BHP

# Carrapateena Operation

# PEPR Compliance Report 2024

## 28 March 2025

| | |
|---|---|
| ML 6471 | MINERAL LEASE |
| MPL 149 | AIRSTRIP AND WORKERS' ACCOMMODATION VILLAGE, ACCESS ROAD AND ANCILLARY INFRASTRUCTURE |
| MPL 152 | WESTERN INFRASTRUCTURE CORRIDOR |
| MPL 153 | EASTERN RADIAL WELLFIELD |
| MPL 154 | SOUTHERN ACCESS ROAD AND RADIAL WELLFIELD |
| MPL 156 | NORTHERN WELLFIELD |

# Acknowledgements

Acknowledgements go to all staff across the Carrapateena Operation for their contributions to the overall report and for undertaking all activities in a safe and effective manner. We also acknowledge the Kokatha People for their ongoing support and assistance provided.

# Document control

## CA-0000-ENV-REP-1051

| Version | Description | Author | Approval | Date |
|---|---|---|---|---|
| 1 | PEPR Compliance Report 2024 | Luke Boehm<br>Specialist Environment<br>Trent Anderson<br>Specialist Environment<br>Josh Allen<br>Superintendent Environment Operations | Sally Lamb<br>Manager Asset Environment Approvals and Sustainability | 28/03/2025 |

# Executive summary

BHP Carrapateena submits this Program for Environment Protection and Rehabilitation (PEPR) Compliance Report for the period January 2024 to December 2024 (Compliance Report); as required by the *Mining Act 1971* (SA) and associated regulations and conditions of the Carrapateena Mining Lease (ML 6471), and Miscellaneous Purposes Licences (MPL 149, MPL 152, MPL 153, MPL 154 and MPL 156). This Compliance Report demonstrates compliance with the ML and MPL conditions, Environmental Outcomes and Outcome Measurement Criteria committed to in the PEPR. This Compliance Report has been completed in general accordance with the Determination Terms of Reference 009 (TOR009) – Mining Compliance Reports.

The tenement MPL 149 was granted on 15 September 2017, tenements ML 6471, MPL 152, MPL 153 and MPL 154 were granted on 3 January 2018, and MPL 156 was granted 11 December 2018.

PEPR2017/028 was approved on 15 September 2017 for MPL 149. PEPR2018/019 was approved on 5 July 2018. PEPR2018/019 covered all works proposed in the Mining Lease Proposal and included ML 6471, MPL 152, MPL 153 and MPL 154. PEPR2019/001 was approved 13 February 2019 for MPL 156.

MPEPR2019/026 was approved on 12 November 2020, which consolidated the three aforementioned PEPRs into a single document encompassing ML 6471, MPL 149, MPL 152, MPL 153, MPL 154 and MPL 156. MPEPR2019/026 was superceded following approval of MPEPR2024/009 on 1 October 2024, which continues to incorporate ML 6471, MPL 149, MPL 152, MPL 153, MPL 154 and MPL 156. This Compliance Report addresses compliance for tenements listed under MPEPR2024/009.

On 2 May 2023 BHP Group Limited completed the acquisition of OZ Minerals Limited. The Carrapateena operation has been developed and operated by OZM Carrapateena Pty Ltd and OZ Minerals Carrapateena Pty Ltd, wholly owned by OZ Minerals Limited. The Carrapateena site has been integrated into the BHP Copper South Australia (SA) asset, also incorporating BHP's Prominent Hill mine, Olympic Dam mine and Oak Dam exploration site. Copper SA forms part of BHP's Australian business portfolio, which also includes Western Australia Iron Ore, Western Australia Nickel, Coal, Mt Arthur Coal and Operations Services.

At Carrapateena, Crusher Station 2 was successfully commissioned in 2024 enabling higher productivity from the sub-level cave, with record ore mined at 5.2 Mt in FY24 (4.6 Mt FY23), which enabled milling throughput to increase to record rates of 5.2 Mt (4.7 Mt in FY23). Development of the mine decline progressed in 2024 to support future block cave mining of the bottom half of the Carrapateena orebody.

Throughout the reporting period, four non-compliances were recorded which triggered regulatory reporting to the Government of South Australia's Department for Energy and Mining (DEM). Non-compliances which were reported to DEM were subsequently rectified or are currently being addressed.

# Contents



## Appendices

# List of tables



# List of figures

# 1 Introduction

BHP Carrapateena submits this Program for Environment Protection and Rehabilitation (PEPR) Compliance Report (Compliance Report) as required by the *Mining Act 1971* (SA) (Mining Act) and associated Regulations, conditions of the Carrapateena Mining Lease (ML) (ML 6471) and Miscellaneous Purposes Licences (MPL) (MPL 149, MPL 152, MPL 153, MPL 154 and MPL 156). This Compliance Report demonstrates compliance with the ML and MPL conditions and Environmental Outcomes committed to in the approved PEPR for the associated tenements (BHP 2024a). Proponent details are provided in Table 1.1.

**Table 1.1 | Proponent details**

| | | | |
|---|---|---|---|
| Mine name | Carrapateena | ML 6471<br>MPL 149<br>MPL 152<br>MPL 153<br>MPL 154<br>MPL 156 | MPEPR2024/009<br>Date approved: 01/10/2024 |
| Lease holder | OZ Minerals Carrapateena Pty Ltd (42%) and OZM Carrapateena Pty Ltd (58%) | | |
| Operator | BHP | | |
| Mining lease approval date | 3 January 2018 | | |
| Tenements | • ML 6471 Mineral Lease<br>• MPL 149 Airstrip, Workers' Accommodation Village, Access Road and Ancillary Infrastructure<br>• MPL 152 Western Infrastructure Corridor<br>• MPL 153 Eastern Radial Wellfield<br>• MPL 154 Southern Access Road and Radial Wellfield<br>• MPL 156 Northern Wellfield | | |
| Approval document | PEPR: MPEPR2024/009 | | |
| Ministerial determination | The Compliance Report has been completed in general accordance with the Determination Terms of Reference 009 (TOR 009) Mining Compliance Reports (DEM 2020) and associated Mineral Regulatory Guideline (MG3) (DEM 2021) | | |
| Site location details | Located approximately 160 km north of Port Augusta, in close proximity to the Carrapateena Arm on the western boundary of Lake Torrens. Nearby townships include Woomera (approximately 65 km west) and Roxby Downs (approximately 90 km north-west). Refer to Figure 1.1. | | |
| Site contact | Elton Peebles, General Manager, Carrapateena | | |
| | Email | elton.peebles@bhp.com | |
| | Phone number | 08 8422 3713 | |
| Reporting period | January 2024 – December 2024 | | |
| Date of compliance report preparation | March 2025 | | |

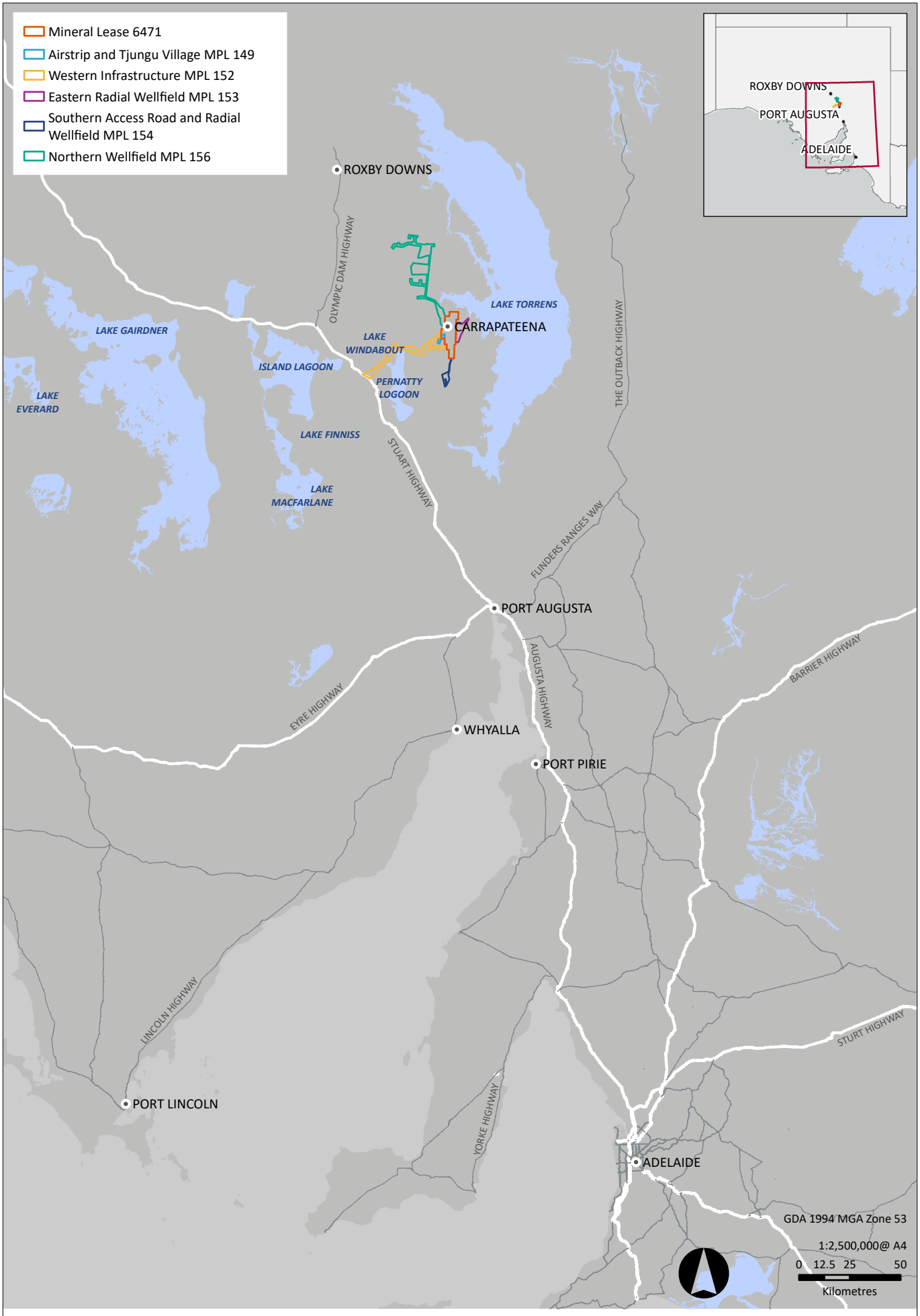


**Figure 1.1 | Operation location**

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# 2 Declaration of accuracy

| Person responsible for the preparation of the Compliance Report | | | |
|---|---|---|---|
| This document has been prepared to fulfil the requirement under sub-regulation 77(3)(b) of Mining Regulations 2020 (SA) for the tenements listed herein. The information contained in this report is to the best of my knowledge a true and accurate record of the mining activities and compliance status for the reporting period. | | | |
| **Name** | **Position or Agent** | **Signature** | **Date** |
| Anna Wiley | Asset President Copper South Australia |  | 28 March 2025 |
| **Company/Agent** | | | |
| Report prepared by tenement holder | | | |
| **Summary of steps undertaken to review the compliance to ensure report accuracy** | | | |
| This report has been prepared by the Carrapateena Environment Team. Information and judgment pertaining to compliance in the areas of ecology, air quality and radiation have been provided by external subject matter experts. | | | |

# 3 Public liability insurance

Details of the public liability insurance for the Carrapateena Operation are provided in Table 3.1. A copy of the cover note for the public liability insurance and/or a copy of the policy of insurance is included in Appendix A.

**Table 3.1 | Public liability insurance details**

| Certificate of currency general liability | |
|---|---|
| Principal insured | BHP Group Limited and all subsidiaries' companies and all/or related and/or affiliated and/or controlled, managed, administered and associated companies or corporation and/or related joint ventures and/or partnerships and other entities. |
| Start date | 1 July 2024 |
| Finish date | 30 June 2025 |
| Limits of liability | US$25,000,000 |
| Company/Agent | |
| Report prepared by tenement holder | |
| Summary of steps undertaken to review the compliance to ensure report accuracy | |
| This report has been prepared by the Carrapateena Environment Team. Information and judgment pertaining to compliance in the areas of ecology, air quality and radiation have been provided by external subject matter experts. | |

# 4 Tenements

A summary of the existing tenements for the Carrapateena Operation is provided in Table 4.1. The locations of these tenements are shown on Figure 4.1.

**Table 4.1 | Tenement summary**

| Tenement | Tenement number | Tenement grant date | Tenement expiry date | Status of currency |
|---|---|---|---|---|
| Carrapateena Mining Lease | ML 6471 | 3 January 2018 | 2 January 2039 | Current |
| Airstrip, Workers' Accommodation Village, Access Road and Ancillary Infrastructure | MPL 149 | 5 July 2017 | 4 July 2038 | Current |
| Western Infrastructure Corridor | MPL 152 | 3 January 2018 | 2 January 2039 | Current |
| Eastern Radial Wellfield | MPL 153 | 3 January 2018 | 2 January 2039 | Current |
| Southern Access Road and Radial Wellfield | MPL 154 | 3 January 2018 | 2 January 2039 | Current |
| Northern Wellfield | MPL 156 | 11 December 2018 | 2 January 2039 | Current |

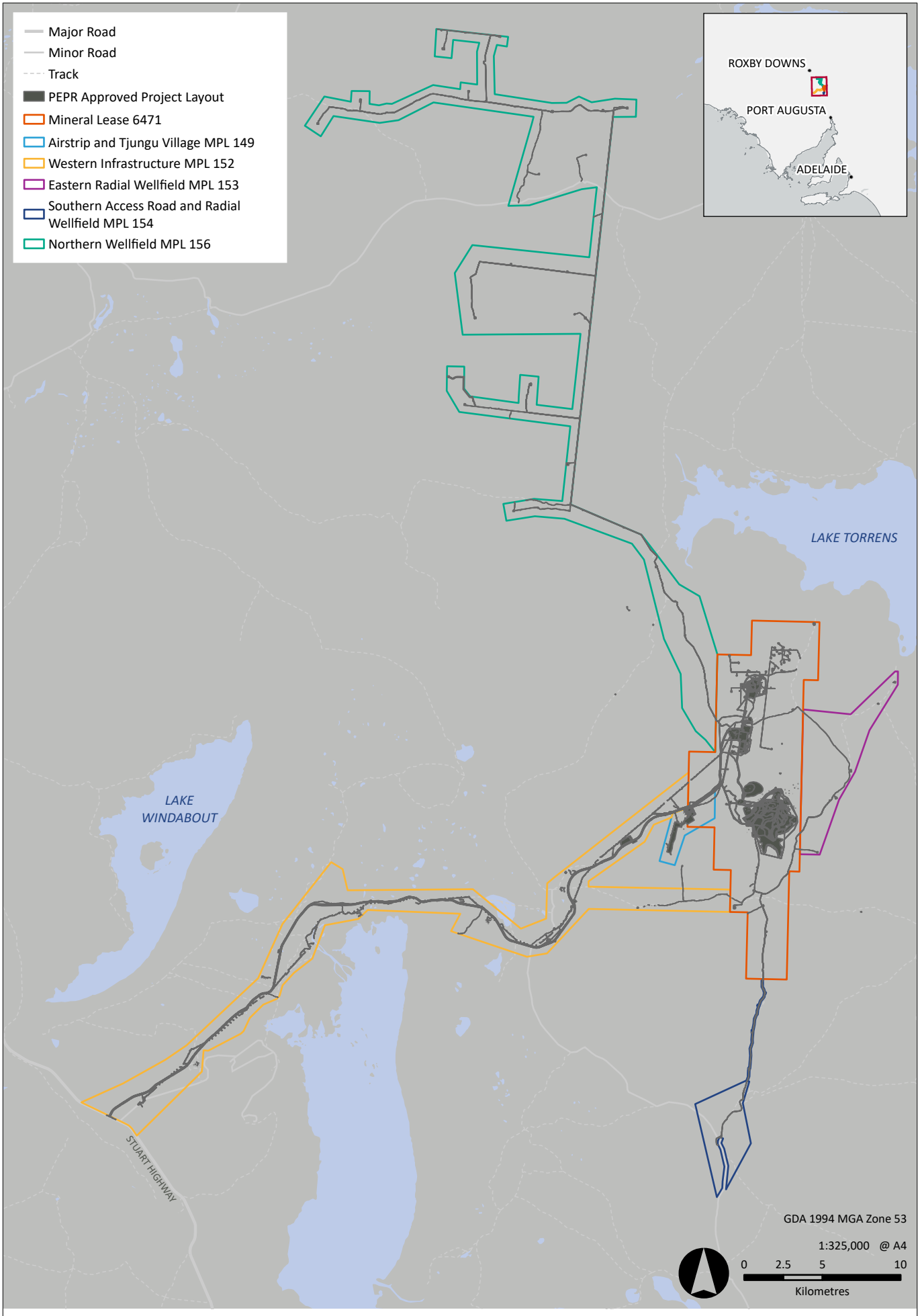


**Figure 4.1 | Carrapateena Operation showing all tenement boundaries covered by approved PEPR**

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# 5 Other approvals, licences, permits, waivers, native title and agreements

| Approval document | Regulatory authority or other | Supporting document | Relevant outcome or tenement condition | Status of currency |
|---|---|---|---|---|
| *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)<br>CA-APR-NOT-1008 Approval of a controlled action Ref: 2017/7895 | Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) | CA-ENV-PLN-1009 Biodiversity Management Plan<br>CA-ENV-PLN-1004 Native Vegetation Management Plan<br>CA-0000-ENV-PLN-1004 EPBC Offset Management Plan | NV1, NV2, NV3, WP1, WP2, WP3, WP6, NF1, EPBC1, EPBC2, EPBC3 | Expires on<br>31 December 2056 |
| Government of South Australia's Environment Protection Authority (EPA)<br>• CA-ENV-LIC-1001 Licence to Undertake Prescribed Activities (Ref: 50463)<br>• 1(1) Chemical storage and warehousing facilities<br>• 1(2)(a)(i) Chemical works (inorganic)<br>• 2(1) Abrasive blasting (mobile)<br>• 2(5) Concrete batching works<br>• 2(9) Mineral works<br>• 3(4)(b) Wastewater treatment works (outside MLR WPA)<br>• 3(5)(a) Activity producing listed waste<br>• 7(7) **Extractive industries**<br>• 8(2)(a) Fuel burning not coal or wood<br>• 8(6a)(b) Desalination plant that discharges wastewater to a wastewater lagoon | EPA | CA-ENV-REP-1023 | LS1, LS2, LS3, LS4 | Expires on<br>30 April 2028 |
| Radiation Licence<br>CA-APR-LIC-1010 Carry Out Mining or Mineral Processing – Construction (Ref: 51113) | EPA | CA-ENV-PLN-1002 Radiation Management Plan<br>CA-ENV-PLN-1003 Radioactive Waste Management Plan | RAD1, RAD2, RAD3, RAD4 | Expires on<br>31 March 2025 |
| Registration and Approval of a Risk Management Plan under the *Safe Drinking Water Act 2011* (SA)<br>OZ Minerals Carrapateena Pty Ltd (Exploration Village) | Department for Health and Wellbeing (SA Health) | CA-4120-OHS-LET-0001<br>CA-6920-ENV-PLN-003 Drinking Water Risk Management Plan | NA | For the life of the system |
| Registration and Approval of a Risk Management Plan under the *Safe Drinking Water Act 2011* (SA)<br>OZ Minerals Carrapateena Pty Ltd (Tjungu Village) | Department for Health and Wellbeing (SA Health) | CA-APR-LET-1112<br>CA-6920-ENV-PLN-003 Drinking Water Risk Management Plan | NA | For the life of the system |
| Registration and Approval of a Risk Management Plan under the *Safe Drinking Water Act 2011* (SA)<br>OZ Minerals Carrapateena Pty Ltd (Mineral Processing Plant (MPP)) | Department for Health and Wellbeing (SA Health) | CA-APR-LET-1171 | NA | For the life of the system |
| Wastewater Treatment Plant (WWTP) Licence 2013-04020<br>Exploration Camp WWTP | Department for Health and Wellbeing (SA Health) | CA-7130-ENV-LET-0008 | NA | For the life of the system |
| WWTP (Licence WWI-10557)<br>Exploration Camp Phase 2 Part A Upgrade | Department for Health and Wellbeing (SA Health) | CA-APR-LET-1139 | NA | For the life of the system |
| WWTP Licence<br>WWI-10185<br>Tjungu Village WWTP | Department for Health and Wellbeing (SA Health) | CA-APR-LET-1066 | NA | For the life of the system |
| Agreement to Supply Recycled Wastewater to Pernatty Station | Department of Primary Industries and Regions, South Australia (PIRSA) | CA-APR-LET-1126 | NA | For the life of the operation |
| Water Affecting Activity – Water Permit to Drill<br>Various purposes (water supply, investigation and monitoring) | Department for Environment and Water (DEW) | Documents recorded in the Carrapateena Well Register CA-ENV-REG-1001 | GW1, GW2, GW3, GW4, GW5 | Well Permits are active for a period of three (3) years |
| Licence for Security Sensitive Substances<br>(AN – SCER000379) | SafeWork SA | CA-MIN-LIC-1004 Licence for Security Sensitive Substances – Ammonium Nitrate (AN) | NA | Expires on<br>30 April 2025 |

