) the offending vehicle sounded their horn more than once, flashed their high beam lights more than once as well as attempted to overtake on one occasion.</p> <p>When the vehicle attempted to overtake, oncoming traffic forced it to resume its original position.</p> <p>The member of the public reported that the offending vehicle turned off in to Comleroi Road. They reported the incident to Singleton Police.</p>	An internal investigation resulted in a site-wide presentation about the importance of road safety whilst travelling to and from site being undertaken at daily HCOMs.



# REPORT | 2023 ANNUAL ENVIRONMENTAL REVIEW

Date	Time	Nature of Complaint	Description	Follow Up Action
9 September 2023	4:08 pm	Blast fume	Following a blast in West Pit at 3:57pm, HVO received a community complaint from a Jerry's Plains Road resident. The resident said they noticed "yellow stuff in the air", but were not impacted.	Review of the live drone footage confirmed a fume from a blast travelled in a south-easterly direction over HVO land and dispersed at height prior to reaching Lemington Road. Wind direction and wind speed at the time of the blast were 4.1m/s and 299 degrees.  Pre-blast environmental assessment, including plume modelling, ranked the dust and fume risk as 'likely', and the blast was fired in accordance with blasting permissions for wind speed and direction.
10 September 2023		Dust	A resident of Mt Thorley contacted the Community Complaints Hotline at 9:06am on 11/9/2023. The resident stated that "yesterday there was dust all day" in the vicinity of their residence.	An environment and community officer analysed previous data from the nearest real-time PM10 monitors (Knodlers Lane and Maison Dieu). The average daily 24hr results from the two monitors were both within compliance limits. This was communicated to the resident via a phone conversation.  The resident did not state where the dust was originating from, nor could they confirm it was coming from HVO when asked, but said the levels were bad due to a morning inversion event. No further action was taken.



## 9.2 | REVIEW OF COMMUNITY ENGAGEMENT

### 9.2.1 | COMMUNICATION

One near neighbour newsletter was sent to HVO’s near neighbours during 2023 providing an overview of:

- Operational updates;
- Community initiatives
- Weed and pest management
- Continuation project updates
- Communication tools –website, environmental monitoring public reporting website and the blast notification SMS alert system
- Available water filter or tank cleaning

### 9.2.2 | CONSULTATION AND ENGAGEMENT ACTIVITIES

Consultation and engagement activities included Community Grants, support of the Jerrys Plains Primary School Redy4school (preschool) programme, apprentice community working bee at Lake Liddell and the Community Consultative Committee.

HVO continued to encourage the community to contact the company in a way that suits the individual community members.

Community information sessions were held at Jerrys Pains on 9 November and Maison Dieu on 11 November to provide information to near neighbours on current operations and the HVO Continuation Project.

### 9.2.3 | COMMUNITY CONSULTATIVE COMMITTEE

The HVO CCC meetings were held in February, May, August, and November 2023. The HVO CCC meet to discuss operations, projects and mine activities. The Committee is comprised of HVO representatives, community members and other key external stakeholders, including Council. The HVO CCC minutes are available on the HVO website ([www.hvo.com.au](http://www.hvo.com.au)). The community is invited to visit the website(s) to learn more about the HVO CCC.

In 2023 CCC members were:

- Dr Colin Gellatly (Independent chairperson)
- Cr Sue George (Singleton Council)
- Dr Neville Hodgkinson
- Mrs Janelle Wenham
- Mr Brian Atfield
- Mrs Di Gee
- Mr Todd Mills



- Mr Michael Wellard
- Mrs Jeanie Hayes
- Mrs Sarah Purser (minute taker)
- HVO General Manager – David Foster
- HVO Environment & Community Manager – Andrew Speechly
- HVO Environment & Community Officer – Nic McLaughlin

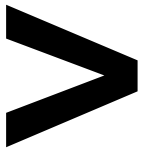
**9.2.4 | COMMUNITY GRANTS**

HVO supports applications for local donations and sponsorships that have a clear community benefit. A total investment of approximately \$162,000 was provided to community organisations in 2023.