| Approval document | Regulatory authority or other | Supporting document | Relevant outcome or tenement condition | Status of currency |
|---|---|---|---|---|
| | | Quantity: 50 tonnes | | |
| Licence for Magazine (675245) | SafeWork SA | CA-MIN-LIC-1008 Licence for Magazine<br>Quantity 1: 10,000 kg Blasting Explosives (high explosives (HE) and ammonium nitrate fuel oil (ANFO)) | NA | Expires on<br>30 June 2025 |
| Licence for Magazine (741074) | SafeWork SA | CA-MIN-LIC-1006 Licence for Magazine<br>Quantity 1: 5,000 kg packaged HE<br>Quantity 2: 160 kg detonators (equivalent to 10,000 #8 size detonators)<br>Total Qty: 5,000 kg packaged HE and 160 kg detonators | NA | Expires on<br>30 November 2025 |
| Licence for Magazine (716210) | SafeWork SA | CA-MIN-LIC-1009 Licence for Magazine<br>Quantity 1: 640 kg detonators (equivalent to 40,000 #8 size detonators)<br>Total Qty: 640 kg detonators | NA | Expires on<br>30 November 2025 |
| Dangerous Substance Licence (698371) – Liquefied Petroleum Gas (LPG) | SafeWork SA | CA-0000-OPS-LIC-1000<br>Quantity: 15 kL LPG | NA | Expires on<br>29 December 2025 |
| Native Title Mining Agreement (NTMA) between OZ Minerals Carrapateena Pty Ltd and Kokatha Aboriginal Corporation | Kokatha Aboriginal Corporation | CA-CRL-LET-1003 NTMA – Confidential | Schedule C1. The Lessee must, in constructing and operating the Lease, ensure that there is no disturbance to Aboriginal or European sites, objects or remains unless prior approval under the relevant legislation is obtained. | Active for the life of the Carrapateena Operation |
| Pernatty Pastoral Access and Compensation Agreement | Billa Kalina Pastoral Pty Ltd, Colin and Jillian Greenfield | CA-APR-AGR-1033 – Confidential | NA | Active for the life of the Carrapateena Operation |
| Arcoona Pastoral Access and Compensation Agreement | Handbury Asset Management Pty Ltd | CA-APR-AGR-1042 – Confidential | NA | Active for the life of the Carrapateena Operation |
| Bosworth Pastoral Access and Compensation Agreement | Handbury Asset Management Pty Ltd | CA-APR-AGR-1035 – Confidential | NA | Active for the life of the Carrapateena Operation |
| Oakden Hills Pastoral Access and Compensation Agreement | Nutt Bros Nominees Pty Ltd | CA-APR-AGR-1054 – Confidential | NA | Active for the life of the Carrapateena Operation |
| BHP Access and Consent Deed (Western Infrastructure Corridor) | BHP Olympic Dam Corporation Pty Ltd | CA-CPS-AGR-1083 | NA | Active for the life of the Carrapateena Operation |

# 6 Ore reserves and mineral resources

## 6.1 Ore reserves

The 2024 Mineral Resources and Ore Reserves can be found in the BHP Annual Report 2024, Additional Information; Section 5, which can be found on the BHP website at bhp.com/investors/annual-reporting (BHP 2024b).

## 6.2 Estimated mine life

The underground decline development continued to advance throughout 2024, with the decline now over 1.2 km vertically below the surface. Crusher Station 2 (CS02), which will enable increased operational and cost efficiencies for the sub-level cave (SLC), was commissioned in March 2024. The estimated life-of-mine (LoM) for Carrapateena is 22 years (2045).

## 6.3 Exploration activities

No exploration activities were undertaken in 2024.

# 7 Mining, processing and waste storage activities

## 7.1 Ore mining

| Ore mined – mine life (t) | Ore mined – reporting period (t) | Expected quantity of ore to be mined during next reporting period (Mt) | Quantity of ore stockpiled on the tenement at the end of the reporting period (t) |
|---|---|---|---|
| 22,496,748 | 5,545,399 | 6.5 – 6.7 | 174,760 |

## 7.2 Ore processing

| Ore processed – mine life (t) | Ore processed – reporting period (t) | Expected quantity to be processed during next reporting period (t) |
|---|---|---|
| 22,283,492 | 5,551,157 | Refer to BHP Operational Review for FY24 guidance (BHP 2024c) |

## 7.3 Concentrate or other product exported

| Concentrate or other product exported – mine life (dmt) | Amount of concentrate or other product exported – reporting period (dmt) | Expected amount of ore to be processed during next reporting period (t) |
|---|---|---|
| 750,717 | 224,495 | Refer to BHP Operational Review for FY24 guidance (BHP 2024c) |

## 7.4 Overburden/waste

| Overburden mined – mine Life (t) | Reporting period – overburden mined (t) | Next reporting period – overburden to be mined (t) |
|---|---|---|
| 5,968,761 | 850,727 | 1,165,572 |
| Production notes:<br>In the figures above, overburden is defined as anything that is not processed by the mill. All raisebore waste is trucked to surface to remove the risk of a potential raisebore cutter head through the crusher. Underground mining during the reporting period comprised of 14,612 metres of lateral advance. With CS02 operating from March 2024 onwards, the waste blending strategy ceased. | | |
| Volume of PAF and NAF material mined during reporting period (t) | Remaining capacity of current waste facilities or planned future waste facilities as per approved PEPR | |
| Potentially-acid forming (PAF): 0*<br>Non-acid forming (NAF): 850,727 t<br>*In CY22, change management was implemented to ensure PAF waste was blended with ore and processed though the mill. | Current waste rock stockpile has a LoM capacity of 5,087,053 t based on current height (10 to 20 m) and footprint constraints. | |

| Will the remaining quantities of overburden to be mined be accommodated in the current or planned waste facilities (waste rock dump (WRD), tailings storage facility (TSF))? If not included, what future work? |
| --- |
| Where available, LoM run-of-mine (ROM) waste rock will be used in future TSF lifts and closure activities (e.g. subsidence zone abandonment bund and backfill of boxcuts). WRD work completed in March/April 2024 indicated 4.3 Mt of waste rock remains to be mined at Carrapateena. The third lift of the TSF (2026/2027) is expected to require 5.4 Mt of material. |
| Are your waste facilities sufficient to deal with the volume of PAF material generated annually? If not, include what future work is required? *(Include any identification of PAF and NAF in the preceding reporting period and strategies to minimise the environmental impacts of this material.)* |
| Currently PAF is being sent through the mill and processed as part of underground material movement. Processes remain in place to identify areas of PAF. |

# 8 Compliance summary

Throughout the reporting period, four non-compliances were recorded. Of these, three were against the Outcome Measurement Criteria (OMC) and the Environmental Outcome, and the other was against the OMC only. A brief summary of the reported incidents is provided in Table 8.1 with rectification of the non-compliance summarised in Section 11.

**Table 8.1 | Summary of non-compliances reported in 2024**

| Licence permit tenement | Type of non-compliance<br>*Notes: e.g. lease condition or OMC* | Brief description<br>*Notes: e.g. Noise limits exceeded on four occasions* | Status<br>*Notes: 'rectified' or 'currently being addressed'* | Section of report for further detail |
|---|---|---|---|---|
| **MPL 156** | **Environmental Outcome not met (Schedule 6 Condition 10)**<br>The Tenement Holder must during construction, operation and post completion ensure that there are no native fauna injuries or deaths due to mining operations or mining related activities that could have been reasonably prevented.<br>**Non-achievement of OMC (NF1)**<br>Investigation and review of incident report records triggered as a result of serious harm or death of native fauna at infrastructure location demonstrates that the incident could not have been reasonably prevented, animal welfare was handled in accordance with the *Animal Welfare Act 1985* (SA) and that any corrective actions are closed out within 30 days or as agreed with the Director of Mines (or authorised officer). | The Northern Wellfield Stage 3 construction team returned to site after a two-week shutdown and found fourteen deceased eastern-grey kangaroos within six recently constructed scour pits.<br>The scour pits were under construction in mid-December before ~50 mm of rain restricted access to the wellfield for approximately five days. The construction crew briefly resumed work, then demobilised from site for the Christmas period. Non-compliant fencing was applied to the scour pits, which in combination with a lack of presence in the area, led to the kangaroos entering the pits and ultimately becoming trapped.<br>The scour pits were constructed to site standard, including a gentle sloping face and egress points, and there was minimal water within the scour pits, however the kangaroos were not able to escape. | Rectified | Section 11. Reported to DEM. |
| **MPL 152**<br>**MPL 153** | **Environmental Outcome not met (Schedule 6 Condition 11)**<br>**Environmental Outcome not met (Schedule 6 Condition 12)**<br>The Tenement Holder must during construction, operation and post Completion ensure that there is no loss of abundance and/or diversity of native vegetation on or off the land unless a significant environmental benefit has been approved in accordance with the relevant legislation.<br>**Non-achievement of OMC (LS1)**<br>Spill reported to the Director of Mines (or other authorised officer) as soon as reasonably practicable after becoming aware of the harm or threatened harm to native vegetation, native fauna and/or groundwater. | Two spills triggered reporting obligations under OMC – LS1 resulting in environmental harm which could have been reasonably prevented.<br>**MPL 152:**<br>Recirculation return pipe dislodged from RP3 bore caused approximately 150 kL of saline water to discharge to the environment. The spill emanated approximately 250 m from the production bore into a creek line dotted with Western Myall (*Acacia papryocarpa*) trees. A final vegetation assessment is planned for 2025.<br>**MPL 153:**<br>Failure of standpipe infrastructure at Turkey Nest 47 on the Western Access Road resulted in approximately 96 to 192 kL of saline water discharging to the environment. An initial vegetation assessment is planned for 2025. | Currently being addressed | Section 11. Reported to DEM. |
| **ML 6471** | **Non-achievement of OMC (AQ3/TSF7)**<br>Audit (TSF Closure Strategy Verification) undertaken by an independent suitably qualified expert approved by the Direct of Mines (or other authorised officer) and provided to the Mining Regulator at 6, 8 and 10 years after the lease grant. The audit demonstrates that data has been collected as per Leading Indicators AQ5, AQ6, TSF8 and TSF9 and recommends any changes to existing TSF closure strategies to meet the relevant Environmental Outcomes. | The TSF Closure Strategy Verification report has not been provided to the Mining Regulator due to the uncertainty around Stage 2 of the TSF being the final downstream embankment raise and the subsequent time required to collect meaningful erosion data through field trials. | Currently being addressed | Section 11. Reported to DEM. |

# 9 Compliance tables

Compliance for the 2024 reporting period is summarised from Section 9.1 to Section 9.19. Regarding the column headings for each table, the following explanations or assessment drivers apply:

- **Environmental Outcome:** provides a copy of the regulatory outcome provided in the relevant tenement document.
- **Sixth Schedule lease conditions**: provides the tenement number and pertinent condition number associated with the Sixth Schedule Environmental Outcome. Where the condition is related to a different schedule that detail is also provided.
- **Regulatory commitment**: provides the OMC, Leading Indicator, Strategy or Future Works commitment related to the Environmental Outcome.
- **Compliance status:** provides the status of the regulatory commitment as one of the following:
  - Compliant (to OMC or Leading Indicator)
  - Non-compliant
  - Unable to determine
  - No longer relevant to risk profile of Operation.
- **Evidence:**
  - For each criterion, states what measurements have been taken to monitor compliance and provides an interpretation of the results (i.e. compliant or non-compliant).
  - Provides a summary of the key measurements (using a graph to summarise data where possible) and refers to a summary of the detailed/raw data (if necessary) in an appendix but only to the extent necessary to verify the compliance conclusion reached.
  - Where graphs are used to illustrate compliance, the relevant compliance limits are clearly included on the graph.
  - Evidence where applicable document control number of the report or technical memo is included.
- **Forward work plan:**
  - If non-compliant, Leading Indicator triggered or any alterations to Outcomes or OMC are recommended, with a summary of actions being undertaken to rectify the non-compliance.
  - If unable to demonstrate compliance, states reasons and relevance of the OMC to the current risk profile of the Operation or current stage of the Operation.
  - States whether OMC or lease condition amendments are required.
  - Quantifies the risks associated with the non-compliance if applicable.
  - States whether the Leading Indicator is adequate to pick up the non-compliance or if it needs to be amended.

## 9.1 Aboriginal heritage

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction, operation and post Completion ensure that there is no damage, disturbance or interference to Aboriginal heritage sites, objects or remains unless it is authorised under the relevant legislation | ML 6471 Condition 1<br>MPL 149 Condition 7<br>MPL 152 Condition 1<br>MPL 153 Condition 1<br>MPL 154 Condition 1<br>MPL 156 Condition 1 | **Outcome Measurement Criteria – AH1** Annual audit of land disturbance permits demonstrate that infrastructure locations are within approved work areas, cultural heritage survey report conditions and have authorisation in accordance with the *Aboriginal Heritage Act 1988* (SA) prior to any ground disturbance occurring | Compliant | All land disturbance is spatially audited against Global Land Use Permit (GLUP) and Land Disturbance Permit (LDP) boundaries using survey data, drone and satellite imagery in ArcGIS to ensure works were completed within approved work areas, cultural heritage survey report conditions and have authorisation in accordance with the *Aboriginal Heritage Act 1988* (SA). |
| | | **Outcome Measurement Criteria – AH2** Annual audit of cultural heritage survey records demonstrate that upon discovery of new Aboriginal heritage sites, objects or remains at infrastructure locations were treated in accordance with the Cultural Heritage Management Plan until authorisation under the *Aboriginal Heritage Act 1988* (SA) was obtained | Compliant | New Aboriginal heritage sites discovered were treated in accordance with the Cultural Heritage Management Plan (CA-CRL-PLN-1016).<br>Existing sites are demarcated to ensure operations don't encroach. |
| | | **Leading Indicator – AH3** Monthly inspection (ground survey, drone flyover or suitable alternative method) of a selected infrastructure location during construction demonstrates land clearing has not been undertaken outside of areas defined in the associated land disturbance permit#<br># Alternative locations must be selected until all locations have been complete. Or on a demonstrated risk-based approach | Compliant | Regular on-ground inspections were undertaken on active LDP areas.<br>Land clearing has not been undertaken outside of areas defined in the associated LDP in 2024. |

## 9.2 Public nuisance

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction and operation ensure that there are no public nuisance impacts from dust and noise generated by mining operations or mining-related traffic | ML 6471 Condition 4<br>MPL 149 Condition 5*<br>MPL 152 Condition 4<br>MPL 153 Condition 4<br>MPL 154 Condition 4 | **Outcome Measurement Criteria – PN1** Audit of stakeholder engagement records undertaken quarterly demonstrates that all traffic related dust and noise concerns associated with access roads are responded to in accordance with the Local Area Agreement - Operating Protocols within 24 hours upon notification and any corrective actions are closed out within 14 days or as agreed with the Director of Mines (or other authorised officer) | Compliant | Stakeholder engagement records for Borealis indicate that no formal noise or dust concerns were raised. Operational stakeholder consultation meetings were conducted in 2024, addressing all aspects of the stakeholder land access agreements as required through face-to-face discussions. |
| | ML 6471 Condition 4<br>MPL 149 Condition 5* | **Outcome Measurement Criteria – PN2** Annual laboratory analysis of continuous dust deposition collected quarterly at monitoring site adjacent to Pernatty Homestead (ERML09) demonstrates dust deposition rates do not exceed 4 g/m$^2$/month (total) as per Table 7.1 of Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales | Compliant | Annual deposition dust at Pernatty Homestead (Environmental Radiation Monitoring Location (ERML09)) ceased in May 2022 following the cessation of use of the Southern Access Road. |
| | | **Leading Indicator – PN3** Continuous dust deposition rate monitoring undertaken at Pernatty Homestead (ERML09) is analysed monthly during construction and demonstrates a trend of continual exceedances of baseline levels of 1.6 g/m$^2$/month | Compliant | Monthly deposition dust at Pernatty Homestead (ERML09) ceased in May 2022 following the cessation of use of the Southern Access Road. |

* Intent of MPL 149 PEPR (OZ Minerals 2017b)

## 9.3 Traffic

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction and operations, ensure that there are no traffic accidents involving members of the public and mine related traffic that could have been reasonably prevented by the Tenement Holder | ML 6471 Condition 5<br>MPL 149 Condition 5*<br>MPL 152 Condition 5<br>MPL 153 Condition 5<br>MPL 154 Condition 5 | Construction and Operation Criteria<br>**Outcome Measurement Criteria – INC1** Investigation and corrective actions triggered as a result of an accident associated with mine related traffic demonstrates that the incident could not have been reasonably prevented and that any corrective actions are closed out within 30 days or as agreed with the Director of Mines (or other authorised officer) | Compliant | No traffic accidents involving members of the public or surface interaction were reported. |

* Intent of MPL 149 PEPR (OZ Minerals 2017b)

## 9.4 Public safety

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction and operation ensure that unauthorised entry to the Land does not result in public injuries and or deaths that could have been reasonably prevented | ML 6471 Condition 2<br>MPL 149 Condition 3<br>MPL 152 Condition 2<br>MPL 153 Condition 2<br>MPL 154 Condition 2 | **Construction and Operation**<br>**Outcome Measurement Criteria – PS1** Investigation and review of incident report records triggered as a result of an incident associated with unauthorised entry to infrastructure locations demonstrates that the incident could not have been reasonably prevented and that any corrective actions are closed out within 30 days or as agreed with the Director of Mines (or other authorised officer) | Compliant | No occurrences of unauthorised access by members of the public resulting in public injury or death were recorded during the reporting period. |
| | ML 6471 Condition 3 | **Completion**<br>**Outcome Measurement Criteria – PS2** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender including a review of the underground caving system, geotechnical data and other relevant data from the Cave Monitoring Plan demonstrates that at cessation of operations, the underground mine has been operated within design parameters and the predicted vertical and lateral extent of the Sub level cave Subsidence Zone is validated and the abandonment bund is adequately located outside of the subsidence zone | Not relevant | Carrapateena is in operational phase, this is a completion criteria, and as such, is not relevant. |
| | | **Outcome Measurement Criteria – PS3** Electronic and hard copies of a topographical survey of the sub level cave subsidence zone are provided to the Director of Mines (or other authorised officer) prior to application of lease surrender to confirm the extent of the surface expression at mine completion | Not relevant | Carrapateena is in operational phase, this is a completion criteria, and as such, is not relevant. |
| | | **Outcome Measurement Criteria – PS4** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender confirms by a construct to design audit that the decline portals and box cut have been closed in accordance with the basis of design | Not relevant | Carrapateena is in operational phase, this is a completion criteria, and as such, is not relevant. |
| | | **Outcome Measurement Criteria – PS5** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender confirms by a construct to design audit of the vent rise plug against the design Vent rise and confirms vent rise closure has been undertaken in accordance with the basis of design | Not relevant | Carrapateena is in operational phase, this is a completion criteria, and as such, is not relevant. |
| | | **Outcome Measurement Criteria – PS6** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease | Not relevant | Carrapateena is in operational phase, this is a completion criteria, and as such, is not relevant. |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | | surrender confirms by a construct to design audit that the abandonment bund around the subsidence zone and quarries have been constructed in accordance with Western Australia Department of Industry and Resources Guideline 'Safety Bund Walls Around Abandoned Open Pit Mines' | | |
| | | **Outcome Measurement Criteria – PS8** Construct to design audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender confirms that the Mine Area Borrow Pit has been closed in accordance with a closure design endorsed by DEM. The closure design will be provided to DEM through a future PEPR update, prior to completion. | Not relevant | Carrapateena is in operational phase, this is a completion criteria, and as such, is not relevant. |
| The Tenement Holder must demonstrate that post completion, the risks to the health and safety of the public so far as it may be affected by mining-related activities are as low as reasonably practicable | MPL 149 Condition 4*<br>MPL 152 Condition 3<br>MPL 153 Condition 3<br>MPL 154 Condition 3 | **Closure**<br>**Outcome Measurement Criteria – PS7** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender demonstrates that all infrastructure is removed or left in-situ as agreed with stakeholders (Outcome Measurement Criteria – LUP2) in a manner that risks to the health and safety of the public so far as it may be affected by mining-related activities are as low as reasonably practicable | Not relevant | Carrapateena is in operational phase, this is a completion criteria, and as such, is not relevant. |

* Intent of MPL 149 PEPR (OZ Minerals 2017b)

## 9.5 Native vegetation

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| Tenement Holder must, during construction and operation, ensure that there is no permanent loss of abundance and/or diversity of native vegetation on or off the Land as a result of mining-related activities unless a significant environmental benefit has been approved in accordance with the relevant legislation | ML 6471 Condition 11<br>MPL 149 Condition 9*<br>MPL 152 Condition 11<br>MPL 153 Condition 11<br>MPL 154 Condition 11<br>MPL 156 Condition 8 | **Construction and Operation**<br>**Outcome Measurement Criteria – NV1** Annual audit (reconciliation) of land disturbance register for infrastructure locations demonstrates native vegetation clearance does not exceed the significant environmental benefit approved under the *Native Vegetation Act 1991* (SA) and Plains Mouse habitat clearance does not exceed that approved under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) | Compliant | Total disturbance is less than the amount approved in Native Vegetation Management Plans. Refer to Figure 12.1 to Figure 12.6.<br>Gateway 1:<br>• 476.15 ha approved<br>• 283.86 ha disturbed (2013 to 2018)<br>Gateway 2:<br>• 708.22 ha approved<br>• 708.19 ha disturbed<br>Gateway 3:<br>• 1,012.38 ha approved<br>• 383.26 ha disturbed<br>Gateway 4:<br>• 20.46 ha approved<br>• 12.10 ha disturbed<br>Northern Wellfield:<br>• 237.50 ha approved<br>• 159.00 ha disturbed<br>Total Operation footprint as of 31 December 2024: 1,546.41 ha |
| | | **Leading Indicator – NV2** Following completion of land clearance, inspections (ground survey, drone flyover or suitable alternative) demonstrates land clearing has not been undertaken outside of areas defined in the associated land disturbance permit | Compliant | A combination of drone imagery captured at site and satellite imagery was utilised to verify ground disturbance footprint.<br>No unathorised land disturbance occurred in 2024. |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | MPL 156 Condition 9<br>MPL 156 Condition 9.1 | **Outcome Measurement Criteria – EC01** Baseline ecological surveys must be undertaken at water dependent ecosystems including, but not limited to SW-6 and SW-7 prior to the impact of mining operations or mining-related activities on the existing environment | Compliant | Baseline vegetation health surveys (Rangeland Assessment Methodology) completed during October 2019 at SW6, SW7 and SW15.<br>Refer to 2019 Annual Compliance Report, Appendix E Bosworth Creek Baseline Assessment (CA-0000-ENV-REP-0013). |

* Intent of MPL 149 PEPR (OZ Minerals 2017b)

## 9.6 Weeds and pests

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| Tenement Holder must, during construction and operation, ensure that there is no permanent loss of abundance and/or diversity of native vegetation on or off the Land as a result of mining-related activities unless a significant environmental benefit has been approved in accordance with the relevant legislation | ML 6471 Condition 6 and Schedule 2 Condition 28<br>MPL 149 Condition 10*<br>MPL 152 Condition 6<br>MPL 153 Condition 6<br>MPL 154 Condition 6<br>MPL 156 Condition 3 | **Construction and Operation**<br>**Outcome Measurement Criteria – WP1** Annual spring flora and fauna surveys undertaken by independent and suitably qualified ecologists at flora (including weeds) and fauna monitoring locations demonstrates no introduction of new species of weeds declared or listed under relevant legislation, plant pathogens or pests (including feral animals) as a result of mining-related activities when compared to previously recorded weed species and introduced fauna | Compliant | There were no new weed species recorded in 2024 and no overall increase in abundance or extent of weed declared under legislation.<br>The existing populations of two Weeds of National Significance are currently being managed. Both invasive species have been contained and reduced.<br>A notable example of effective management is the isolated Prickly Pear (Opuntia sp.) population near the Yeltacowie Homestead, which has been under biological control using cochineal since 2021. The cochineal population has been actively managed, with ongoing harvesting and re-distribution of the control agent to unaffected areas.<br>Additionally, control efforts for Athel Pine (*Tamarix aphylla*) at Yeltacowie Homestead have shown success, with most trees dead or dying. In 2024, no new populations were recorded, and only three mature trees remained. Ongoing efforts continue to eradicate the remaining live trees.<br>Refer to Appendix D 2024 Carrapateena Flora and Fauna Survey (CA-0000-ENV-REP-1047) |
| | | **Outcome Measurement Criteria – WP2** Annual spring flora and fauna surveys undertaken by independent and suitably qualified ecologists at flora (including weeds) and fauna monitoring locations demonstrates no increase in the abundance of existing weeds or pest species in the land compared to previous survey records as a result of mining-related activities | Compliant | Refer to Appendix D 2024 Carrapateena Flora and Fauna Survey (CA-0000-ENV-REP-1047) |
| | | **Leading Indicator – WP3** Monthly inspection (including photographic evidence of a selected infrastructure location identifies weeds listed in the Weed Red Alert List and triggers a review of the effectiveness of management strategies#<br># Alternative locations must be selected until all locations have been complete. or on a demonstrated risk-based approach | Compliant | Weed inspections are conducted routinely as part of the GLUP and LDP Inspection and General Environmental Inspection processes.<br>During this reporting period, 46 General Environmental Inspections were completed.<br>No new Priority Weed species were identified in 2024.<br>In 2024, monitoring continued on cochineal insects deployed on two prickly pear populations located off-tenure on Pernatty Station. The cochineal remains active on both specimens, and while many plants appear to be dying, some parts remain alive, and numerous potentially viable propagules are present on the ground.<br>Weed management efforts are ongoing in these areas. |
| | ML 6471 Condition 6 and Schedule 2 Condition 28 | **Leading Indicator – WP4** Quarterly audit of inspection records (including photographic evidence) maintained at the site by the waste contractor demonstrate that prior to collection food waste containers that service the accommodation village kitchen are closed to prevent feral animal scavenging | Compliant | Inspections of waste handling areas are routinely undertaken by the camp contractor and routine inspections are completed by BHP Carrapateena personnel.<br>Bin/skip lids are mandatory across the Carrapateena Operation and any non-conformance is addressed when identified. |
| | | **Leading Indicator – WP5** Quarterly audit of inspections records (including photographic evidence) maintained at the site by the waste contractor demonstrate that the tip face has been covered at the end of each day to prevent feral animal scavenging | Not relevant | Landfill not constructed. |
| | ML 6471 Condition 6 and Schedule 2 Condition 28<br>MPL 149 Condition 10* | **Leading Indicator – WP6** Quarterly audit of records maintained at the site by all contractors demonstrates that all incoming vehicle, plant and equipment have been subject to weed hygiene procedures | Compliant | Weed hygiene certificates are completed as a compulsory deliverable within the General Induction before new vehicles are permitted to mobilise. Targeted inspections are also undertaken at the Western Access Road on entry to the site focusing on ground disturbing equipment and vehicles that leave the main mine and non-process infrastructure (NPI) footprint. |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | MPL 152 Condition 6<br>MPL 153 Condition 6<br>MPL 154 Condition 6<br>MPL 156 Condition 3 | | | During the reporting period monthly weed hygiene audits were undertaken with no gaps identified. Two hundred and twenty-nine (229) inspections were completed on vehicles entering site during the reporting period. |

* Intent of MPL 149 PEPR (OZ Minerals 2017b)

## 9.7 Native fauna

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must ensure during construction, operation and post completion that there are no native fauna injuries or deaths due to mining-related activities that could reasonably have been prevented.<br>Provide data from any future sightings and records of the Plains Mouse to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions | ML 6471 Condition 13<br>MPL 149 Condition 8*<br>MPL 152 Condition 12<br>MPL 153 Condition 12<br>MPL 154 Condition 12<br>MPL 156 Condition 10 | **Construction and Operation**<br>**Outcome Measurement Criteria – NF1** Investigation and review of incident report records triggered as a result of serious harm or death of native fauna at infrastructure location demonstrates that the incident could not have been reasonably prevented, animal welfare was handled in accordance with the Animal Welfare Act 1985 and that any corrective actions are closed out within 30 days or as agreed with the Director of Mines (or authorised officer)#<br># serious harm is defined in the *Animal Welfare Act 1985* | Non-compliant | At BHP Carrapateena, a site firearm is used to humanely euthanize sick or injured fauna, in compliance with the *Animal Welfare Act 1985* (SA).<br>All fauna interactions (sightings, mortalities, and/or relocations) are recorded in a register maintained by BHP Carrapateena environment personnel. In 2024, there were 90 recorded fauna interactions, including 69 mortalities, 12 euthanized animals, and 5 relocations. The primary cause of fauna mortality was vehicle strikes involving kangaroos.<br>Throughout the year, site communications are distributed during periods of heightened fauna activity (e.g. summer) to increase awareness of potential interactions and reinforce the correct reporting procedures.<br>Non-compliance with NF1 is reported as a result of an incident that could have reasonably prevented where fourteen deceased eastern-grey kangaroos were found within six recently constructed scour pits in the Northern Wellfield.<br>Refer to Section 11 for further information on the non-compliance. |
| | MPL 149*<br>Schedule 6 Condition 8 | **Outcome Measurement Criteria – NF4** Monthly inspections (ground survey) of the wildlife and stock control fence surrounding the airstrip demonstrates that the integrity of the fence is maintained | Compliant | Aerodrome inspections are undertaken by the Aerodrome Reporting Officer prior to the arrival of all incoming flights to ensure that no wildlife have entered the fenced complex and pose a risk of interaction with landing aircraft.<br>No occurrences of fauna identification within the fenced aerodrome compound were recorded in 2024. Inspections were documented and retained on file. |
| | MPL 152 Condition 12 | **Leading Indicator – NF2 Audit** of the Transmission Line undertaken at the completion of construction and signed by construction manager demonstrates infrastructure has been constructed in accordance with the transmission line design including:<br>Line spacing between phase and ground conductors greater than 150 cm<br>Insulation of phase and/or ground conductors where necessary<br>Installation of perch discourages | Compliant | Transmission line completed with:<br>• 1,593 mm line spacing and 2 m spacing to Optical Ground Wire<br>• insulation installed where required<br>• perch discouragers deemed not required under design review due to adequate line spacing. |
| | | **Leading Indicator – NF3** Audit of the Western Access Road undertaken at the completion of construction and signed by construction manager demonstrates speed limit signage has been installed at entry points and at a minimum of 5 km intervals in accordance with the design plans | Compliant | Construction of Western Access Road was completed in December 2021. Signage was installed as per NF3 following completion.<br>Evidenced by Western Access Road – Inspection and Test Plan (ITP) 017 Road Furniture (CA-5410-QAC-ITP-1017). |
| | MPL 149* | **Leading Indicator – NF5** Airstrip clearance and foreign object inspections prior to the landing and take-off of aircraft identify a rising trend in kangaroo, emu and stock access to the internal perimeter of the wildlife and stock control fence surrounding the airstrip. | Compliant | Aerodrome inspections are undertaken by the Aerodrome Reporting Officer prior to the arrival of all incoming flights to ensure that no wildlife have entered the fenced complex and pose a risk of interaction with landing aircraft.<br>No occurrences of fauna identification within the fenced aerodrome compound were recorded in 2024. Inspections were documented and retained on file. |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | ML 6471<br>Schedule 2 Condition 28.2<br>Schedule 2 Condition 28.3<br>Schedule 2 Condition 28.4<br>MPL 149 Condition 6*<br>MPL 152<br>Schedule 2 Condition 13.2<br>Schedule 2 Condition 13.3<br>Schedule 2 Condition 13.4<br>MPL 153<br>Schedule 2 Condition 13.2<br>Schedule 2 Condition 13.3<br>Schedule 2 Condition 13.4<br>MPL 154<br>Schedule 2 Condition 13.2<br>Schedule 2 Condition 13.3<br>Schedule 2 Condition 13.4 | **Operations**<br>**Outcome Measurement Criteria – EPBC1** Records of the Thick-billed Grasswren are to be provided to the Biological Database of South Australia (BDSA) to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites#<br># Linked to MNES Condition (Schedule 2 Condition 28.2) | Compliant | Refer to Appendix D 2024 Carrapateena Flora and Fauna Survey (CA-0000-ENV-REP-1047) |
| | | **Outcome Measurement Criteria – EPBC2** Records of the Plains Mouse are to be provided to the Biological Database of South Australia (BDSA) to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites#<br># Linked to MNES Condition (Schedule 2 Condition 28.4) | Compliant | Plains Mouse (Plains Rat) observation records were reported to the BDBSA by Nature Foundation on behalf of BHP Carrapateena as a data submission in their annual report to enable effective monitoring and record keeping, as per the Recovery Plan Actions.<br>2024 South Gap Offset Annual Report (CA-0000-ENV-REP-1050)<br>Appendix D 2024 Carrapateena Flora and Fauna Survey (CA-0000-ENV-REP-1047) |
| | | **Outcome Measurement Criteria – EPBC3** Records of the Night Parrot are provided to the Night Parrot Recovery Team to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites#<br># Linked to MNES Condition (Schedule 2 Condition 28.3) | Compliant | Appendix D 2024 Carrapateena Flora and Fauna Survey (CA-0000-ENV-REP-1047) |

* Intent of MPL 149 PEPR (OZ Minerals 2017b)

## 9.8 Land use and property

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction and operation ensure there are no impacts to third-party land use or property on or off the Land as a result of mining-related activities other than those agreed between the Tenement Holder and the affected user or determined by an appropriate court as evidenced in its order(s) (and the Tenement Holder must provide the Director of Mines (or other authorised officer) with a copy of the order(s), which shall be placed on the Mining Register).<br>Before Completion, the Tenement Holder must satisfy the Director of Mines (or other authorised officer) that where practicable, the pre-Tenement land use of the Land can be recommenced post Completion<br>The Tenement Holder must ensure that the Land is progressively and finally rehabilitated to support the future land use | ML 6471 Condition 7<br>MPL 149*<br>MPL 152 Condition 7<br>MPL 153 Condition 7<br>MPL 154 Condition 7<br>MPL 156 Condition 4 | **Construction and Operation Criteria**<br>**Outcome Measurement Criteria – LUP1** Audit of stakeholder engagement records undertaken quarterly demonstrates that concerns associated with agricultural productivity of Pernatty, Arcoona or Bosworth Pastoral Lease or adjacent pastoral leases as a result of ML-activities are responded to in accordance with the Local Area Agreement - Operating Protocol within 24 hours and any corrective actions are closed out within 14 days or as agreed with the Director of Mines (or other authorised officer) | Compliant | No records in Borealis of formal concerns raised relating to pastoral productivity. There was one complaint relating to driving on station access tracks in 2024 which was immediately resolved.<br>BHP Carrapateena has committed to working closely with local and regional stakeholders. All communications are recorded in the communication register Borealis. |
| | ML 6471 Condition 8 and Condition 9<br>MPL 149*<br>MPL 152 Condition 8 and Condition 9<br>MPL 153 Condition 8 and Condition 9<br>MPL 154 Condition 8 and Condition 9<br>MPL 156 Condition 5 and Condition 6 | **Completion**<br>**Outcome Measurement Criteria – LUP2** Audit undertaken prior to application of lease surrender of all infrastructure locations against any relevant third-party liability legal transfer agreements and Government agreements demonstrates that all infrastructure have been removed, unless otherwise agreed with Government or signed legal documentation to transfer on going liability of the infrastructure to third parties is provided prior to the relinquishment of the tenement(s) | Not relevant | Carrapateena is in operational phase, this is a completion criteria, and as such, is not relevant. |
| | | **Outcome Measurement Criteria – LUP3** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender verifies at infrastructure locations the Landscape Function Analysis (LFA) monitoring results indicate that the LFA | Not relevant | Carrapateena is in operational phase, this is a completion criteria, and as such, is not relevant. |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | | curve has moved above, or is likely to move above the critical threshold of sustainability at infrastructure locations | | |
| | | **Leading Indicator – LUP4** Rehabilitation trials shall be undertaken at infrastructure locations no longer required and ongoing assessment at LFA monitoring at sites (CEF1 – CEF7) are assessed annually demonstrating development of trends and annual improvement of rehabilitation through LFA methodology. Should the data indicate rehabilitation not trending towards sustainability route cause, investigations will be undertaken and rectification methods be identified and implemented. | Compliant | Baseline LFA data established from analogue sites.<br>Site rehabilitation commenced in 2019. LFA sites established at two locations (LFA01-AL1 and LFA02-VOL1). Use of Point Centred Quarter (PCQ) method and Established Method enabled.<br>Two new sites were established in spring 2022, both on the Western Access Road, one adjacent the Midway Quarry and one near the Tjungu Village.<br>The current status and trend in landscape function measured at the four rehabilitation sites indicated a positive trend in the number and area of plants per hectare. Plant colonisation is currently dominated by short-lived perennial species, although several longer-lived perennials were also recorded.<br>OMC LUP4 is considered to be in-progress/compliant.<br>Appendix D 2024 Carrapateena Flora and Fauna Survey (CA-0000-ENV-REP-1047) |
| | | **Leading Indicator – LUP6** Airstrip clearance and foreign object inspections prior to the landing and take-off of aircraft identify a rising trend in kangaroo, emu and stock access to the internal perimeter of the wildlife and stock control fence surrounding the airstrip | Compliant | Aerodrome inspections are undertaken by the Aerodrome Reporting Officer prior to the arrival of all incoming flights to ensure that no wildlife have entered the fenced complex and pose a risk of interaction with landing aircraft.<br>No occurrences of fauna identification within the fenced aerodrome compound were recorded in 2024. Inspections are documented and retained on file. |

* Intent of MPL 149 PEPR (OZ Minerals 2017b)