Local organisations successful in obtaining funding included:

- Muswellbrook Netball Association – uniforms and court bags for the U12 girls representative team to compete at the state championships;
- Novaskill (Singleton) – mental health first aid training for Singleton community;
- Aberdeen Pre-school – new fence for social area;
- Kurri Kurri Minor Rugby League Club – upgrade of safety and training equipment;
- Singleton Heights Pre-school – physical skill development programme through ball sports;
- Singleton Neighbourhood Centre – food programme at Singleton Open Door;
- Singleton Mountain bike Club – race timing equipment;
- Witmore – Return and Earn recycling programme;
- Muswellbrook Chamber of Commerce and Industry – The Great Cattle Dog Muster;
- Rotary Club of Singleton on Hunter – The Singleton Art Prize;
- Business Singleton – Singleton Business Awards 2023;
- Carrie’s Place Domestic Violence and Homeless Services – household appliances for a temporary accommodation facility;
- Denman Public School – colour run fundraiser to help raise money towards fixing school basketball / netball court;
- Whittingham Hall – replace kitchen flooring;
- Jerrys Plains School of Arts – replace and upgrade stage curtains;
- Australian Native Bee Association (Hunter Branch) – purchase of bee hives, native bee colonies, native bee (husbandry) books and native beehive splitting workshop;
- Muswellbrook South Public School – colour run to help raise funds for the Where There’s a Will Foundation.

Five partnership mining trucks are operated for the mine and for local charities. The trays of the trucks have been painted in the colours of Westpac Rescue Helicopter Service, Hunter Prostate Cancer Alliance, Type



1 Foundation, Singleton Family Support and Hunter Breast Cancer Foundation. The charities receive an agreed donation for every load the trucks haul plus other fundraising support throughout the year. These charities received \$32,500 in total for the 2023 calendar year.

HVO delivered \$5,000 in gift vouchers to Singleton Family Support and the Salvos in time for Christmas. Many employees donated back the gift voucher HVO gave them for Christmas and HVO matched their generosity. HVO also provided St Vincent de Paul food items that our staff put under HVO Christmas trees.

Two of our trucks wore moustaches during Movember to raise awareness about men’s health and \$5,430 for the cause. Coffee carts and a hard hat sticker campaign raised \$10,000 for the Mark Hughes Foundation.

### 9.2.5 | HVO CONTINUATION PROJECT

Community members and stakeholders have been consulted through each step of the HVO Continuation Project. Community feedback has helped to design and refine the proposal and our plans to minimise and manage social and environmental impacts.

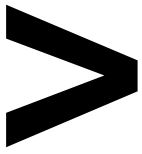
HVO used a variety of tools to provide information and gather feedback consistent with the State Significant Development Engagement Guidelines 2021, Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 and the Secretary’s Environmental Assessment Requirements (SEARs) issued by DPHI.

Engagement has also included the following:

- Project newsletters for the local community;
- Community information sessions in Jerrys Plains, Maison Dieu and Long Point;
- Other community and stakeholder meetings;
- Consultation with HVO’s Community Consultative Committee;
- Information on the HVO website;
- Consultation with 33 RAPs; and
- Responding to email and phone enquiries.

The HVO Continuation Project Environmental Impact Assessment was placed on public exhibition by DPHI February 2023. HVO reviewed all submissions and in November 2023 submitted a Submissions Report and an Amendment Report to DPHI.

The Federal Government will independently assess the Project in accordance with the Environment Protection and Biodiversity Conservation Act 1999.



## 10 | INDEPENDENT AUDIT

The last Independent Environmental Audit (IEA) was undertaken in November 2022. This audit was undertaken against the conditions of both Project Approval PA 06\_0261 (as modified) and DA 450-10-2003 (as modified). The audit also assessed compliance with other licences and approvals including mining leases and EPL 640.

RPS AAP Consulting Pty Ltd (RPS) were engaged and endorsed by DPHI as suitably qualified, independent experts to undertake the audit. The timeframe for the audit was from 2 December 2019 to 30 November 2022. The site inspection component of the audit was undertaken over three days between 28 and 30 November 2022.

The audit report and HVO’s response to the auditor’s recommendations were submitted to the DPHI on 23 February 2023.

The audit report was revised and resubmitted June 2023 to address comments from DPHI.

The audit identified 14 non-compliances with PA 06\_0261 and DA 450-10-2003:

- 6 non-compliances associated with PA 06\_0261
- 8 non-compliances associated with DA 450-10-2003

These findings, along with the auditor’s recommendation and HVO’s response to these recommendations, are summarized in **Table 10-1**. The next IEA is due in 2025. The 2022 IEA can be downloaded from the HVO Website.





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Table 10-1: Independent Audit Recommendations

Ref	Recommendation	HVO Response	Due Date
<b>HVO South – PA 06_0261 Non-Compliance Recommendations</b>			
S2 C2	No Further Action Required	No Further Action Required	N/A
S2 C2A	Refer S2 C2	No Further Action Required	N/A
S3 C2	Reference in Table 9 of the Monthly Environmental Monitoring Reports should be updated to reference LA1, 1-minute criteria Where a tonality penalty has been applied, the monthly report should include discussion and clarification on whether this constitutes an exceedance or is attributable to other sources.	HVO will amend future Monthly Environmental Monitoring Reports to included updated reference HVO will amend future Noise Reports to include discussion and clarification regarding observed tonality penalties	Complete
S2 C7	No Further Action Required	No Further Action Required	N/A
S3 C15	Ensure that the blasting schedule on the HVO website is maintained.	Issue with the Blasting Schedule link from the “Contacts” page has been rectified	Complete
S3 C15	It is recommended that management plans, and other necessary documents include a table itemising the matters raised during consultation with identified parties, and description of the resolution of these matters.	HVO will amend and include in future revised management plans and other necessary documents a table itemising the matters raised during consultation with identified parties, and description of the resolution of these matters.	Complete*
S3 C18	Recommend updating Section 1, Table 1 to Table 3 of the BMP to ensure correct references in column 3 (“Section of BMP which addresses this requirement”, “Where Commitment is addressed”, “Where Condition is addressed”).	HVO will amend in the next revision of the Blast Management Plan.	Complete* The BMP was updated and resubmitted
S3 C19	It is recommended that operators are provided with refresher training to ensure awareness of these TARPs and to ensure more proactive management of wheel generated and plant-generated dust.	HVO will roll out refresher training to operators to ensure awareness of Dust TARPS.	Complete



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Ref	Recommendation	HVO Response	Due Date
S3 C25	Repair the eroded batter to Dam 37S or redirect flow to the existing stabilised entries. Sediment should then be removed from the basin to restore capacity	HVO will include repair works in future works programs to ensure completion. HVO will undertake a review of current sediment storage capacity compared to dam design criteria to determine whether further desilting is required.	20/06/2024
S3 C27	Version 3.4 of the WMP has been issued to the secretary and is awaiting approval. Review the contents of the WMP to reflect the audit findings when next updated.	HVO will amend in the next revision of the Water Management Plan.	Complete* WMP was resubmitted.
S3 C58	Ensure that waste containers have lids fitted and/or are stored undercover to limit additional generation of contaminated liquid.	HVO will undertake a site inspection to ensure lids are fitted to waste containers on bunded pallets that are not undercover and reinforce this expectation with a site communication.	Complete
<b>HVO North – DA 450-10-2003 Non-Compliance Recommendations</b>			
S2 C2	No Further Action Required	No Further Action Required	N/A
S2 C2A	Refer S2 C2	No Further Action Required	N/A
S3 C2	Where a tonality penalty has been applied, the monthly report should include discussion and clarification on whether this constitutes an exceedance or is attributable to other sources.	HVO will amend future Noise Reports to include discussion and clarification regarding observed tonality penalties	Complete
S3 C4A	It is recommended that operators are provided with refresher training to ensure awareness of these TARP's and to ensure more proactive management of wheel generated and plant-generated dust	HVO will roll out refresher training to operators to ensure awareness of TARPS	Complete
S3 C7	Reference in Table 9 of the Monthly Environmental Monitoring Reports should be updated to reference LA1, 1-minute criteria	HVO will amend future Monthly Environmental Monitoring Reports to included updated reference	Complete