## 9.9 Land and soil

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must ensure that there is no contamination of land and soils either on or off the Land as a result of mining operations or mining-related activities<br>The Tenement Holder must ensure that no contamination of land and soils either on or off the Land post Completion occurs as a result of mining operations or mining-related activities | ML 6471 Condition 10.1<br>MPL 149<br>Schedule 2 Condition 9*<br>MPL 152 Condition 10.1<br>MPL 153 Condition 10.1<br>MPL 154 Condition 10.1<br>MPL 156 Condition 7.1 | **Construction and Operation**<br>**Outcome Measurement Criteria – LS1** Investigation and corrective actions triggered as a result of an accidental spill at infrastructure locations that triggers the notification provisions of Part 9 of the Environment Protection Act 1993 (SA) demonstrates that the spill was reported to the Director of Mines (or other authorised office) as soon as reasonably practicable after becoming aware of the harm or threatened harm, all risks were minimised so far as is reasonably practicable and that any corrective actions are closed out within 30 days or as agreed with the Director of Mines (or other authorised officer) #<br># Material and Serious Environmental Harm are defined in *the Environment Protection Act 1993* (SA), Section 5(3). The act does not apply a definition for 'trivial', which is included within the definitions. Therefore, for the purpose of this criteria, any spills below 250 L are considered to be trivial or unlikely to result in material or serious environmental harm | Compliant | Two (2) spills triggered notification requirements to DEM during the reporting period. For evidence refer to the provision of reports to DEM:<br>• Saline water spill – RP3 Southern Wellfield (INX #24312)<br>• TN47 Standpipe saline water spill (EMS #1001227788)<br>Refer to Section 8 for further information on the non-compliance. |
| | | **Leading Indicator – LS2** Annual audit of waste disposal records, maintained at the site demonstrates that commercial and/or industrial wastes have been disposed of to an EPA licenced facility | Compliant | Monthly waste disposal records are provided by Cleanaway Pty Ltd to BHP Carrapateena and site contractors for all waste leaving the Carrapateena site.<br>Transport certificates are generated by BHP Carrapateena personnel for waste types listed in Schedule 1 of the *Environment Protection Act 1993* (SA). |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | | **Leading Indicator – LS3** Monthly audit of chemical storages at a selected infrastructure location demonstrates they have been constructed and are operating in accordance with the SA EPA Guideline 080/16 Bunding and Spill Management (2016)#<br># Alternative locations are to be selected until all locations have been completed or on a demonstrated risk-based approach | Compliant | Fourty-six (46) general environmental compliance inspections were undertaken at selected infrastructure locations in 2024.<br>Actions raised during the year pertained to operational hygiene and were closed out within prescribed deadlines:<br>• hazardous/chemical waste storage<br>• vehicle wash pad hygiene<br>• fuel bay cleanliness<br>• waste segregation<br>• housekeeping practices. |
| | | **Leading Indicator – LS4** Monthly audit of chemical storages at a selected infrastructure location demonstrates that all chemicals are recorded (including volumes) in the chemical database#<br># Alternative locations are to be selected until all locations have been completed or on a demonstrated risk-based approach | Compliant | BHP Carrapateena tracks the location and volumes of chemicals via the ChemWatch Database.<br>Chemical storage areas are routinely audited as part of the environment inspection process to ensure that storage is acceptable and that safety data sheets (SDS) are maintained on file within the immediate area. Evidence is stored within INX InControl and Event Management System. |
| | ML 6471 Condition 10.2<br>MPL 149<br>Schedule 2 Condition 9*<br>MPL 152 Condition 10.2<br>MPL 153 Condition 10.2<br>MPL 154 Condition 10.2<br>MPL 156 Condition 7.2 | **Completion**<br>**Outcome Measurement Criteria – LS5** Audit of rehabilitation activities at infrastructure locations and waste disposal records prior to application of lease surrender demonstrates that commercial and/or industrial wastes have been disposed of to an EPA licenced facility and no soil contamination (as defined in the National Environment Protection (assessment of Site Contamination) Measure 2013) remains in areas used for the handling and storage of hazardous materials | Not relevant | Carrapateena is in operational phase, this is a completion criteria and as such, is not relevant. |

* Intent of MPL 149 PEPR (OZ Minerals 2017b)

## 9.10 Air quality

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction, operation and post Completion ensure no adverse change to the environment as a result of particulate emissions and/or dust generated by mining operations or mining-related activities | ML 6471<br>Condition 14 | **Construction and Operation**<br>**Outcome Measurement Criteria – AQ1** Quarterly gravimetric analysis and review of continuous dust deposition collected quarterly at monitoring sites adjacent to the Tailings Storage Facility (ERML16–ERML19) demonstrates dust deposition rates do not exceed 4 g/m$^2$/month (total) as per Table 7.1 of Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC, 2005) | Compliant | The average rate of dust deposition at ERML16 to ERML19 (inclusive) in 2024 was 1.2 g/m$^2$/month. This is significantly below the OMC value of an annual average of 4 g/m$^2$/month in accordance with DEC (2005) guidance.<br>In 2024, dust deposition rates were generally consistent with, and slightly down on, results over the last two years. Dust deposition rates at ERML16 (TSF North) decreased to be consistent with the other ERML results following two quarters of elevated results caused by local TSF embankment and seepage collection infrastructure construction activities.<br>Appendix E 2024 Air Quality Monitoring Report (CA-0000-ENV-REP-1048) |
| | | **Outcome Measurement Criteria – AQ2** Annual (spring) surveys undertaken by a suitably qualified and experienced expert demonstrates no adverse impact on the diversity and abundance of native vegetation at monitoring sites directly attributed to dust deposition from mining operations or mining-related activities when compared to baseline native vegetation conditions | Compliant | Appendix D 2024 Carrapateena Flora and Fauna Survey (CA-0000-ENV-REP-1047) |
| | | **Outcome Measurement Criteria – AQ3** Audit (TSF Closure Strategy Verification Report) undertaken by an independent suitably qualified expert approved by the Director of Mines (or other authorised officer) demonstrates#:<br>• that data has been collected for the calibration of the Air Quality Model and Landform Evolution Model as per Leading Indicators AQ5, AQ6, TSF8 and TSF9<br>• that data collected as per Leading Indicators AQ5, AQ6, TSF8 and TSF9 (and any other relevant data) demonstrates that the TSF closure strategies set out in the PEPR (Section 4.17.3), specifically the requirement for no TSF cover system, would be effective in | Non-compliant | The frequency/timing for the TSF Closure Strategy Verification Report for OMC AQ3/TSF7 is 6/8/10 years after lease grant. The Verification Report was not completed in 2024 (6 years after lease grant) as there has been insufficient time to collect meaningful erosion data from an erosion field study since construction of the Stage 2 Tailings embankment. The other work that is required to be audited as per this OMC (i.e dust lift-off study, air quality update and landform evolution model update) have all demonstrated that the proposed closure strategy remains valid.<br>The TSF Closure Strategy Verification Report will be completed in 2025 as |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
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| | | achieving the relevant environmental outcomes.<br>The audit must also include the following information in each TSF closure strategy verification report:<br>• recommendations for any changes to existing TSF closure strategies to ensure achievement of the relevant environmental outcomes; and<br>• recommendations for any new TSF closure strategies to ensure achievement of the relevant environmental outcomes;<br>The audit will be provided to the Mining Regulator at the following frequencies:<br>• an initial report at 6 years after lease grant (allowing for 2 years to reach first tailings deposition, and 4 years to conduct the relevant scientific investigations); and<br>• 8 years after lease grant; and<br>• 10 years after lease grant; or<br>• any other timeframe as agreed between the Tenement Holder and Director of Mines (or other authorised officer)<br>Demonstration of achievement of the outcome will be met through the independent and suitably qualified expert verifying the requirement for no TSF cover system at any of the time intervals stated above.<br>If the independent and suitably qualified expert can not verify the requirement for no TSF cover system, demonstration of achievement of the outcome will be met through:<br>• PEPR review which details the changed and/or new TSF closure strategies; and<br>• payment of a Bond (or top up to the existing Bond) to reflect the rehabilitation liability of the changed and/or new TSF closure strategies.<br># The scope of the audit will be agreed by the Tenement Holder and the Director of Mines (or other authorised officer) at an appropriate time ahead of delivery of the initial report. | | agreed with DEM. Further information in Forward Works Plan (Section 23). |
| | | **Leading Indicator – AQ4** Annual laboratory analysis of continuous metals in dust at sites adjacent to the Tailings Storage Facility (ERML16 –ERML19) demonstrates a rising trend in metals concentrations when compared to previous monitoring results (ERML1–ERML15) | Compliant | Metals in deposited dust concentrations were generally similar to the previous reporting period with only copper, uranium and titanium recording small increases, and are typically consistent with pre-operations baseline concentrations except for chromium, copper and uranium which are slightly above baseline. Copper, titanium and uranium have exhibited a trend of increasing concentrations as defined in the Leading Indicator criterion; however, it is noted that this trend remains consistent with, if slightly above,<br>baseline ranges and has also occurred at sites remote from the TSF and thus may be attributed to aspects not wholly related to TSF operations.<br>Metals concentrations at sites around the TSF continue to be, in general, elevated compared to other monitoring sites across the operation except for uranium, which is higher at locations remote from the TSF.<br>Appendix E 2024 Air Quality Monitoring Report (CA-0000-ENV-REP-1048) |
| | | **Leading Indicator – AQ5** Calibration of the air quality model (Air Quality Modelling and Assessment of Effects, PEPR Appendix C1) is undertaken at years 6/8/10 of the Tailings Storage Facility operation with operational monitoring data and dust threshold lift data established in the tailings beach trials and validates modelling outputs (Table 8.3 PEPR). | Compliant | Stage 1 of the TSF commenced operation on 25 February 2020. Calibration of the air quality model occurred in 2024. |
| | | **Leading Indicator – AQ6** Annual audit by an independent and suitably qualified expert of dust threshold lift data from the tailings beach trials at the Tailings Storage Facility is compared to the Air Quality Model (Appendix C1) dust threshold lift speed of 5.4m/s. Should the threshold lift speed is <5.4m/s an assessment will be undertaken by an independent and suitably qualified expert to determine if there is a material deviation expected on modelling outputs that triggers a model calibration.<br># Linked to Outcome Measurement Criteria – AQ3 | Compliant | Operation of the TSF continued in its fifth year of operation during 2024. During the reporting period BHP Carrapateena completed an in-field dust lift off study in conjunction with Engineer of Record, WSP.<br>The study included the deployment of a portable in-situ wind erosion laboratory (PI-SWERL) at the TSF to characterise wind erosion emissions parameters.<br>The Air Quality Model was updated in 2024 conservatively using the dust threshold lift off speed of 5.4 m/s although in-field validation of wind erosion parameters demonstrated that actual velocities are higher, updated velocities can be reincorporated into future air quality assessments. |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
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| | | **Leading Indicator – AQ7** Annual soil sampling and laboratory analysis undertaken at monitoring sites adjacent to the Tailings Storage Facility (ERML16–ERML19) demonstrates a rising trend in metals concentrations when compared to previous monitoring results#<br># Linked to Land and Soil Outcome (Schedule 6 Condition 10.1) | Compliant | The average concentration of metals in soil sediments was presented in Appendix B1 to the MLP (OZ Minerals 2017a), with sites SED2, SED6 and SED8 occurring in the Eliza Creek catchment. Comparison against monitoring undertaken during 2023 is presented within Appendix E 2024 Air Quality Monitoring Report (CA-0000-ENV-REP-1048)<br>This demonstrates that measured concentrations at the ERML sites are consistent with previous reporting periods. The measured concentrations remain (generally) orders of magnitude less than the relevant National Environment Protection (Assessment of Soil Contamination) Measure 1999 guidelines for commercial/industrial environments. The 2019 values are considered to represent baseline conditions at the ERML sites as no tailings deposition occurred prior to the soil sampling in 2019.<br>Refer to Section 2.2 of Appendix E 2024 Air Quality Monitoring Report (CA-0000-ENV-REP-1048) |
| | | **Leading Indicator – AQ8** Quarterly iso-kinetic sampling of the Flash Steam Heat Recovery Stack, Plant Extraction Scrubber Stack and Nonox Vent Scrubber Stack at the Concentrate Treatment Plant demonstrates compliance with Schedule 1 of the Environment Protection (Air Quality) Policy 2016 (SA) (Table 8.3 PEPR)#<br># Linked to CTP Condition (Schedule 2 Condition 15) | Not relevant | Concentrate Treatment Plant (CTP) is no longer under consideration |
| | | **Leading Indicator – AQ9** Monthly analysis of the trends associated with the Concentrate Treatment Plant scrubber efficiencies (continuous data logging) indicates a decrease in the performance of the scrubbing systems when compared to previous months#<br># Linked to CTP Condition (Schedule 2 Condition 15) | Not relevant | CTP is no longer under consideration |
| | | **Leading Indicator – AQ10** Quarterly audit of inspection records (including photographic evidence) maintained at the site by the transport contractor demonstrate the integrity of containers have been checked prior to departure to ensure no release of concentrate to the environment#<br># Linked to Concentrate Transport Condition (Schedule 2 Condition 16) | Not relevant | CTP is no longer under consideration |
| | | Completion<br>**Outcome Measurement Criteria – AQ11** Laboratory analysis of continuous dust deposition collected monthly at monitoring sites adjacent to the Tailings Storage Facility (ERML16–ERML19) post completion for a period of no less than one (1) year (dry weather cycle and tailings must be of a moisture content and crust thickness as per the air quality model inputs) demonstrates dust deposition rates do not exceed 4 g/m$^2$/month as per Table 7.1 of Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC, 2005) | Not relevant | CTP is no longer under consideration |
| | | **Outcome Measurement Criteria – AQ12** An ecological risk assessment including soil sampling at monitoring sites adjacent to the Tailings Storage Facility (ERML16–ERML19) undertaken in accordance with NEPM (Assessment of Site Contamination 1999) by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender verifies concentrations of metals are within the site specific Ecological Investigation Levels. Ecological Investigation levels to be derived based on the ecological risk assessment framework detailed in Schedule B5a "Guideline on Ecological Risk Assessment#<br># Linked to Land and Soil Outcome (Schedule 6 Condition 10.2) | Not relevant | Carrapateena is in operational phase, this is a completion criteria and as such, is not relevant. |

## 9.11 Radiation

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder, must during construction, operation and post Completion ensure no public health or environmental impacts from radionuclides (including radon) as a result of mining operations or mining-related activities | ML 6471<br>Condition 16 | **Operations**<br>**Outcome Measurement Criteria – RAD1** Annual audit undertaken by an independent and suitably qualified expert of radon and radionuclides data (methods outlined Appendix E Radioactive Waste Management Plan) at monitoring locations (ERML1–ERML19) demonstrates total radiation doses do not exceed 1 mSv/annum for members of the public (Appendix C7 PEPR Radioactive Waste Management Plan) | Compliant | Estimated maximum annual dose to the public was 0.0343 mSv. When referring to the 'public' it pertains to a scenario where the public were able to access the mining lease after institutional control.<br>Quarterly monitoring for radon, gamma and radionuclides in dust was undertaken in 2024. The annual monitoring period July 2023 – June 2024 is compliant.<br>Refer to Appendix F 2024 Environmental Radiation Impact Assessment (CA-0000-ENV-REP-1049) |
| | | **Outcome Measurement Criteria – RAD2** Annual audit undertaken by an independent and suitably qualified expert of radon and radionuclides data (methods outlined Appendix E Radioactive Waste Management Plan) at monitoring locations adjacent to the Tailings Storage Facility (ERML16–ERML19) demonstrates total radiation doses do not exceed 10 µGy/hour for non-human biota (Appendix C7 PEPR Radioactive Waste Management Plan) | Compliant | Quarterly monitoring for radon, gamma and radionuclides in dust was undertaken in 2024. The annual monitoring period July 2023 – June 2024 is compliant.<br>Total dose rate per organism fell well below the 10 µGy/hour no effect threshold:<br>• Red Kangaroo (*Macropus rufus*) – 0.00181 µGy/hour<br>• Emu (*Dromaius novaehollandiae*) – 0.000216 µGy/hour<br>• Sand Goanna (*Varanus gouldii*) – 0.00831 µGy/hour.<br>Refer to Appendix F 2024 Environmental Radiation Impact Assessment (CA-0000-ENV-REP-1049) |
| | | **Completion**<br>**Outcome Measurement Criteria – RAD3** Annual audit undertaken by an independent and suitably qualified expert of radon and radionuclides data (methods outlined Appendix E Radioactive Waste Management Plan) at monitoring locations adjacent to the Tailings Storage Facility (ERML16–ERML19) post completion for a period of no less than one (1) year (dry weather) cycle and tailings must be of a moisture content and crust thickness as per the air quality model inputs) demonstrates total radiation doses do not exceed 1 mSv/annum for members of the public (Appendix C7 PEPR Radioactive Waste Management Plan) | Not relevant | Carrapateena is in operational phase, this is a completion criteria and as such, is not relevant. |
| | | **Outcome Measurement Criteria – RAD4** Annual audit undertaken by an independent and suitably qualified expert of radon and radionuclides data (methods outlined Appendix E Radioactive Waste Management Plan) at monitoring locations (ERML1–ERML19) post completion for a period of no less than one (1) year (dry weather cycle and tailings must be of a moisture content and crust thickness as per the air quality model inputs) demonstrates total radiation doses do not exceed 10 µGy/hour for non-human biota (Appendix C7 PEPR Radioactive Waste Management Plan) | Not relevant | Carrapateena is in operational phase, this is a completion criteria and as such, is not relevant. |

## 9.12 Surface water – erosion and sedimentation

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction, operation and post completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities | ML 6471 Condition 17<br>MPL 149*<br>MPL 152 Condition 13 and 14<br>MPL 153 Condition 13 and 14<br>MPL 154 Condition 13 and 14<br>MPL 156 Condition 11 | **Construction and Operation**<br>**Outcome Measurement Criteria – SWES1** Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) at surface water sampling sites (SW05–SW09) at least once a year within seven days of a rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (whichever is greater) (PEPR Table 8.7; pH, EC, SS and hydrocarbons) whichever is greater | Compliant | Surface water monitoring was conducted three times during the reporting period (March, November, and December). The March sampling event did not adhere to the requirement of sampling within seven days of a rain event due to flooding that made the sites inaccessible.<br>Five electrical conductivity (EC) and five pH measurements exceeded ANZECC guidelines (ANZG 2018), but were within or correlated with baseline groundwater compositions. One hydrocarbon exceedance was recorded.<br>Minor hydrocarbon concentrations may originate from environmental sources (biogenic processes), pastoral activities, mining activities, or contamination during sampling.<br>Refer to Appendix C 2024 Groundwater and Surface Water (CA-0000-ENV-REP-1046) |
| | ML 6471 Condition 17<br>MPL 152 Condition 13 and 14<br>MPL 153 Condition 13 and 14<br>MPL 154 Condition 13 and 14<br>MPL 149* | **Leading Indicator – SWES2** Audit of surface water management infrastructure undertaken annually (prior to summer) demonstrates surface water management infrastructure is as constructed and have been maintained in accordance with the design and corrective actions closed out within 14 days | Compliant | Annual surface water management infrastructure audit completed in September 2024 (INX #31955). A combination of drone imagery captured by BHP Carrapateena personnel and on-ground inspection were utilised to assess the integrity of surface water infrastructure:<br>• subsidence zone diversion drain<br>• WRD containment ponds (A, B, C)<br>• aerodrome diversion drains and<br>• MPP and NPI event ponds.<br>Observations are summarised below:<br>• no major damage to key infrastructure which would impact the ability to manage flows<br>• minor erosion observed within internal drains<br>• no seepage/lateral expression of water in WRD containment ponds<br>• negligible silting of WRD containment ponds<br>• event pond outfall intact, no evidence of scouring<br>• minor sedimentation from diversion drain outfall (aerodrome/subsidence zone). |
| | | **Leading Indicator – SWES3** Audit of surface water management infrastructure undertaken at least once a year within seven days of a rainfall event required to create flows demonstrates surface water management infrastructure have performed in accordance with the design and corrective actions closed out within 14 days | Compliant | One audit of surface water infrastructure was completed in March following the rain event recorded in March 2024 (INX #26023)<br>Key infrastructure surface water infrastructure inspected:<br>• subsidence zone diversion drain<br>• WRD containment ponds<br>• aerodrome<br>• Western Access Road creek crossings (Yelatcowie Creek and Elizabeth Creek)<br>• general NPI. |
| | ML 6471 Condition 17 | **Outcome Measurement Criteria – SWES4** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender confirms by a construct to design audit that the abandonment bund around the subsidence zone and the Tailings Storage Facility Final Embankment have been rock armoured in accordance with the identification of material types identified in detailed design#<br># Linked to strategies SWES13 and SWES14 | Not relevant | Carrapateena is in operational phase, this is a completion criteria and as such, is not relevant. |
| | ML 6471 Condition 17<br>MPL 149*<br>MPL 152 Condition 13 and 14<br>MPL 153 Condition 13 and 14<br>MPL 154 Condition 13 and 14 | **Outcome Measurement Criteria – SWES5** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender demonstrates that all culverts, fords, and surface water management infrastructure that is not required post completion is removed in a manner to ensure long term physical stability in consideration of potential erosion and sedimentation and natural flow regimes have been restored | Not relevant | Carrapateena is in operational phase, this is a completion criteria and as such, is not relevant. |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | ML 6471 Condition 17 | **Outcome Measurement Criteria – SWES6** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender demonstrates waste rock, ore stockpiles and soil stockpiles have been removed from the ground surface | Not relevant | Carrapateena is in operational phase, this is a completion criteria and as such, is not relevant. |
| | MPL 156 Condition 11 and 12 | **Outcome Measurement Criteria – EC01** Baseline ecological surveys must be undertaken at water dependent ecosystems including, but not limited to SW-6 and SW-7 prior to the impact of mining operations or mining-related activities on the existing environment | Compliant | Refer to Appendix D 2024 Carrapateena Flora and Fauna Survey (CA-0000-ENV-REP-1047) |