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Ref	Recommendation	HVO Response	Due Date
S3 C10	Recommend updating Section 8.1.1, Table 8-1 to reference AS1055- 2018 (supersedes AS1055-1997), and include reference to NSW EPA Approved methods for the measurement and analysis of environmental noise in NSW, 2022.	HVO will amend in the next revision of the Noise Management Plan.	Complete 4/07/2023*
S3 C19	Recommend updating Section 1, Table 1 to Table 3 of the BMP to ensure correct references in column 3 (“Section of BMP which addresses this requirement”, “Where Commitment is addressed”, “Where Condition is addressed”).	HVO will amend in the next revision of the Blast Management Plan.	Complete*
S3 C20	No Further Action Required	No Further Action Required	N/A
S3 C21	No Further Action Required	No Further Action Required	N/A
S3 C27	Version 3.4 of the WMP has been issued to the secretary and is awaiting approval. Review the contents of the WMP to reflect the audit findings when next updated.  Repair the inlet to Dam 5N to stop ongoing sedimentation, remove sediment from the dam, and confirm the capacity of Dam 5N and Dam 2N meets industry guidelines.	HVO will amend in the next revision of the Water Management Plan.  HVO will include repair works in future works programs to ensure completion.  HVO will undertake a review of current storage capacity in relation to Bluebook Standard to confirm whether current storage capacities are sufficient or additional capacity is required.	Complete*  Complete  Complete
S3 C28A	No Further Action Required	No Further Action Required	N/A

\* Date indicates when Management Plans are submitted for Department approval. Timing of approval and finalisation of the plan with the changes is outside of HVO’s control.



## 11 | INCIDENTS AND NON-COMPLIANCES

During 2023 there were 14 incidents that required reporting to DPHI. These were related to air quality and blast fume and are summarised below.

### Cheshunt East PM<sub>10</sub> Exceedance – 6 March 2023

HVO recorded a 24-hour average of 61.1 µg/m<sup>3</sup> at the Cheshunt East TEOM, above the HVO North consent criteria of 50 µg/m<sup>3</sup>. The maximum HVO contribution to this exceedance was calculated to be 20.3 µg/m<sup>3</sup>. HVO considers that all reasonable and feasible avoidance and mitigation measures were taken in accordance with the site AQGGMP to manage particulate emissions on 6 March 2023. HVO's contribution was ~30% therefore significant and considered non-compliant with the consent condition.

### Level 4B Blast Fume Event – 9 September 2023

HVO initiated a blast in the Mitchell Pit at 3:57pm on Saturday 9 September 2023. Blast fume was identified post initiation and ranked Level 4B in accordance with the AEISG rating scale. Blast fume travelled from the initiation point post ignition in a south-easterly direction across HVO land and dispersed at height prior to reaching Lemington Road. The blast was fired in accordance with blasting permissions for speed and direction.

A change to the planned explosives type was made in response to reduce the risk of water degradation of the explosives. This more dense product increased the Powder Factor of the blast. The resultant fume generation was likely caused through incomplete explosives combustion given the high Powder Factor and low-strength ground material being blasted.

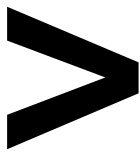
An amendment was made to the pre-blasting checklist to identify and assess changes to blast design to prevent a recurrence.

### Cheshunt East PM<sub>10</sub> Exceedance – 20 September 2023

The Cheshunt East HVAS recorded a result of 86.4 µg/m<sup>3</sup> on 20 September 2023, above the HVO North consent total criteria of 50 µg/m<sup>3</sup>. The maximum HVO contribution to these exceedances was calculated to be 44.9 µg/m<sup>3</sup>. HVO considers that all reasonable and feasible avoidance and mitigation measures were taken in accordance with the site AQGGMP to manage particulate emissions on this day. HVO's contribution was >30% therefore significant and considered non-compliant with the consent condition.