* Intent of MPL 149 PEPR (OZ Minerals 2017b)

## 9.13 Surface water – reduced flows

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction, operation and post Completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities | ML 6471 Condition 17 | **Operations**<br>**Outcome Measurement Criteria – SWRF1** Annual surveys undertaken by an independent and suitably qualified expert demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependant ecosystems at Eliza Creek monitoring attributed to reduced surface water flows caused by mining operations when compared to baseline conditions (PEPR Appendix C6 Ecological Baseline) unless a significant environmental benefit has been approved in accordance with the relevant legislation#<br># Linked to Native Vegetation Outcome (Schedule 6 Condition 11) – If surveys show that there is a permanent loss of abundance and/or diversity of native vegetation on or off the Land as a result of mining-related activities, a significant environmental benefit must be established approved in accordance with the relevant legislation) | Compliant | Refer to Appendix D 2024 Carrapateena Flora and Fauna Survey (CA-0000-ENV-REP-1047) |

## 9.14 Surface water – tailings storage facility

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction, operation and post Completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities | ML 6471 Condition 17 | **Construction and Operation**<br>**Outcome Measurement Criteria – TSF1** Quarterly sampling and laboratory analysis of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1s–TSFMB4s) and analysis of pH, Metals and EC demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (PEPR Table 9.22; pH, EC and metals) whichever is greater | Non-compliant | Groundwater was present in bore TSFMB3s during the reporting period, which was also the case in the 2022 and 2023 reporting periods. Exceedances of EC, aluminium, barium, cobalt, copper, strontium, uranium and iron were recorded.<br>Bores TSFMB1s, TSFMB2s and TSFMB4s continue to be in a dry state and samples are not able to be obtained.<br>Refer to Appendix C 2024 Groundwater and Surface Water (CA-0000-ENV-REP-1046) |
| | | **Outcome Measurement Criteria – TSF2** Quarterly monitoring of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1s–TSFMB4s) demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well (PEPR Table 9.21). | Non-compliant | The standing water level (SWL) at TSFMB3s is trending as predicted, influenced by pre-operational water levels and rainfall recharge prior to TSF operation.<br>Bores TSFMB1s, TSFMB2s, and TSFMB4s remain dry, making obtaining groundwater levels not possible.<br>Refer to Appendix C 2024 Groundwater and Surface Water (CA-0000-ENV-REP-1046) |
| | | **Outcome Measurement Criteria – TSF3** Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) within Eliza Creek (SW05–SW09) at least once a year within seven days of a rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) | Compliant | Outcome Measurement Criteria TSF3 states that opportunistic surface water sampling is required at Eliza Creek monitoring locations (SW05 – SW09). As previously discussed in the 2021, 2022 and 2023 Groundwater and Surface Water Monitoring Reports, only sites SW05, SW06 and SW07 are reported under OMC TSF3 as SW08 and SW09 are within Salt Creek, not Eliza Creek.<br>Exceedances were reported at all three sites SW05, SW06, and SW07. Elevated concentrations |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
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| | | Freshwater Guidelines or baseline ranges (PEPR Table 9.16; pH, EC and metals) whichever is greater | | were reported for EC, pH, alumiumium, copper, strontium, barium and zinc. Analytical results for uranium at all three sites was at the limit of reporting (LOR).<br>All three sites are below both ANZECC Freshwater and baseline data for suspended solids, arsenic, cobalt, lead, manganese and selenium.<br>Refer to Appendix C 2024 Groundwater and Surface Water (CA-0000-ENV-REP-1046) |
| | | **Outcome Measurement Criteria – TSF4** Annual sediment sampling and laboratory analysis for metals shall be undertaken within Eliza Creek (IT01–IT03) and demonstrates sediments meet ANZECC/ARMCANZ (2000) Sediment Quality Guidelines or baseline ranges (determined prior to commencement Stage 1 Tailings commissioning) whichever is greater. | Compliant | Sediment sampling was undertaken at sites IT01 to IT03 within Eliza Creek in 2024. One sample was collected and analysed for each site. Metals concentrations for all sites were within the relevant guideline value or baseline ranges, except for uranium at IT02.<br>Refer to Appendix C 2024 Groundwater and Surface Water (CA-0000-ENV-REP-1046) |
| | | **Outcome Measurement Criteria – TSF5** Reporting, investigation and corrective actions triggered as a result of an accidental spill from Tailings Delivery Infrastructure or seepage from the Tailings Storage Facility as identified through Leading Indicators TSF7, TSF10 or TSF11 that relate to serious or material environmental harm demonstrates that spills are reported to the Director of Mines (or other authorised office) as soon as reasonably practicable after becoming aware of the harm or threatened harm, all risks were minimised so far as is reasonably practicable and that any corrective actions are closed out within 30 days or as agreed with the Director (or other authorised officer). | Compliant | Construction of TSF Stage 1 was completed in September 2019. Tailings deposition commenced in February 2020 as the MPP was gradually ramped up to nameplate capacity in the latter stages of the year. Construction of TSF Stage 2 embankment was completed in May 2022 with tailings deposition commencing on 22 March 2023.<br>No spillage or release of tailings outside of the TSF or plant footprint was recorded in 2024. |
| | | **Outcome Measurement Criteria – TSF6** Annual surveys undertaken by an independent and suitably qualified expert demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependent ecosystems at Eliza Creek monitoring sites attributed to tailings seepage when compared to baseline conditions (PEPR Appendix C6 – Ecological Baseline)#<br># Linked to Native Vegetation Outcome (Schedule 6 Condition 11) – If surveys show that there is a permanent loss of abundance and/or diversity of native vegetation on or off the Land as a result of mining-related activities a significant environmental benefit must be established approved in accordance with the relevant legislation | Compliant | Refer to Appendix D 2024 Carrapateena Flora and Fauna Survey (CA-0000-ENV-REP-1047) |
| | | **Outcome Measurement Criteria – TSF7** Audit (TSF Closure Strategy Verification Report) undertaken by an independent suitably qualified expert approved by the Director of Mines (or other authorised officer) demonstrates#:<br>that data has been collected for the calibration of the Air Quality Model and Landform Evolution Model as per Leading Indicators AQ5, AQ6, TSF8 and TSF9<br>that data collected as per Leading Indicators AQ5, AQ6, TSF8 and TSF9 (and any other relevant data) demonstrates that the TSF closure strategies set out in the PEPR (Section 4.17.3), specifically the requirement for no TSF cover system, would be effective in achieving the relevant environmental outcomes.<br>The audit must also include the following information in each TSF closure strategy verification report:<br>• recommendations for any changes to existing TSF closure strategies to ensure achievement of the relevant environmental outcomes; and<br>• recommendations for any new TSF closure strategies to ensure achievement of the relevant environmental outcomes;<br>The audit will be provided to the Mining Regulator at the following frequencies:<br>• an initial report at 6 years after lease grant (allowing for 2 years to reach first tailings deposition, and 4 years to conduct the relevant | Non-compliant | The frequency/timing for the TSF Closure Strategy Verification Report for OMC AQ3/TSF7 is 6/8/10 years after lease grant. The Verification Report was not completed in 2024 (6 years after lease grant) as there has been insufficient time to collect meaningful erosion data from an erosion field study since construction of the Stage 2 Tailings embankment. The other work that is required to be audited as per this OMC (i.e dust lift-off study, air quality update and landform evolution model update) have all demonstrated that the proposed closure strategy remains valid.<br>The TSF Closure Strategy Verification Report will be completed in 2025 as agreed with DEM. Further information in Forward Works Plan (Section 23). |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | | scientific investigations); and<br>• 8 years after lease grant; and<br>• 10 years after lease grant; or<br>• any other timeframe as agreed between the Tenement Holder and Director of Mines (or other authorised officer)<br>Demonstration of achievement of the outcome will be met through the independent and suitably qualified expert verifying the requirement for no TSF cover system at any of the time intervals stated above.<br>If the independent and suitably qualified expert can not verify the requirement for no TSF cover system, demonstration of achievement of the outcome will be met through:<br>• PEPR review which details the changed and/or new TSF closure strategies; and<br>• payment of a Bond (or top up to the existing Bond) to reflect the rehabilitation liability of the changed and/or new TSF closure strategies.<br># The scope of the audit will be agreed by the Tenement Holder and the Director of Mines (or other authorised officer) at an appropriate time ahead of delivery of the initial report. | | |
| | | **Leading Indicator – TSF8** Calibration of the Landform Evolution Model is undertaken at years 6/8/10 of the Tailings Storage Facility operation with erosion field study data and validates modelling outputs (PEPR Appendix B1 Tailings Storage Facility Design (Landform Evolution Modelling)#<br># Linked to Outcome Measurement Criteria – TS7 | Not relevant | Construction of TSF Stage 2 embankment was completed in May 2022 with tailings deposition commencing on 22 March 2023.<br>Calibration of the TSF landform evolution model (LEM) was executed in 2022 using TSF Stage 2 embankment construction material and refined tailings properties. Key findings included:<br>• The water storage capacity of the closed TSF would be reduced over time, but it is unlikely the TSF would spill during extreme storm events.<br>• It would not result in tailings discharge to the environment.<br>• It would result in minor erosion of the embankment.<br>• The next calibration of the TSF LEM will occur in 2025 (Year 6). |
| | | **Leading Indicator – TSF9** Annual audit by an independent and suitably qualified expert of laboratory and field data including rainfall intensity, tailings particle sizes, in-channel lateral erosion parameters, 'm' from the tailings beach trials at the Tailings Storage Facility is compared to the Landform Evolution Model (PEPR Appendix B1 – Tailings Storage Facility Design (Landform Evolution Modelling)) input assumptions. Should values deviate outside of the sensitivities in Table 8.2 an assessment will be undertaken by an independent and suitably qualified expert to determine if there is a material deviation expected on modelling outputs that model calibration#<br># Linked to Outcome Measurement Criteria – TS7 | Compliant | Golder Associates reviewed the LEM inputs as described within TSF9 as a deliverable within the scope of the Annual Dam Safety review conducted in January 2022 (CA-3630-PRM-REP-1516).<br>Key findings include:<br>• Future updates to the LEM should also consider less frequent and higher intensity rainfall events.<br>• A review of tailings particle size distribution (PSD) data shows consistency between the adopted PSD (the annual average was slight lower (3.12 g/m$^3$) compared with the 2020 period (3.29 g/m$^3$).<br>Conservative assumption that PSD of rockfill diminishes over time to that of tailings. The long-term performance of the coarse rockfill on the downstream slope of the decant dam embankment and future TSF Stage 2 embankment should be reviewed. This will be addressed through implementation of the infield erosion trial following construction of TSF Stage 2 embankment in 2022. |
| | | **Leading Indicator – TSF10** Inspection (including photographic evidence) of the Eliza Creek bed (IT01–IT03) undertaken quarterly demonstrates visual evidence of shallow lateral seepage surface expressions (salt crystals, salinisation or water logging) and triggers further investigation (Outcome Measurement Criteria TSF5) | Compliant | Quarterly inspections of the Eliza Creek bed (IT01–IT03) were undertaken using both drone and on-ground methodology. No evidence of new seepage/salt expression at surface was observed during the reporting period. |
| | | **Leading Indicator – TSF11 Audit** undertaken by a suitably qualified expert approved by the Director of Mines (or other authorised officer), including quality assurance inspections undertaken during construction prior to commissioning of Stage 1 of the Tailings Storage Facility and signed by construction manager demonstrates that seepage design controls and TSF and Decant embankment foundation preparation have been constructed in accordance with the design (PEPR Appendix B1 – Tailings Storage Facility Design)# | Compliant | Works completed in accordance with the design and documented in TSF Stage 1 and Stage 2 construction reports:<br>• CA-3630-CIV-REP-1018 (TSF Stage 1)<br>• CA-3630-CIV-REP-1054 (TSF Stage 2).<br>Independent audit completed by ATC Williams prior to operation:<br>• CA-3630-QAC-REP-2016 (TSF Stage 1) |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | | # Tailings Storage Facility Audits (Schedule 2 Condition 4.1). The expert reports for the audits of Stage 1 of TSF embankment construction must address all items as specified in Schedule 2 Condition 10 | | • CA-3630-PRM-REP-1524 (TSF Stage 2). |
| | | **Leading Indicator – TSF15** Audit undertaken by a suitably qualified expert approved by the Director of Mines (or other authorised officer), including quality assurance inspections undertaken during construction prior to commissioning of Stages 2, 3, 4 and 5 of the Tailings Storage Facility and signed by construction manager demonstrates embankment foundation preparation have been constructed in accordance with the design (PEPR Appendix B1 – Tailings Storage Facility Design)#<br># Tailings Storage Facility Audits (Schedule 2 Condition 4.2). The expert reports for the audits of Stages 2, 3, 4 and 5 of TSF embankment construction must address all items as specified in Schedule 2 Condition 10 | Not relevant | Construction of TSF Stage 2 was completed in May 2022 under the technical guidance from Engineer of Record WSP Golder. |
| | | **Leading Indicator – TSF16** Audit undertaken by a suitably qualified expert approved by the Director of Mines (or other authorised officer), including quality assurance inspections and audit of records of the Operations, Maintenance and Surveillance Manual of the Tailings Storage Facility undertaken every 3 months during Stage 1 and 2 every 6 months for Stage 3, 4, 5 and 6 demonstrates that the TSF is being operated in accordance with design (PEPR Appendix B1 – Tailings Storage Facility Design) and the Operations, Maintenance and Surveillance Manual#<br># Tailings Storage Facility Audits (Schedule 2 Condition 4.3 and 4.4) | Compliant | During 2024, prescribed TSF audits were undertaken at the required frequency outlined within the TSF Operations, Maintenance and Surveillance Manual (CA-3630-CIV-MNL-1000). Five inspections were undertaken pertaining to operation of the TSF during the reporting period:<br>• Tailings Storage Facility, Q1 2024 Site Visit and Monitoring Report, June 2023 (WSP) (CA-3630-CIV-REP-1103)<br>• Tailings Storage Facility, Q2 2024 Site Visit and Monitoring Report, September 2024 (WSP) (CA-3630-CIV-REP-1114)<br>• Tailings Storage Facility, Q3 2023 Site Visit and Monitoring Report, December 2024 (WSP) (CA-3630-CIV-REP-1119)<br>• Tailings Storage Facility, Engineer of Record Annual Inspection Report, January 2024 to January 2025 (WSP). Report to be delivered early March 2024.<br>• ATC Williams annual independent audit completed in March 2024, final report pending. |
| | | **Leading Indicator – TSF21** Monthly water sampling and laboratory analysis from the TSF supernatant pond and lined decant pond of pH, EC, and, metals validates geochemical modelling predictions (PEPR Table 8.10; pH, EC and metals). Should values deviate by +/- 10% an investigation will be undertaken and seepage model re-run#<br># Surface Water Strategy (Schedule 6 Condition 22) and Groundwater Strategy (Schedule 6 Condition 26.2) | Triggered | Monthly samples were obtained as per the frequency prescribed by TSF21. During the reporting period supernatant/decant water deviated 10% outside of the range used for modeling (notably copper, uranium and molybdenum); triggering TSF21.<br>BHP Carrapateena engaged LWC during the reporting period to review supernatant water quality composition and determine whether there is any materiality with respect to the original assessment formulated by LWC in 2019.<br>Refer to Section 23 for forward works plan for Leading Indicator TSF21. |
| | | **Leading Indicator – TSF23** Quarterly water sampling in the seepage cut-off drain (SCD1) and analysis of pH, EC and metals is compared to geochemical modelling prediction (PEPR Table 8.10; pH, EC and metals). Should values deviate by +/- 10% an investigation will be undertaken and seepage model re-run#<br># Groundwater Strategy (Schedule 6 Condition 26.2) | Triggered | Quarterly samples were obtained as per the frequency prescribed by TSF21.<br>Geochemical composition of downstream toe seepage differed by magnitudes in comparison to supernatant/decant. Maximum uranium concentration recorded was 0.010 mg/L compared to 2.16 mg/L in supernatant water, whilst the annual average was 0.014 mg/L.<br>Copper, the other element of interest, was measured (0.010 mg/L maximum value) in magnitudes less than supernatant (2.59 mg/L maximum value) and averaged 0.010 mg/L for the reporting year.<br>LWC were engaged to re-run the seepage model with observed supernatant water quality data. The review was completed and an updated geochemical affects assessment will be presented in future PEPR and impact assessments.<br>Refer to Section 23 for forward works plan for Leading Indicator TSF23. |
| | | **Leading Indicator – TSF24** Water sampling and analysis of pH, metals and EC in the seepage cutoff drain after a rainfall event that results in the activation of the flood storage area of the decant dam will be undertaken and compared to geochemical modelling prediction (PEPR Table 8.10; pH, EC and metals). Should values deviate by +/- 10% an investigation will be undertaken and seepage model re-run | Triggered | Significant rain events accumulating greater than 20 mm occurred three times throughout 2024 which activated the flood storage area of the Decant Dam. On each occasion a sample was collected and dispatched to a NATA-accredited laboratory for analysis. The only safe sampling location was near the decant outflow pipe therefore water quality was generally not representative of runoff. In late 2023, in response to a seepage impact in Eliza Creek, a seepage cut-off trench was constructed downstream of the Decant Dam to intercept shallow lateral seepage.<br>Refer to Section 23 for forward works plan for Leading Indicator TSF24. |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | | **Completion**<br>**Outcome Measurement Criteria – TSF35** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) after the final discharge of tailings into the TSF and prior to commencement of final rehabilitation, closure and decommissioning of the TSF and Decant Dam including a review of the operational TSF audit reports and other relevant information and demonstrates that the Tailings Storage Facility has been operated within design (PEPR Appendix B1 – Tailings Storage Facility Design) or any operational deviations from design parameters have been assessed and addressed appropriately and therefore can be expected function in the long term as per the design#<br># Tailings Storage Facility Audits (Schedule 2 Condition 4.5). The expert reports for the audits of Stage 1 of TSF embankment construction must address all items as specified in Schedule 2 Condition 10 | Not relevant | TSF is in operational phase. |
| | | **Outcome Measurement Criteria – TSF36** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) after the final TSF and Decant Dam rehabilitation, closure and decommissioning works have been completed, demonstrates that the Tailings Storage Facility embankment and spillways have been constructed to design (PEPR Appendix B1 – Tailings Storage Facility Design) to ensure long term physical stability in consideration of potential erosion and sedimentation of the downstream environment#<br># Tailings Storage Facility Audits (Schedule 2 Condition 4.6). The expert reports for the audits of Stage 1 of TSF embankment construction must address all items as specified in Schedule 2 Condition 11 | Not relevant | TSF is in operational phase. |
| | | **Outcome Measurement Criteria – TSF37** Quarterly sampling of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1S– TSFMB4S) at the cessation of tailings discharge for a period of no less than one (1) year and analysis of pH, Metals and EC demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (PEPR Table 8.15; pH, EC and metals) whichever is greater | Not relevant | TSF is in operational phase. |