### Cheshunt East PM<sub>10</sub> Exceedance – 26 September 2023

The Cheshunt East HVAS recorded a result of 50.3 µg/m<sup>3</sup> on 26 September 2023, above the HVO North consent total criteria of 50 µg/m<sup>3</sup>. The maximum HVO contribution to these exceedances was calculated to be 15.5 µg/m<sup>3</sup>. HVO considers that all reasonable and feasible avoidance and mitigation measures were taken in accordance with the site AQGGMP to manage particulate emissions on these days. HVO's contribution towards this event was minor and not considered to be a non-compliance attributable to HVO North.



**Jerrys Plains PM<sub>10</sub> Exceedance – 2 October 2023**

The Jerrys Plains TEOM recorded a total result of 63.6 µg/m<sup>3</sup> for 2 October 2023 against the total criteria of 50 µg/m<sup>3</sup>. The maximum HVO contribution to this result was calculated to be 9.0 µg/m<sup>3</sup>. HVO considers that all reasonable and feasible avoidance and mitigation measures were taken in accordance with the site AQGGMP to manage particulate emissions. HVO’s contribution towards this event was minor and not considered to be a non-compliance attributable to HVO North.

**Cheshunt East PM<sub>10</sub> Exceedance – 19 December 2023**

The Cheshunt East HVAS recorded a result of 63.8 µg/m<sup>3</sup> on 19 December 2023, above the HVO North consent criteria of 50 µg/m<sup>3</sup>. The maximum HVO contribution to this exceedance was calculated to be 14.6 µg/m<sup>3</sup>. It was noted that there was smoke from several bushfires impacting on air quality in the upper Hunter region on 18-19 December 2023.

HVO considers that all reasonable and feasible avoidance and mitigation measures were taken in accordance with the site AQGGMP to manage particulate emissions on the day. HVO’s contribution towards this event was minor and not considered to be a non-compliance attributable to HVO North.

**DL30 and Warkworth Depositional Dust Exceedances – 2023 Annual Average**

The DL30 and Warkworth monitoring locations exceeded the annual average insoluble matter deposition rate criteria of 4 g/m<sup>2</sup>/month (HVO North only) during 2023. However, all results were below the maximum insoluble solids incremental increase criterion of 2 g/m<sup>2</sup>/month and hence compliant with criteria.

An external specialist investigation determined the exceedances to be due to local sources of dust in close proximity to the monitors. The elevated levels at DL30 and Warkworth were assessed to estimate the maximum contribution from HVO North to the annual results. The HVO North maximum contribution to the incremental increase at DL30 was 0.4 g/m<sup>2</sup>/month, and 0.1 g/m<sup>2</sup>/month at Warkworth. These maximum concentrations were not deemed to have caused the exceedances. The monitors are located in close proximity to HVO South, on the opposite side of HVO North. Given the significant separation distances between HVO North and these monitors, HVO North’s contribution to these monitoring sites would always be low and likely indiscernible from background concentrations and the influences of other mines. Therefore, HVO North could only reasonably have a tangible impact at its nearest monitors which include D118 and D119.

**Warkworth TSP Exceedance – 2023 Annual Average**

The Warkworth TSP monitoring location recorded an annual average of 130.8 µg/m<sup>3</sup> compared to a criteria of 90 µg/m<sup>3</sup>.

Contributions at the TSP monitors were estimated to be the 24-hour concentrations minus an estimated background level on the corresponding day. The background level is considered to be the level which excludes the contribution from HVO but may include the influence of other sources, including other mines, localised sources, or regional sources of background dust. For the Warkworth monitor, which is often downwind of HVO South and a neighbouring mine concurrently, the daily contribution is considered to include both mines. In order to determine the contribution from HVO South alone, the combined mining increment was scaled by the proportion of time the monitor was downwind of HVO South relative to the total time the monitor was downwind of both mines during each 24-hour period.

Further methodology for determining HVO contribution is presented in Section 2.7.1 of **Appendix A**. This investigation method has determined the contribution of HVO South to the Warkworth annual average to be



51.9 µg/m³. HVO’s contribution was >30% therefore significant and considered non-compliant with the consent condition.

**Warkworth and Hunter Valley Glider Club (HVGC) PM<sub>10</sub> Exceedances – 2023 Annual Average**

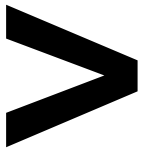
Annual average PM<sub>10</sub> levels were above the impact assessment criteria of 25 µg/m³ for HVO South at the Hunter Valley Gliding Club (HVAS) (31.7 µg/m³) and Warkworth (TEOM) (32.5 µg/m³) during 2023. These exceedances were investigated by a specialist consultant (see **Appendix A**). The investigation estimated maximum incremental contribution to PM<sub>10</sub> level from HVO South to be a minor contribution to the overall result (3.4 µg/m³ for Warkworth, 12.8 µg/m³ for HVGC). There are no privately owned residences near the Warkworth or Glider Club monitors and HVO has a Concessions and Mitigation Agreement with the Gliding Club with respect to air quality levels when the facilities are in use. Refer to Section 2.6.1 of **Appendix A** for more information.

**Maison Dieu and Kilburnie South PM<sub>2.5</sub> Exceedances – 2023 Annual Average**

Annual average PM<sub>2.5</sub> was above the annual average criteria of 8 µg/m³ at Maison Dieu (11.1 µg/m³) and Kilburnie South (13.3 µg/m³) for the reporting period. While HVO’s contribution is not calculated to be significant, the elevated total levels are considered to be anomalously high and are not consistent with other regional PM<sub>2.5</sub> monitors or expected ratios of co-located PM<sub>2.5</sub> monitors. PM<sub>2.5</sub> levels recorded have been investigated throughout the year, including:

- Monitoring locations have been inspected multiple times to identify any significant local PM<sub>2.5</sub> sources, with none identified.
- Calculation of PM<sub>10</sub>:PM<sub>2.5</sub> ratios for monitoring equipment for co-located units. The ratio in the Hunter Valley is typically 0.3 to 0.4. Ratios measured at HVO range from 0.43 to 0.62.
- Comparison to levels recorded by new EBAMs installed in March 2023.

It is believed that the source of the high readings is due to the high-volume air sampler monitoring method. HVO engaged an air quality consultant to review the air quality monitoring network. The review recommended the implementation of real-time PM<sub>2.5</sub> monitoring at Maison Dieu and Kilburnie South. During March 2023, HVO installed Beta Attenuation Mass Monitors (EBAMs) which is an equivalent type to that used in the EPA’s Upper Hunter Air Quality Monitoring Network. The use of the EBAMs is pending DPHI approval of the AQGG Management Plan. The aim of these monitors is to determine the potential contribution of HVO South to annual average PM<sub>2.5</sub> levels recorded at HVO HVAS monitors. Given that the results recorded at the Maison Dieu and Kilburnie South HVAS monitors appears to be implausibly high, monitoring data at these locations have been used in order to estimate HVO South’s increment to the recorded levels.



## 12 | ACTIVITIES TO BE COMPLETED IN 2024

### 12.1 | APPROVALS

HVO will continue to progress its application for the HVO Continuation Project.

### 12.2 | NOISE

Noise management improvements identified for implementation in 2024 include:

- Sound Power Level testing of various heavy mining equipment,
- Install replacements for ageing Barnowl monitors; and
- Fitting of sound attenuation to new heavy mining equipment brought to site.

### 12.3 | AIR QUALITY

Air quality management improvements identified for implementation in 2024 include:

- Aerial seeding of overburden that is temporarily unavailable for rehabilitation where available,
- Implement recommendations from a review of the air quality monitoring program,
- Upgrading watercart fill points for reliability and improve filling times,
- CHPP dust suppression upgrades,
- Implement new real-time monitoring data interface; and
- Trial chemical dust suppression effectiveness on the North Void Tailings facility

### 12.4 | BLASTING

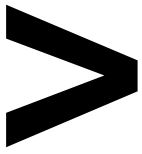
HVO will continue to manage blasting activities in 2024 in accordance with the *Blast Management Plan*.

HVO will conduct an independent review of blast fume generation and implement findings where required to mitigate frequency of blast fume.

### 12.5 | ABORIGINAL AND HISTORIC HERITAGE

Improvements to historic heritage identified for implementation in 2024 include completing Phase 2 of the Historic Homestead Project. This will include the preparation of detailed costings and budget for the works identified in the 2023 Phase 1 Survey and Condition Reports for the Archerfield, Wandewoi and Carrington Stud homesteads. In addition the project will prepare long term maintenance and management plans for each homestead complex.