## 9.15 Surface water – acid and metalliferous drainage

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction, operation and post Completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities | ML 6471 Condition 17 | **Construction and Operation**<br>**Outcome Measurement Criteria – AMD1** Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) within Eliza Creek at least once a year within seven days of a rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (PEPR Table 9.16; pH, EC and metals) whichever is greater. | Non-compliant | Throughout the reporting period, surface water sampling was conducted in Eliza Creek due to greater than 20 mm rainfall events resulting in streamflow. The requirement of sampling within seven days of a rain event that creates flows was not met on either occasion as the sites were inaccessible due to flooding of access tracks.<br>Exceedances of baseline ranges and freshwater guidelines for some parameters were recorded at the monitoring sites within Eliza Creek.<br>Refer to Section 11 for further information on the non-compliance.<br>Refer to Appendix C 2024 Groundwater and Surface Water (CA-0000-ENV-REP-1046) |
| | | **Leading Indicator – AMD2** Audit of the production stockpile pad undertaken at the completion of construction and prior to the placement of material above the sulphur cut-off grade and signed by construction manager demonstrates the production stockpile pad has been constructed in accordance with the basis of design | Compliant | Construction of the pre-production stockpile pad was completed to design (CA-2800-CIV-GAR-1005).<br>As-built pavement layout includes 400 mm layer of quartzite overlaying, 400 mm layer of Woomera Shale (NAF – acid consuming) overlaying, 450 mm CBR 45 and a 300 mm re-worked clay subgrade base.<br>Completion and handover to BHP Carrapateena is evidenced in CA-2800-QAC-CRT-1001. |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | | **Leading Indicator – AMD3** Annual audit of the block model maintained at the site with updated geological and sulphur assay data to determine the sulphur distribution of all waste for the forward year to estimate the distribution and estimation of volume of AMD material using the sulphur cut-off grade and develop or adjust management requirements if needed | Compliant | The block model is maintained and continuously updated to identify PAF areas, which are delineated, managed and reported in accordance with the Carrapateena Acid and Metalliferous Drainage Management Plan (CA-ENV-PLN-1013) and associated procedures. PAF waste is currently blended with ore and processed in the mill. |
| | | **Leading Indicator – AMD4** Audit of waste rock and ore stockpiles at the surface including reconciliation of volumes undertaken annually demonstrates that all potential AMD material has been handled in accordance with the management requirements determined by the annual block model review and in accordance with the AMD Management Plan | Compliant | Audits are regularly conducted to confirm and identified PAF material is directed to the processing mill, rather than the waste rock dump. The delineation, handling and reporting of PAF waste comply with the Carrapateena Acid and Metalliferous Drainage Management Plan (CA-ENV-PLN-1013) and associated procedures. |
| | | **Completion**<br>**Outcome Measurement Criteria – AMD5** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender demonstrates ore stockpiles have been removed from the ground surface#<br># Surface Water Strategy (Schedule 6 Condition 21.12) | Not relevant | Carrapateena is in operational phase, this is a completion criteria and as such, is not relevant. |
| | | **Outcome Measurement Criteria – AMD6** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender including a review of mine block model records, reconciliation records, geological and sulphur assay data, updates of sulphur cut-off grade and other relevant information demonstrates that waste rock and ore stockpiles have been managed appropriately to prevent AMD | Not relevant | Carrapateena is in operational phase, this is a completion criteria and as such, is not relevant. |

## 9.16 Groundwater – tailings storage facility

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction, operation and post Completion ensure that there is no adverse change to groundwater quality within aquifers outside of the TSF seepage zone of influence area delineated by the groundwater model as a result of mining operations or mining-related activities. | ML 6471 Condition 17 | **Construction and Operation**<br>**Outcome Measurement Criteria – GW1** Quarterly sampling and laboratory analysis of THA Wells downstream of the Tailings Storage Facility (TSFMB1d – TSFMB4d) and analysis of pH, EC and metals demonstrates water quality are within the site groundwater baseline composition ranges (PEPR Table 8.15)#<br># Groundwater Criteria (Schedule 6 Condition 27.2) | Non-compliant | TSFMB1d: EC is elevated above the baseline Tent Hill Aquifer (THA) composition, ranging from 73,100 to 81,400 µS/cm. Uranium, aluminum, strontium, and iron exceedances were observed.<br>TSFMB3d: EC is within the baseline THA range, reported as 32,900 to 38,300 µS/cm. Aluminum, atrontium, and iron exceedances were observed.<br>TSFMB4d: EC is within the baseline THA range, reported as 32,100 to 38,200 µS/cm. Aluminum, strontium, and iron exceedances were observed.<br>BHP Carrapateena will continue to monitor groundwater at the prescribed frequency in 2025.<br>Refer to Section 23 for forward works plan for OMC GW1.<br>Refer to Appendix C 2024 Groundwater and Surface Water (CA-0000-ENV-REP-1046) |
| | | **Outcome Measurement Criteria – GW2** Quarterly monitoring of THA monitoring wells downstream of the Tailings Storage Facility (TSFMB1d – TSFMB4d) demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well.<br># Groundwater Criteria (Schedule 6 Condition 27.1) | Non-compliant | Construction of TSF Stage 2 embankment was completed in May 2022 with tailings deposition commencing on 22 March 2023. Monitoring was conducted at a quarterly frequency as per GW2.<br>The SWL recorded at all three bores is higher than the groundwater modelled prediction and has continued to increase in elevation (mAHD) over the reporting period. These observations imply hydraulic loading of the THA in the immediate vicinity of the TSF.<br>Standing water levels are shallower (closer to ground level) in all three wells. TSF1D gained 2.73 m to 85.49 mAHD, TSF3D increased 2.56 m to 80.59 mAHD and TSF4D increased 2.57 m to 85.15 mAHD.<br>The THA wells will continue to be monitored quarterly and compared to the groundwater model predicted hydrograph. |

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| | | | | Refer to Section 23 for forward works plan for OMC GW1.<br>Refer to Appendix C 2024 Groundwater and Surface Water (CA-0000-ENV-REP-1046) |

## 9.17 Groundwater – drawdown

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction, operation and post Completion ensure that there is no adverse change to groundwater quantity within aquifers outside of the predicted extent of groundwater drawdown delineated by the groundwater model as a result of mining operations or mining-related activities. | ML 6471 Condition 25<br>ML 6471 Condition 26<br>MPL 152 Condition 15<br>MPL 153 Condition 15<br>MPL 154 Condition 15<br>MPL 156 Condition 14 | **Construction and Operation**<br>**Outcome Measurement Criteria – GW3** Quarterly monitoring of groundwater compliance monitoring wells demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well (PEPR Table 8.12). | Compliant | Groundwater compliance wells comprise ENV S2, ENV W3, ENV N4, ENV N8, MS2, MS3 and MD3.<br>All the compliance wells fulfilled the quarterly monitoring requirement of OMC GW3. Compliance with OMC GW3 for these wells is also assessed by comparing groundwater model predicted SWLs against actuals during the 2024 reporting period.<br>Refer to Appendix C 2024 Groundwater and Surface Water (CA-0000-ENV-REP-1046) |
| | | **Leading Indicator – GW4** Quarterly analysis of groundwater abstraction volumes from flow meter reading confirms abstraction is not trending to exceed the predicted water demand (12.9 ML/d) and no more than an average of 7 ML/d was abstracted from the Northern Wellfield. | Compliant | Total abstraction below predicated demand listed in MPEPR2024/009 (14.5 ML/day).<br>Refer to Appendix C 2024 Groundwater and Surface Water (CA-0000-ENV-REP-1046) |
| | | **Leading Indicator – GW5** Quarterly monitoring of groundwater leading indicator monitoring wells demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well (Table 8.13) and demonstrate that no evidence of a trend in standing water levels over three consecutive quarters. | Compliant | In 2024, three wells exhibited steady or less drawdown than predicted (MD1, ENV 6 and ENV 7). Three shallow wells are still dry (SC Piezo, YC Piezo 1 and YC Piezo 2).<br>Wells MS4, PS6, PI12, MS6 and PI8 Obs showed either no deviation from modelled or minor fluctuations throughout the year.<br>Refer to Appendix C 2024 Groundwater and Surface Water (CA-0000-ENV-REP-1046) |

## 9.18 Groundwater – contamination

| Environmental Outcome | Sixth Schedule lease conditions | Regulatory commitment | Compliance status | Evidence and forward work plan |
|---|---|---|---|---|
| The Tenement Holder must during construction, operation and post Completion ensure that there is no adverse change to the Environmental Values of the groundwater within the shallow perched aquifer within the Land as a result of chemicals or hydrocarbons from mining operations or mining-related activities | ML 6471 Condition 23<br>ML 6471 Condition 17<br>MPL 149* | **Construction and Operation**<br>**Outcome Measurement Criteria – GW7** Investigation and corrective actions triggered as a result of an accidental spill at infrastructure locations that triggers the notification provisions of Part 9 of the Environment Protection Act 1993 (SA) relating to serious or material environmental harm demonstrates that the spill was reported to the Director of Mine (or other authorised officer) as soon as reasonably practicable after becoming aware of the harm or threatened harm, and all risks were minimised so far as is reasonably practicable and that any corrective actions are closed out within 30 days or as agreed with the Director of Mines (or other authorised officer)#<br># Material and Serious Environmental Harm are defined in the *Environment Protection Act 1993* (SA), Section 5(3). The act does not apply a definition for 'trivial', which is included within the definitions. Therefore, for the purpose of this criteria any spills below 250 L are considered to be trivial or unlikely to result in material or serious environmental harm<br>Land and Soil relating to the transport, storage and handling of hydrocarbons and chemicals and associated Leading Indicator – LS2, Leading Indicator – LS3, Leading Indicator – LS4 and Outcome Measurement Criteria – LS5 | Compliant | Two (2) spills triggered notification requirements to DEM during the reporting period. For evidence refer to the provision of reports to DEM:<br>• Saline water spill – RP3 Southern Wellfield (INX #24312)<br>• TN47 Standpipe saline water spill (EMS #1001227788). |

* Intent of MPL 149 PEPR (OZ Minerals 2017b)

## 9.19 Effectiveness of Design Strategies and Management Strategies

| Environmental Aspect | Design and management strategy | Effectiveness of existing control strategies |
|---|---|---|
| Aboriginal heritage | **Design Strategies**<br>• Avoidance of sites of cultural heritage significance as determined in consultation with the Kokatha People<br>**Management Strategies**<br>• Cultural heritage surveys with the Kokatha People<br>• Cultural Heritage Obligations Register and supporting GIS information (shapefiles) to record/identify clearance areas and status<br>• Land disturbance approval process<br>• Cultural respect training<br>• Area-specific and site inductions and training<br>• Employment of suitably qualified people<br>• Cultural Heritage Management Plan, including new discovery reporting procedures*<br>• Identification and fencing of sites of cultural heritage significance<br>• Monthly (construction) or annual (operations) land disturbance reconciliation* | Cultural heritage sites are identified through cultural heritage surveys prior to the commencement of any work. All known sites are recorded and issued in Cultural Heritage Survey Reports with associated spatial data. The Cultural Heritage Survey Reports are document controlled. The master cultural heritage spatial data is updated upon receipt of reports identifying all ground that has been culturally surveyed, sites identified as culturally cleared, sites identified as not culturally cleared and any specific obligations. Prior to works commencing, the master cultural heritage spatial data is used to plan works to avoid any cultural sites. Any cultural sites deemed at risk due to proximity of works are flagged off and identified on LDP/GLUPs and within area-specific cultural heritage management plans.<br>GLUPs and LDPs were not approved or issued until the cultural heritage aspects have been reviewed by the BHP Heritage Advisor. Kokatha Aboriginal Corporation Cultural Monitors are present during initial land disturbance.<br>Site specific cultural heritage plans have been developed for each construction area.<br>There has been no disturbance of these sites to date. |
| Public nuisance | **Design Strategies**<br>• Pernatty Station Homestead bypass road<br>**Management Strategies**<br>• Maintenance of unsealed roads.<br>• Dust suppression on unsealed roads*<br>• Speed limit restrictions at homestead*<br>• Operating Protocols<br>• Heavy vehicle transport movements adjacent to the Pernatty Homestead limited to hours between 7 am and 7 pm without prior agreement | Use of the Southern Access Road ceased in 2022 following the opening of the Western Access Road. Speed limits adhered to as evidenced by fixed speed cameras. Offending vehicles are notified of any breaches and an incident is logged in the Event Management System (EMS).<br>Road opening and closing times are enforced by Access Road Controllers based at the Carrapateena gatehouse.<br>Evidence of visual dust was minimal and no complaints due to dust were reported as outlined in Section 16. |
| Traffic | **Design Strategies**<br>• Intersections with the Stuart Highway constructed in accordance with appropriate standards and other requirements established in consultation with DPTI<br>**Management Strategies**<br>• Traffic Management Plans and speed limits<br>• Area-specific and site inductions and training | Stuart Highway – Western Access Road turn off construction was completed in December 2021.<br>No incidents of vehicle interactions were recorded on the Southern Access Road or Western Access Road. |
| Public safety | **Design Strategies (Schedule 6 Condition 2)**<br>• Access area gatehouse and signage at site access points<br>• Exclusion fencing around mine compounds<br>• Livestock fencing around TSF<br>• Security gatehouse would be established at the entry to the proposed Mining Lease area<br>• Signage at mine access points<br>**Design Strategies (Schedule 6 Condition 3)**<br>• Design measures to minimise risks at closure (e.g. SLC abandonment bund, decline portal plug, boxcut backfilled, ventilation raises capped)<br>**Management Strategies**<br>• Decommissioning and Rehabilitation Plan<br>• Removal of infrastructure<br>• Cave Monitoring Plan | No unauthorised access to site beyond gatehouse or to active areas.<br>Fences established around the mine, MPP, airstrip and Tjungu Village. |

| Environmental Aspect | Design and management strategy | Effectiveness of existing control strategies |
|---|---|---|
| Native vegetation | **Design Strategies**<br>• Avoidance of critical habitat during site selection<br>• Completing pre-construction 'clearance' surveys to identify any critical and preferred habitat of Plains Mouse (e.g. cracking clays on run-ons, drainage channels or gilgais), Thick-Billed Grasswrens (e.g. patches of taller and dense shrubland habitat, often associated with drainage channels) and Night Parrots (e.g. spinifex hummock grasslands) by a suitably qualified and experienced ecologist<br>• Flag off any populations or preferred habitat identified in close proximity to the disturbance footprint identified during the pre-construction 'clearance' surveys<br>• Access track upgrade or construction will include flow disruptors and diversion drains to minimise erosion<br>**Management Strategies**<br>• Land disturbance approval process*<br>• Area-specific and site inductions and training<br>• Monthly (construction) or annual (operations) land disturbance reconciliation*<br>• Land Disturbance Register and supporting GIS information (shapefiles) to record/identify clearance areas and status*<br>• Including awareness training regarding the conservation significance of flora and fauna species in the area as part of the induction process | No unauthorised land disturbance occurred in 2024.<br>Avoidance of critical and preferred habitat of Plains Mouse, Thick-Billed Grasswren and Night Parrot is checked off during generation of an LDP/GLUP. Spatial data for vegetation association is interrogated to ensure that proposed disturbance avoids potential Plains Mouse, Thick-Billed Grasswren and Night Parrot habitat where possible.<br>No populations of Plains Mouse, Thick-Billed Grasswren and Night Parrot identified during pre-clearance surveys.<br>Installation and maintenance of flow disruptors and/or diversion drains will be undertaken during operations where high risk areas are delineated. |
| Weeds and pests | **Management Strategies**<br>• Vehicle inspections and wash-down procedures*<br>• Weed inspection program within disturbance footprint*<br>• Weed "Red Alert" List for quick identification<br>• Weed and pest eradication programmes*<br>• Waste Management Plan and practices<br>• Landfill Environment Management Plan<br>• Pest eradication program<br>• Waste Management Plan and practices<br>• Daily cover of landfill face | Vehicle wash down bay operational for entire reporting period.<br>Vehicle inspections prior to commencement of works identifies any potential for weeds/seeds. Vehicles sent straight to wash down bay if required.<br>New populations of Bathurst Burr (Priority Weed species) were identified in 2019, one (1) which is believed to be a result of mining activities. This population (~20 stems) was destroyed by BHP Carrapateena personnel (CA-ENV-REP-1103).<br>Cat trapping continued throughout 2024 to manage numbers on mining tenure.<br>Landfill not established on site. |
| Native fauna | **Management Strategies**<br>• Traffic Management Plan and speed limits<br>• Area-specific and site inductions and training<br>• Wherever possible, open excavations and drill holes will be covered as soon as practicable or managed to ensure no entrapment can occur through the use of ramps<br>• Incident reporting procedures<br>• Land disturbance approval process*<br>• Land Disturbance Register and supporting GIS information (shapefiles) to record/identify clearance areas and status*<br>• Area-specific and site inductions and training<br>• Monthly (construction) or annual (operations) land disturbance reconciliation*<br>• Design Strategies<br>• Avoidance of critical habitat during site selection | BHP Carrapateena personnel monitor scour pits and turkey's nests infrastructure (including fences) on a fortnightly basis and identified issues are rectified. |

| Environmental Aspect | Design and management strategy | Effectiveness of existing control strategies |
|---|---|---|
| Land use and property | **Design Strategies**<br>• Rehabilitation of land to achieve a landscape function equivalent to the surrounding landscape<br>• Separation of overland surface water flows originating from undisturbed areas of the Operation Area from the surface water run-off that has interacted with stockpiles and access roads<br>• Provision of sediment basins/ponds and appropriate drainage on roadways adjacent to surface water bodies or catchments for the collection of sediments in surface water transported along the roadway (longitudinal flows)<br>• Fords, culverts, diversion drains, bunding and sedimentation/event basins designed and installed in accordance with Best Practice Operating Procedures endorsed by the SA Arid Lands Natural Resources Management Board or a Water Affecting Activity Permit under the *Natural Resources Management Act 2004* (SA)<br>• Infrastructure designed with consideration to facilitating closure and permitting progressive rehabilitation (e.g. layout of temporary and permanent site infrastructure, placement of stockpiles, design of plant and equipment modules etc.)<br>**Management Strategies**<br>• Local Area Agreement - Operating Protocol<br>• Regular meetings with pastoral land managers<br>• Waivers in place for any water point infrastructure in close proximity to Operation activities<br>• Destocking infrastructure locations<br>• Traffic Management Plan<br>• Area-specific and site inductions and training<br>• Decommissioning and Rehabilitation Plan<br>• All commercial or industrial waste is disposed of in an EPA licensed facility<br>• Rehabilitation procedures*<br>• Rehabilitation trials<br>• Stockpile management procedures to ensure quantity and quality is maintained | Operating protocols are established with Pernatty, Bosworth, Arcoona and Oakden Hills Pastoral Stations. Negotiations with South Gap Pastoral Station is ongoing, with a draft operating protocol in operation.<br>Regular operational updates provided to local Pastoralist stakeholders.<br>Waivers of exemption are in place and evidenced in GLUPs/LDPs. Exempt land is barricaded off if a waiver of exemption is not in place.<br>Northern Wellfield trunk line is buried at major creek crossings (Salt Creek and Bosworth Creek) to preserve flows.<br>Northern Wellfield borepads are rehabilitated back to infrastructure boundaries (where possible). |
| Land and soil | **Design Strategies**<br>**(Schedule 6 Condition 10.1)**<br>• Hydrocarbon and chemical storage facilities designed in accordance with Australian Standards.<br>• Storages bunded in accordance with EPA Bunding Guidelines and/or relevant Australian Standards*<br>**Management Strategies**<br>• All commercial or industrial waste is disposed of in an EPA licensed facility<br>• Licenced chemical and waste transporters<br>• Establishment of Chemical Database including copies of SDS and storage, handling and disposal requirements*<br>• Contaminated land register<br>• Contracts contain conditions relevant to the bringing of chemicals and hydrocarbons onto site<br>• Induction contains process for bringing chemicals and hydrocarbons onsite including requirements for storage, handling and disposal<br>• Contracts contain conditions relevant to design, management of the storage and handling of chemicals and hydrocarbons<br>• Spill and emergency response procedures<br>• Equipment maintenance to prevent spills<br>• Incident reporting procedures<br>• Regular inspection programs where bunding either temporary or permanent is installed to ensure appropriate use, placement of spill kits, clean up procedures and handling procedures<br>**Design Strategies**<br>**(Schedule 6 Condition 10.2)**<br>• Landfill is constructed and operated in accordance with EPA Guidelines and is appropriately licensed under the *Environment Protection Act 1993* (SA). | Standards for hydrocarbon storage and fuel facilities included in all relevant contracts.<br>Environmental Inspection template addresses compliance to EPA guidelines and Australian Standards.<br>Consignment Authority and Tracking Certificates generated for removal of all listed Schedule 1 wastes are on site.<br>No landfill onsite.<br>Chemical Request Form and Risk Assessment process is established for operations. |