Pending approval of the Wilton and Mitchell extension AHIP application submitted to Heritage NSW on the 4 December 2023 (AHIP #5219), HVO will commence salvage for the Wilton and Mitchell Pit extension in Q1 2024.



HVO also plan to submit an application for a second AHIP in 2024. This AHIP is titled “Mitchell Pit South” and is located due south of the Wilton & Mitchell Pit extension. If the AHIP application is approved this will result in a second round of aboriginal cultural heritage salvage activity in this area.

## 12.6 | WATER

Improvements to mine water management in 2024 include:

- Install sediment dams ahead of mining in Mitchell Pit,
- Complete construction of Dam15N enlargement project,
- Detailed engineering and scoping of water containment projects beyond 2024,
- Continue geotechnical investigations and engineering for barrier wall installation or alternative method to control seepage from the North Void TSF,
- Ongoing upgrade of internal water transfer pipelines, pumping infrastructure, and system controls and monitoring; and
- Prepare a surface water management plan for the Cheshunt Dump life of mine

## 12.7 | REHABILITATION

During the next reporting period key focus areas for HVO will be:

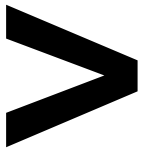
- Completion of annual rehabilitation target of 69 ha of new rehabilitation,
- Continuation of Section 240 rehabilitation maintenance plan including progression of 88.5ha of historic cover crop management areas to final target land use,
- Completion of remediation works at the East TSF rehabilitation area; and
- Undertake contour repair works on the WOOP dump in line with the detailed design for the remainder of the contours.

## 12.8 | TAILINGS STORAGE FACILITIES

The following tailing storage facility activities are planned for 2024:

- Continuation of management activities for the North Void TSF, focusing on monitoring, dewatering and surface strength development,
- Review & Update of all tailings dam Operational and Maintenance Manuals,
- Undertake capping activities on Bob’s Dump TSF; and
- Commence Geochemical sampling analysis on tailings and exploration drill holes

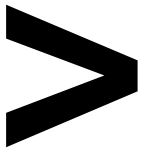




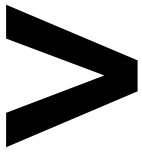
## 12.9 | STAKEHOLDER ENGAGEMENT

The following stakeholder engagement activities are planned for 2024:

- Hosting four CCC meetings,
- Implementing two rounds of the HVO Community Grants Fund,
- Undertaking an improvement project in the community with HVO Apprentices,
- Developing and distributing two community newsletters,
- Conducting two Community Information sessions (at Jerrys Plains and Maison Dieu),
- Hosting a School Site Tour; and
- Stakeholder engagement activities related to the HVO Continuation Project



APPENDIX A: ANNUAL AIR QUALITY REVIEW



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APPENDIX B: ANNUAL GROUNDWATER REVIEW

## APPENDIX C: HVO S240 REHABILITATION MAINTENANCE SCHEDULE

<b>Carrington GMD</b>		<b>HVO WOOP Dump</b>
<small>HVOCAR201201, HVOCAR200902, HVOCAR201301, HVOCAR201202, HVOCAR201401</small>		
Area (ha)	88.5 ha	52.94 ha
HVO Pit	Carrington Pit	West of Riverview Pit
RMP Final Land Use	Final Landform Pasture/Woodland	Final Landform Woodland
Polygon Centroid Easting	309682.07	308666.66
Polygon Centroid Northing	64029668.841	6399187.34
Slope (minimum)	0 deg	10.1 deg
Slope (maximum)	15 deg	15.6 deg
Primary Aspect	Northwest	East
Secondary Aspect	N/A	West
Landform Surface Preparation	Boomspray Surface Vegetation Soil Aeration	Slash surface vegetation Repair Contours and Complete Drainage Works Soil Aeration
Growth Medium Surface Preparation	Aerate Seed	Aerate Seed



APPENDIX D: 2023 HERITAGE COMPLIANCE INSPECTION AUDITS