| Environmental Aspect | Design and management strategy | Effectiveness of existing control strategies |
|---|---|---|
| | **Management Strategies**<br>• All commercial or industrial waste is disposed of in an EPA licensed facility, which is closed in accordance with relevant EPA Guidelines*<br>• Licenced chemical and waste transporters*<br>• Establishment of Chemical Database including copies of SDS and storage, handling and disposal requirements<br>• Induction contains process for bringing chemicals and hydrocarbons onsite including requirements for storage, handling and disposal<br>• Landfill Environmental Management Plan<br>• Waste Management Plan and practices, including daily covering of the landfill face | |
| Air quality | **Design Strategies**<br>• Buffer applied to disturbance footprint to account for edge effects on native vegetation and habitat.<br>• 25 km distance to homestead and water tanks.<br>• Progressive rehabilitation of disturbed areas (primary, secondary rehabilitation and/or revegetation).<br>• Enclosure of concentrate storage and handling facilities<br>• Copper concentrate transport containers* | Vegetation condition assessed annually to determine when and where buffer for land disturbance is to be applied.<br>Audit of copper concentrate haulage container inspections were completed throughout the reporting period at a quarterly frequency. Third-party independent audit of concentrate haulage containers was completed. |
| | **Design Strategies for TSF**<br>• Rock armouring of final landforms external slopes<br>• Progressive rehabilitation of disturbed areas (primary, secondary rehabilitation and/or revegetation)<br>• No-cover capping for TSF surface | Construction of Stage 1 (starter embankment) of the TSF was completed in September 2019. Construction of Stage 2 (downstream raise) was completed in May 2022 and constitutes the final rock armoured embankment.<br>Construction of TSF Stage 2 embankment was completed in May 2022 with tailings deposition commencing on 22 March 2023. |
| | **Design Strategies for Disturbed Operational Areas**<br>• Progressive rehabilitation of disturbed areas<br>• All disturbed areas rehabilitated except for TSF top surface and subsidence zone crater | Rehabilitation of TSF borrow pits, haul roads and surplus open areas completed post-construction of Stage 1.<br>Progressive rehabilitation of disturbed areas completed during construction of Stage 2.<br>Infrastructure associated with construction of the Western Access Road including the Tjungu Village temporary access road and Midway Quarry stockpile areas were rehabilitated in 2022. |
| | **Design Strategies for CTP**<br>• Acid mist scrubbers fitted to the CTP flash steam discharge vents* (Fundamental Design Control)<br>**Management Strategies**<br>• Dust suppression on disturbed land and unsealed roads<br>• Dust suppression systems on crushing operations<br>• Dust suppression at conveyor transfer points<br>• Maintenance of unsealed roads<br>• Dust suppression water sprays on Course Ore Stockpile<br>• Destocking infrastructure areas<br>• Waivers will be in place for any water point infrastructure in close proximity to Operation activities<br>• Field trials to confirm outputs of the air quality modelling outputs*<br>• Acid mist scrubber maintenance and monitoring program including<br>• Continuous monitoring of scrubber performance through the site Process Control System (PCS)<br>• Implementation of preventative maintenance and/or condition monitoring processes Regular verification of scrubber performance through third-party isokinetic sampling of the stack vent gases (pre- and post-scrubber)<br>• Copper concentrate transport container maintenance and monitoring program including regular visual inspection of the containers, including the sealing of the lids<br>• Establishing container filling procedures, with appropriate training and supervision for personnel involved in this task, and the use of container weighing/load information to inform loading activities | Not applicable |

| Environmental Aspect | Design and management strategy | Effectiveness of existing control strategies |
|---|---|---|
| Radiation | **Design Strategies**<br>• Buffer applied to disturbance footprint to account for edge effects on native vegetation and habitat<br>• Progressive rehabilitation of disturbed areas (primary, secondary rehabilitation and/or revegetation)<br>• Enclosure of concentrate storage and handling facilities<br>• No mineralised material left on the surface post closure<br>• No-capping for TSF surface | Radiation risks are managed in accordance with Radioactive Waste Management Plan (000793). |
| Surface water – erosion and sedimentation | **Design Strategies**<br>• Separation of overland surface water flows originating from undisturbed areas of the Operation area from the surface water run-off that has interacted with stockpiles, MPP and Mining infrastructure<br>• Provision of sediment basins/ponds and appropriate drainage on roadways adjacent to surface water bodies or catchments for the collection of sediments in surface water transported along the roadway (longitudinal flows)*<br>• TSF embankment and decant collection dam and ponds<br>• Fords, culverts, diversion drains, bunding and sedimentation/event basins design and installed in accordance with Best Practice Operating Procedures endorsed by the SA Arid Lands Natural Resources Management Board or a Water Affecting Activity Permit under the *Natural Resources Management Act 2004* (SA)<br>• Rehabilitation of land to achieve a landscape function equivalent to the surrounding landscape<br>**Management Strategies**<br>• Best Practice Operating Procedures<br>• Temporary sediment and erosion controls (e.g. mobile sediment booms, sediment fencing)<br>• Surface water management infrastructure maintenance and inspection programs<br>• Culvert and ford maintenance and inspection programs<br>• Rehabilitation procedures and inspection program | Life of Mine surface water management infrastructure was completed at the end of 2020.<br>All key management features include:<br>• subsidence zone diversion drain<br>• MPP and NPI internal drain network and event ponds<br>• pre-production stockpile drainage<br>• WRD environmental ponds (x3)<br>• aerodrome diversion drain.<br>Construction of a network of internal (dirty water) swale drains traversing north/south between the pre-production stockpile and the quartzite stockpile was completed in 2021. This catchment is contained within an internal footprint, therefore the risk of contaminated water leaving this area is negligible. |
| Surface water – reduced flows | **Design Strategies**<br>• TSF site selection considered 12 sites with the minimisation of footprint and catchment disturbance of Eliza Creek a key consideration<br>• Diversion Infrastructure | Construction of Stage 1 of the TSF completed in September 2019 in the upper reaches of Eliza Creek catchment.<br>Diversion infrastructure around cave established before the cave breakthrough in December 2022. |
| Surface water – TSF | **Fundamental Design Control***<br>• TSF embankment and decant collection dam and ponds*<br>• Final detailed TSF design in accordance with ANCOLD design criteria*<br>• Flood storage capacity (1-in-100 AEP Rain Event including wave freeboard)*<br>• Freeboard capacity (1-in-1000 AEP critical duration event)*<br>• A central compacted clay core, extending into a cut-off key trench where in situ soil is present*<br>• Dental concrete on fractured bedrock at the contact of the central clay core with the watercourse i.e., where in situ soil is not present*<br>• An upstream sloping zone of compacted clay in the Stage 1 (and Stage 2) TSF embankment, extending into a cut-off key at the toe, where in situ soil is present*<br>• A geosynthetic lined cell in the Decant Dam, at the upstream toe of the embankment to manage seepage and decant water from the TSF*<br>**Design Strategies**<br>• A clay liner in the drainage channel where exposed bedrock exists. Approximately 3500 m by 1 m thick by 30 m wide in the Stage 1 Footprint. Extra disturbance footprint around the TSF has been included to allow additional extraction of material*<br>• A seepage cut-off drain at the downstream toe of the embankment. A geosynthetic liner on the upstream slope of the Stage 1 TSF embankment*<br>• Decant outfall pipe extension from the TSF embankment to the lined decant cell* | Construction of TSF Stage 1 completed in September 2019, in accordance with the design (OZ Minerals 2020; Appendix B1 Tailings Storage Facility Design), evidenced in:<br>• Construction Report for Tailings Stage 1 Works, Golder Associates (CA-3630-CIV-REP-1018)<br>• TSF Stage 1 – Final Independent Auditor Report, ATC Williams (CA-3630-QAC-REP-2016).<br>TSF Stage 2 Construction Reports prepared by the Engineer of Record (WSP Golder) and Independent Auditor (ATC Williams) are evidenced in:<br>• WSP Golder TSF Stage 2 Construction Report (CA-3630-CIV-REP-1054)<br>• ATC Williams TSF Stage 2 Construction Independent Audits of Tailings Storage Facility (CA-3630-PRM-REP-1524). |

| Environmental Aspect | Design and management strategy | Effectiveness of existing control strategies |
|---|---|---|
| | **Management Strategies**<br>• Embankment foundation assessments*<br>• Embankment stability assessment*<br>• Dam Safety Monitoring Program*<br>• QA/QC Procedures*<br>• Daily inspections*<br>• Alarmed pressure indicators<br>• Remote isolation valves on delivery infrastructure*<br>• QA QC Procedures*<br>• Auditing of critical stages*<br>• Detailed final design*<br>• Seepage collection and volume monitoring in cut-off drain<br>• Continual characterisation of chemical and physical properties of the tailings* | |
| Surface water – acid mine drainage (AMD) | **Design Strategies**<br>• Pre-Production stockpile pad*<br>• Separation of overland surface water flows originating from undisturbed areas of the Operation area from the surface water run-off that has interacted with stockpiles, MPP and Mining infrastructure.<br>**Management Strategies**<br>• PAF material (marginal ore) would be preferentially left underground where possible if brought to surface, marginal ore would be stored on the ROM stockpile (ex-Development Pre-Production Ore Stockpile)*<br>• Block modelling of ore and waste units*<br>• Sulphur cut-off grade determined*<br>• QA/QC procedures and record keeping*<br>• Development of an AMD Management Plan | Life of Mine surface water management completed at the end of 2020. All key management features completed:<br>• subsidence zone diversion drain<br>• MPP and NPI internal drain network and event ponds<br>• pre-production stockpile drainage<br>• WRD environmental ponds (x3).<br>Acid and Metalliferous Drainage Management Plan (CA-ENV-PLN-1013) and associated procedures provide framework for handling PAF material.<br>Geological block model underpins delineation non-desirable waste (PAF) using an AMD Classification System: sulphur (>0.3 wt%) and copper (<0.2 wt%) assay data. Further interrogation of the Classification System is being undertaken through (QA/QC) sampling in accordance with CA-PRO-ENV-1002 Operational Characterisation.<br>In 2024, the overall understanding of PAF material and its location was considered sufficient, leading to a commissioning of a review of the acid base accounting (ABA) sampling program to ensure its continued effectiveness. |
| Groundwater – TSF | Design Strategies<br>• Lining of water-holding ponds and barren liquor evaporation ponds.<br>• Design of a thickened tailings disposal system (65% w/w solids).<br>• TSF located upstream of the sub level cave subsidence zone.<br>**Management Strategies**<br>• TSF Water balance to be updated in accordance with Life-Of Mine Plan and verified against modelling inputs.<br>• Continued tailings physical and geochemical characterisation undertaken and verified against modelling inputs.<br>• Flow and sump meters to monitor tailings inputs and outputs.<br>• Ongoing calibration of the groundwater model using data obtained from groundwater monitoring | Stage 1 of the TSF was completed in September 2019 and commenced operation on 25 February 2020. Construction of TSF Stage 2 embankment was completed in May 2022 and deposition commenced on 22 March 2023.<br>Thickened tailings disposal averaged approximately 61% density (w/w, %) continuing in a steady state during the reporting period. Whilst this falls below the predicted 65% (w/w, %), dry density averaged 2 t/m$^3$ which aligned to the 1.9 t/m3 adopted during early operation of TSF Stage 2.<br>Decant return pumps were operational throughout the reporting period (average rate of return 95.7 ML/month). |
| Groundwater – drawdown | **Design Strategies**<br>• Site Water Balance based on modelling inputs and LoM plan*<br>• Production wellfield and mine dewatering will not exceed maximum daily abstraction rate (PEPR Table 4.67)*<br>• Abstraction rates designed to sustainable yields<br>• Telemetric controls/headwork engineering and flow meters to monitor abstraction rates<br>**Management Strategies**<br>• Water balance to be updated in conjunction with Life of Mine Plans<br>• Flow/sump meters to monitor abstraction and mine dewatering rates<br>• Ongoing calibration of the groundwater model using data obtained from groundwater monitoring* | Installed capacity of pumping infrastructure is below the maximum daily abstraction rate.<br>Current mine inflows are within modelled parameters. This dataset is collated and reported internally within Aquifer Resource Assessment Reports.<br>Water transactions are metered with data reporting to Pi Historian via telemetry.<br>Quarterly Aquifer Resource Assessment Reports are issued by the site environmental team reporting on assessed pumping data, SWL and projected drawdown against hydrographs.<br>Groundwater model was revised in 2023 as per two-yearly requirement. |

| Environmental Aspect | Design and management strategy | Effectiveness of existing control strategies |
|---|---|---|
| Groundwater – contamination | **Design Strategies**<br>• Hydrocarbon and chemical storage facilities designed in accordance with relevant Australian Standards<br>• Landfill is constructed and operated in accordance with EPA Guidelines and is appropriately licensed under the *Environment Protection Act 1993* (SA)<br>• Storages bunded in accordance with EPA Bunding Guidelines and/or relevant Australian Standards<br>**Management Strategies**<br>• Spill and emergency response procedures<br>• Equipment maintenance to prevent accidental releases<br>• Licenced chemical and waste transporters<br>• Incident reporting procedures<br>• Regular inspection programs where bunding either temporary or permanent is installed to ensure appropriate use, placement of spill kits, clean up procedures and handling procedures<br>• Induction contains process for bringing chemicals and hydrocarbons onsite including requirements for storage, handling and disposal<br>• Contracts contain conditions relevant to design, management of the storage and handling of chemicals and hydrocarbons<br>• Establishment of Chemical Database including copies of SDS and storage, handling and disposal requirements | Standards for hydrocarbon storage and fuel facilities is included in all relevant contracts.<br>Environmental Inspection template addresses compliance to EPA guidelines and Australian Standards.<br>Waste Tracking Forms are provided by waste management contractor for all listed Schedule 1 wastes.<br>No landfill onsite.<br>Chemical Request Form and Risk Assessment process established for operations. |

* If there is a high reliance on a control strategy or management strategy to prevent or minimise an impact a Leading Indicator has been proposed

# 10 Non-outcome based lease conditions

| Tenement/Schedule 2 Licence Condition # | Tenement Condition | Compliance Status | Evidence demonstrating compliance with tenement condition |
|---|---|---|---|
| ML 6471, MPL 149, MPL 152, MPL 153, MPL 154, MPL 156 Cond 1 | The Tenement holder must during construction, operation and post Completion ensure there is no damage, disturbance or interference to Aboriginal heritage sites, objects or remains unless it is authorised under the relevant legislation. | Compliant | All land disturbance is spatially audited against LDP/GLUP boundaries using survey data, drone and satellite imagery in ArcGIS to ensure works were completed within approved work areas, cultural heritage survey report conditions and have authorisation in accordance with the *Aboriginal Heritage Act 1988* (SA).<br>All land disturbance activities complied with authorisation requiremetns during the reporting period. |
| ML 6471 Cond 2 | The Tenement Holder must ensure that post Completion, all final mine landforms (including the TSF) will be chemically and physically stable in the long term. | In progress | TSF design provided as Appendix B1 of Mining Lease PEPR (OZ Minerals 2020).<br>Updated geochemical characterisation for waste rock and ore completed in 2024.<br>Life of Mine TSF design updated in 2024. |
| ML 6471 Cond 3 | Following completion of detailed design of the TSF and Decant Dam, the following documentation for the TSF and Decant Dam must be developed and maintained:<br>• 3.1 Construction documentation;<br>• 3.2 Design drawings and quantity schedule;<br>• 3.3 Technical specifications;<br>• 3.4 Construction Quality Assurance (CQA) Manual;<br>• 3.5 Operations, Maintenance and Surveillance (OMS) Manual; and<br>• 3.6 Dam Safety Emergency Plan (DSEP) | Compliant | TSF Stage 1 completed construction.<br>Conditions 3.1, 3.2, 3.3 and 3.4 provided to DEM via email dated 12/11/18.<br>TSF design provided as Appendix B1 of Mining Lease PEPR (OZ Minerals 2020).<br>Final copies of OMS (Condition 3.5) (CA-PRO-MNL-1001) and DSEP (Condition 3.6) (CA-PRO-PLN-1000) provided to DEM 13/12/2019, prior to commissioning. |
| ML 6471 Cond 4 | The TSF and Decant Dam construction, operation and closure must be audited against (i) the design, the design criteria and plans that have been adopted for the TSF and Decant Dam construction, operation and closure, (ii) all of the documentation listed in Second Schedule Condition 3 and (iii) the most recent version of the ANCOLD Tailings Dam Guideline:<br>• 4.1 For the Stage 1 TSF and Decant Dam embankment foundation preparation and embankment construction; and<br>• 4.2 For each subsequent stage of the TSF and Decant Dam embankment construction; and<br>• 4.3 On a three (3) monthly basis during Stages 1 and 2 of TSF and Decant Dam operations or at a frequency as the Director of Mines (or other authorised officer) may specify in writing; and<br>• 4.4 On a six (6) monthly basis during Stages 3, 4, 5 and 6 (and any subsequent stages) of TSF and Decant Dam operations or at a frequency as the Director of Mines (or other authorised officer) may specify by notice in writing; and<br>• 4.6 After the final TSF and Decant Dam rehabilitation, closure and decommissioning works have been completed. | Compliant (4.1)<br>Complaint (4.3)<br>Compliant (4.2), (4.4) and (4.6) | TSF Stage 1 completed construction and in operation.<br>Suitably qualified expert (ATC Williams), endorsed by DEM, engaged for Construction Quality Assurance as required by Condition 4.1.<br>Final version of Stage 1 Construction Independent Audit Report provided to DEM on 6/12/19 (CA-3630-QAC-REP-2016[2]).<br>Final version of Stage 2 Construction Independent Audit Report provided to DEM on 20/03/23 (CA-3630-PRM-REP-1524)<br>Condition 4.2: ATC Williams TSF Stage 2 Construction Independent Audits of Tailings Storage Facility (CA-3630-PRM-REP-1524).<br>Five (5) audits were undertaken pertaining to operation of the TSF during the reporting period, which meet the requirements of ML 6471 Condition 4:<br>• Tailings Storage Facility, Q1 2024 Site Visit and Monitoring Report, June 2024 (WSP) (CA-3630-CIV-REP-1103)<br>• Tailings Storage Facility, Q2 2024 Site Visit and Monitoring Report, September 2024 (WSP) (CA-3630-CIV-REP-1114)<br>• Tailings Storage Facility, Q3 2024 Site Visit and Monitoring Report, December 2024 (WSP) (CA-3630-CIV-REP-1120)<br>• Tailings Storage Facility, Engineer of Record Comprehensive Annual Report, January 2024 to January 2025 (WSP). Annual audit completed in February 2025, final report pending.<br>• ATC Williams annual independent audit completed in March 2025, final report pending. |
| ML 6471 Cond 5 | Following audit of the Tailings Storage Facility the expert must prepare reports of the findings of each audit. | Compliant | Refer to ML 6471 Condition 4 for relevant documents. |
| ML 6471 Cond 6 | The initial expert report for the audit of the Stage 1 TSF and Decant Dam foundation preparation and embankment construction must be provided to the Director of Mines (or other authorised officer) prior to the placement of tailings and waste into the TSF. | Compliant | Final version of Construction Independent Audit Report provided to DEM on 6/12/19 (CA-3630-QAC-REP-2016[2]). |
| ML 6471 Cond 7 | The expert report for the audit which occurs after the final discharge of tailings into the TSF must be provided to the Director of Mines (or other authorised officer) prior to the commencement of final rehabilitation of the TSF and Decant Dam. | Not relevant | TSF is in operational phase. This is a completion criteria and as such, is not relevant. |

| Tenement/Schedule 2 Licence Condition # | Tenement Condition | Compliance Status | Evidence demonstrating compliance with tenement condition |
|---|---|---|---|
| ML 6471 Cond 8 | All other expert reports must be provided to the Director of Mines (or other authorised officer) within forty-five (45) days or such longer period approved by the Director of Mines (or other authorised officer) of completion of the audit. | Compliant | Final version of Construction Independent Audit Report provided to DEM on 6/12/19 (CA-3630-QAC-REP-2016[2]). |
| ML 6471 Cond 9 | All expert reports will be made publicly available. | Compliant | Reports are publicly available on the DEM website. |
| ML 6471 Cond 10 | The expert reports for the audits of Stage 1 and each subsequent stage of TSF embankment construction must address the following matters (but not limited to):<br>• 10.1 Demonstrate that sufficient freeboard has been achieved to ensure flood storage capacity for a 1-in-100 AEP rainfall event including wave freeboards (1 in 10 AEP winds) and contingency freeboard of 0.5m;<br>• 10.2 Demonstrate emergency spillways for each stage of the operation have the capacity for flow resulting from 1-in-100 AEP critical duration event including wave freeboard;<br>• 10.3 Demonstrate that tailings properties in operations are consistent with the adopted tailings properties, including density and strength as specified in the detailed final design:<br>• 10.3.1 Should tailings density or strength be inconsistent, undertake an assessment of the potential impact on the TSF (including, but not limited to, TSF storage capacity) and propose any remediation to the design if deemed necessary;<br>• 10.4 Liquefaction assessment based on in-situ test work of the tailings prior to upstream raises;<br>• 10.5 A seismic hazard assessment (SHA) to provide site-specific peak ground acceleration (PGA) parameters for stability assessments;<br>• 10.6 The geometry of upstream raises and foundation treatment has been confirmed prior to each upstream raise;<br>• 10.7 The suitability and compatibility of the various embankment fill materials has been assessed; and<br>• 10.8 Assessment of all of the documentation listed in Second Schedule Condition 3 to ensure that the content of the documents is appropriate for the next stage of TSF embankment construction. | Compliant | Final version of Construction Independent Audit Report provided to DEM on 6/12/19 (CA-3630-QAC-REP-2016[2]).<br>ATC Williams TSF Stage 2 Construction Independent Audits of Tailings Storage Facility (CA-3630-PRM-REP-1524). |
| ML 6471 Cond 11 | The expert report for the audit which occurs after the final TSF and Decant Dam rehabilitation, closure and decommissioning works have been completed must address the following matters (but not limited to):<br>• 11.1 Spillway designed for the seventy-two (72) hour PMP critical duration event and in accordance with ANCOLD;<br>• 11.2 Decant system is decommissioned in accordance with the design; and<br>• 11.3 Reshaping of the TSF embankment in accordance with the design to provide a profile that is resistant to erosion. | Not relevant | TSF is in operational phase. This is a completion criteria and as such, is not relevant. |
| ML 6471 Cond 12 | The audits required by Second Schedule Conditions 4.1, 4.2, 4.5, 4.6 and associated reports required by Second Schedule Condition 5 must be conducted and provided by an independent and suitable qualified expert approved by the Director of Mines (or other authorised officer). | Compliant | Suitably qualified expert (ATC Williams), endorsed by DEM, was engaged for Operation Quality Assurance as per Condition 4.1. |
| ML 6471 Cond 13 | The audits required by Second Schedule Conditions 4.3, 4.4 and associated reports required by Second Schedule Condition 5 must be conducted and provided by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) at least once for each twelve (12) month period. | Compliant | Suitably qualified expert (ATC Williams), endorsed by DEM, was engaged for Operation Quality Assurance as per Condition 4.1. |
| ML 6471 Cond 14 | An audit required by Second Schedule Conditions 4.3, 4.4 and associated reports required by the Second Schedule Condition 5 may be conducted and provided by a suitably qualified Tenement Holder employee previously approved by the Director of Mines (or other authorised officer). To apply for approval the Tenement Holder must:<br>• 14.1 Apply in writing; and<br>• 14.2 Provide the employee's Curriculum Vitae showing their academic qualifications, publications (if any) and practical experience. | Not relevant | BHP Carrapateena is not using a Tenement Holder employee to undertake relevant audits. |
| ML 6471 Cond 15 | The Tenement Holder must during operations ensure that any CTP constructed on the Land is equipped with scrubbers which are designed appropriately to prevent acid mist emissions. | Not relevant | CTP is no longer under consideration. |

| Tenement/Schedule 2 Licence Condition # | Tenement Condition | Compliance Status | Evidence demonstrating compliance with tenement condition |
|---|---|---|---|
| ML 6471 Cond 16 | The Tenement Holder must during operations ensure that copper concentrate is transported in fit for purpose sealed containers to prevent copper concentrate release to the environment | Compliant | Haulage of copper concentrate is undertaken using dedicated purpose-built trailers by a suitably qualified contractor. |
| ML 6471 Cond 17<br>MPL 149 Cond 2<br>MPL 152 Cond 3<br>MPL 153 Cond 2<br>MPL 154 Cond 3<br>MPL 156 Cond 2 | The Tenement Holder must ensure that all commercial or industrial waste (which does not include CTP process residue, tailings and waste rock) is disposed of in an EPA licenced facility. | Compliant | Monthly waste disposal records are provided by Cleanaway Pty Ltd for BHP Carrapateena and site contractors for all waste leaving the Carrapateena site.<br>Waste Tracking Forms are provided for wastes listed in Schedule 1 of the *Environment Protection Act 1993* (SA). |
| ML 6471 Cond 18<br>MPL 149 Cond 2<br>MPL 152 Cond 4<br>MPL 153 Cond 3<br>MPL 154 Cond 4<br>MPL 156 Cond 3 | The Tenement Holder must ensure that all mining related infrastructure is decommissioned and removed from, the Land at Completion unless the Director of Mines (or other authorised officer) has approved, in writing, for the infrastructure to remain. | Not relevant | Carrapateena is in operational phase. This is a completion criteria and as such, is not relevant. |
| ML 6471 Cond 19<br>MPL 149 Cond 4<br>MPL 152 Cond 5<br>MPL 153 Cond 4<br>MPL 154 Cond 5<br>MPL 156 Cond 4 | The Tenement Holder agrees to the Approved PEPR and any compliance reports and reportable incident reports, submitted in accordance with the Regulations, being made available for public inspection. | Compliant | Details of reportable incidents in 2024 are provided in Section 8. |
| ML 6471 Cond 20<br>MPL 149 Cond 2<br>MPL 152 Cond 6<br>MPL 153 Cond 5<br>MPL 154 Cond 6<br>MPL 156 Cond 5 | Within thirty (30) days of becoming aware of any event or decision which is likely to give rise to the cessation of mining operations or mining related activities for a period of more than seven (7) days and where possible prior to the cessation of mining operations or mining related activities, the Tenement Holder must notify the Director of Mines in writing of the event or decision. The notice must specify the date upon which the mining operations or mining related activities are expected to cease or have ceased, an estimate of the period of cessation and an outline of the steps to develop any required DRP under Second Schedule | Not relevant | |
| ML 6471 Cond 21<br>MPL 149 Cond 6<br>MPL 152 Cond 7<br>MPL 153 Cond 6<br>MPL 154 Cond 7<br>MPL 156 Cond 6 | The Tenement Holder must comply with a Decommissioning and Rehabilitation Plan (DRP) approved in accordance with Second Schedule when decommissioning or rehabilitating the Mining Tenement. | Not relevant | |
| ML 6471 Cond 22<br>MPL 149 Cond 7<br>MPL 152 Cond 8<br>MPL 153 Cond 7<br>MPL 154 Cond 8<br>MPL 156 Cond 7 | Unless the Director of Mines (or other authorised officer) otherwise directs, a DRP must be submitted to the Director of Mines (or other authorised officer) for approval within sixty (60) days or such longer period which is approved by the Director of Mines (or other authorised officer) of any notification provided to the Director of Mines in relation to the notification of cessation of operations under Second Schedule, and that DRP must:<br>• Set out the activities and scheduling required for the carrying out of the rehabilitation works specified in the Approved PEPR;<br>• Be prepared in accordance with any guidelines provided by the Director of Mines (or other authorised officer). | Not relevant | |
| ML 6471 Cond 23<br>MPL 149 Cond 8<br>MPL 152 Cond 9<br>MPL 153 Cond 8<br>MPL 154 Cond 9 | If, in the opinion of the Director of Mines (or other authorised officer), mining operations or mining related activities on the mining Tenement have substantially ceased for two (2) consecutive years or more, the Director of Mines (or other authorised officer) may:<br>• Require that the Tenement Holder submit a DRP for approval dealing with the requirements set out in Second Schedule; and/or | Not relevant | |

| Tenement/Schedule 2 Licence Condition # | Tenement Condition | Compliance Status | Evidence demonstrating compliance with tenement condition |
|---|---|---|---|
| MPL 156 Cond 8 | • Direct the Tenement Holder to rehabilitate the Mining Tenement in accordance with the Approved PEPR and/or any DRP. | | |
| ML 6471 Cond 24<br>MPL 149 Cond 6<br>MPL 152 Cond 10<br>MPL 153 Cond 9<br>MPL 154 Cond 10<br>MPL 156 Cond 9 | The Tenement Holder must develop (in consultation with the owners of land and to the satisfaction of the Director of Mines (or other authorised officer)) a communication and operating protocol, or an agreement incorporating such a protocol, between itself and owners of land adjacent to and on the Land prior to the commencement of mining operations and mining related activities that includes, unless the Director of Mines (or other authorised officer) is otherwise satisfied, the following matters:<br>• Interaction with landowner operations;<br>• emergency procedures;<br>• Communications and issue management processes;<br>• Land management;<br>• Dispute resolution;<br>• Ongoing communication about the Tenement Holder's operations;<br>• Receiving and considering feedback;<br>• safety procedures;<br>• Access protocols; and<br>• Any matters identified by the Director of Mines (or other authorised officer) in writing. | Compliant | Protocols developed and agreed to in 2018.<br>Protocols submitted to DEM March 2019.<br>Refer also to Community Engagement in Section 22 for details of consultation undertaken with landowners. |
| ML 6471 Cond 25<br>MPL 149 Cond 7<br>MPL 152 Cond 11<br>MPL 153 Cond 10<br>MPL 154 Cond 11 | The Tenement Holder must:<br>• Provide the protocol(s) to the Director of Mines (or other authorised officer) within six (6) months of the grant of the Mining Tenement or such longer period that the Director of Mines (or other authorised officer) may allow; and | Compliant | Protocols developed and agreed to in 2018.<br>Protocols submitted to DEM March 2019. |
| ML 6471 Cond 25<br>MPL 149 Cond 7<br>MPL 152 Cond 11<br>MPL 153 Cond 10<br>MPL 154 Cond 11<br>MPL 156 Cond 10 | Maintain and adhere to the protocol(s) to the satisfaction of the Director of Mines (or other authorised officer) for the term of the Mining Tenement. | Compliant | The protocols are managed through the obligation management database (LandFolio) and the Carrapateena Community and Corporate Affairs team ensure obligations are adhered to.<br>BHP Carrapateena utilises SAP EMS to record non-compliances with the protocols. |
| ML 6471 Cond 26<br>MPL 149 Cond 11<br>MPL 152 Cond 12<br>MPL 153 Cond 11<br>MPL 154 Cond 12<br>MPL 156 Cond 11 | A notification required by regulation 98(1) must be in writing. | Compliant | No notifications required under regulation 98(1). |
| ML 6471 Cond 27 | For the purpose of this Additional Condition:<br>• 27.1 ‘Plains Mouse’ means *Pseudomys australis*;<br>• 27.2 ‘Existing population’ means an area of suitable habitat for Plains Mouse where the species has been observed/recorded;<br>• 27.3 ‘Existing habitat’ means an area of suitable habitat for the Plains Mouse;<br>• 27.4 ‘Suitable habitat’ means large open gypseous cracking clay areas associated with minor drainage features, and depressions within gibber stony plains (National Recovery Plan for the Plains Mouse *Pseudomys australis* 2012).<br>• 27.5 To compensate for the residual impact from mining operations on the existing Plains Mouse habitat, the Tenement holder must provide an environmental offset that:<br>• 27.5.1 Contains suitable habitat for the Plains Mouse or is known to have existing population of Plains Mouse; | Compliant | EPBC 2017/7895 Compliance Report 2024.<br>Refer to Section 14. |

| Tenement/Schedule 2 Licence Condition # | Tenement Condition | Compliance Status | Evidence demonstrating compliance with tenement condition |
|---|---|---|---|
| | • 27.5.2 Contains no less than 750ha of suitable habitat to offset the permanent loss of the existing Plains Mouse habitat;<br>• 27.5.3 The quality of suitable habitat must be at least equal to that of the quality of existing habitat that will be permanently lost;<br>• 27.5.4 Is connected to existing habitat of Plains Mouse by biodiversity corridors to ensure the Plains Mouse can utilise the environmental offset;<br>• 27.5.5 Is direct on-ground offset located on land using an appropriate legal mechanism (to the satisfaction of the Director of Mines (or other authorised officer)) that ensures the environmental offset is secured for conservation purposes for the life of the Mining Tenement or longer;<br>• 27.5.6 Is located as close as practical to the existing habitat that will be permanently lost;<br>• 27.5.7 The implementation of which is commenced either before, or at the same point in time as, the impact to the Plains Mouse habitat arising from the mining operations; and<br>• 27.5.8 Is managed for the life of the Mining Tenement or longer to maintain or improve the existing suitable habitat quality. | | |
| ML 6471 Cond 28<br>MPL 152 Cond 13<br>MPL 153 Cond 12<br>MPL 154 Cond 13 | To ensure the protection of Matters of National Environmental Significance, the Tenement Holder must:<br>• 28.1 Develop, implement and maintain appropriate management actions to ensure the control of feral animal populations, including cats and foxes;<br>• 28.2 Provide data from any future sightings and records of the Thick-billed Grasswren to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the National Recovery Plan Actions;<br>• 28.3 Provide data from any future sightings and records of the Night Parrot to the Night Parrot Recovery Team; and<br>• 28.4 Provide data from any future sightings and records of the Plains Mouse to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions. | Compliant | Weed inspections were routinely completed as inspection criteria within the Land Disturbance Inspection and General Environmental Inspection template.<br>No new Priority Weed species were identified in 2024.<br>Annual ecology survey targets sightings of species of National Environmental Significance, namely Thick-Billed Grasswren, Plains Mouse, Night Parrot and Curlew Sandpiper. Refer to Appendix D 2024 Carrapateena Flora and Fauna Survey (CA-0000-ENV-REP-1047). |
| ML 6471 Cond 29<br>MPL 149 Cond 8<br>MPL 152 Cond 14<br>MPL 153 Cond 13<br>MPL 154 Cond 14<br>MPL 156 Cond 12 | The Tenement Holder must comply with all State and Commonwealth legislation and regulations applicable to the activities undertaken pursuant to the Mining Tenement. | Compliant | All State and Commonwealth legislation is identified in the PEPR and Environment and Social Performance Management Plans. All licenses, permits and agreements are tracked through the obligations management database (LandFolio).<br>The Carrapateena Environment department ensures compliance with all State and Commonwealth legislation and Mining Tenement regulations. A subscription to the online service Environment Essentials is available to all staff at Carrapateena to support and inform compliance to State and Commonwealth legislation.<br>BHP Carrapateena's EMS is used to record any non-compliance with the protocols. |

# 11 Rectification of non-compliance

**Table 11.1 | Rectification of current non-compliances**

| Tenement | Date of Incident | Detected by operator or DEM | Reportable under Regulation 79? | Date reported to Minister | Date written report to Minster | Non-complaince Environmental outcome or tenement condition breached | Cause of non-compliance, OMC or lease condition breach | Status | Further Work Planned<br>Actions to rectify non-compliance and prevent reoccurrence | Actions Status |
|---|---|---|---|---|---|---|---|---|---|---|
| ML 6471 | N/A | Operator | Yes | Comprehensive incident report submitted 09 October 2023 | 09/08/23 | Non achievement of Outcome Measurement Criteria<br>**OMC – TSF1, GW1, TSF2, GW2, AMD1** | Groundwater and Surface Water OMCs associated with the TSF have not been achieved predominantly due to higher than predicted lateral and vertical seepage from the TSF during early operation. SWLs in groundwater monitoring locations within the TSF seepage zone are outside of OMC Achievement Values determined by the Groundwater Model. Water quality at TSFMB1d is in exceedance of OMC Achievement Values determined by the TSF Surface Water and Groundwater Geochemical Effects Assessment.<br>It is important to note that the Outcome is anticipated to be achieved and this reflects the OMC being established with limited data at the time of the original PEPR development. The groundwater monitoring wells are located within the zone of influence (the Outcome relates to groundwater outside of the zone of influence) and therefore a review of the location of the OMC monitoring locations is required and the monitoring locations inside the zone of influence may be better suited for a Leading Indicator. This is supported by information that demonstrates that that the operation is and will continue to have the ability to achieve the Environmental Outcomes. | Currently being addressed | • **Completed:** update the assumptions and inputs in the Tailings Storage Facility: Surface Water and Groundwater Geochemical Effects Assessment 2017 to determine if there is likely to be any ongoing change to the predicted effects and impacts. Use updated model to derive new water quality targets in shallow and deep TSF monitoring wells.<br>• **Completed:** review seepage modelling with observed rates, new assumptions and new parameters from TSF Stage 2 operations.<br>• **Completed:** review the Seepage Fate Analysis to confirm that vertical seepage still reports to the subsidence zone.<br>• **2025:** develop site specific guideline values for groundwater and surface water as an alternative to ANZECC/ARMCANZ (2000) freshwater and limited baseline ranges to update relevant leading indicators.<br>• **2025:** review relevant OMCs to determine suitability of existing monitoring locations and achievement values.<br>Update future PEPR to reflect new controls, Leading Indicators and OMCs where relevant. | The models used for the groundwater and geochemical effects assessments have been updated with observed seepage rates and supernatant and seepage quality. The outcomes of the updated modelling demonstrate that the relevant environmental outcomes can be achieved and provide updated predictions for Leading Indicators and OMC in terms of observed seepage quality and groundwater response.<br>Ongoing – present in future PEPR |
| ML 6471 | N/A | Operator | No | Leading Indicator Report submitted 10 February 2022 | N/A | Breach of Leading Indicator<br>**Leading Indicator TSF21, TSF23 and TSF24** | The metals composition of supernatant and decant water remain outside of the +/-10% range adopted within MPEPR 2024/009 in 2024. The Leading Indicator is based on the metals composition that was used for the Geochemical Effects Assessment (OZ Minerals 2017c, Appendix F). If observed water quality is different to the inputs to the geochemical model then additional work is required to ensure that observed/actual water quality does not change the outcomes of the Assessment of Effects nor cause new or increased impacts.<br>BHP Carrapateena engaged LWC to review the data and comment on the whether the risk profile adopted in development of the MPEPR2019/026 had changed. | Currently being addressed | Key assumptions of an Assessment of Effects was reviewed and a preliminary impact assessment has been completed which determined to not represent an increased likelihood of actual or potential harm. The concentrations of tailings water metals, as determined and assessed, are not considered to represent a risk of actual or potential based on the nature and magnitude of reported concentrations and Tier 2 toxicology considerations. No significant elevation of risk profile is evident relative to previous works (CA-ENV-REP-1120).<br>The geochemical and seepage models have been updated with observed data and an updated geochemical assessment of effects has determined that the supernatant and decant water quality observed do no change the outcomes of the original impact assessment. The updated assessments will be presented in a future PEPR. | Ongoing – present in future PEPR |

| Tenement | Date of Incident | Detected by operator or DEM | Reportable under Regulation 79? | Date reported to Minister | Date written repot to Minster | Non-complaince Environmental outcome or tenement condition breached | Cause of non-compliance, OMC or lease condition breach | Status | Further Work Planned<br>Actions to rectify non-compliance and prevent reoccurrence | Actions Status |
|---|---|---|---|---|---|---|---|---|---|---|
| MPL 156 | 08/01/24 | Operator | Yes | Comprehensive incident report submitted 08 February 2024 | 08/02/24 | Environmental Outcome not met<br>**MPL 156 Schedule 6 Condition 10**<br><br>Non achievement of OMC<br>**NF1** | The Northern Wellfield Stage 3 construction team returned to site after a two-week shutdown and found fourteen deceased eastern-grey kangaroos within six recently constructed scour pits.<br>The scour pits were under construction in mid-December before ~50 mm of rain restricted access to the wellfield for approximately five days. The construction crew briefly resumed work, then demobilised from site for the Christmas period. Non-compliant fencing was applied to the scour pits, which in combination with a lack of presence in the area, led to the kangaroos entering the pits and ultimately becoming trapped.<br>The scour pits were constructed to site standard, including a gentle sloping face and egress points, and there was minimal water within the scour pits, however the kangaroos were not able to escape.<br>Non-compliance is reported as the native fauna deaths could have reasonably been prevented. | Rectified | • **Completed:** Install permanent fencing around all recently constructed scour pits.<br>• **Completed:** Update scour pit construction standards and land disturbance permit conditions to clearly stipulate appropriate barricading.<br>• **Completed:** Share incident at construction crew toolbox and refresh team on correct site procedures.<br>• **Completed:** Incorporate new scour pits into existing scour pit inspection program at completion of project. | Completed |
| MPL 152 | 17/01/24 | Operator | Yes | Comprehensive incident report submitted 15 February 2024 | 15/02/24 | Environmental Outcome not met<br>**MPL 152 Schedule 6 Condition 11**<br><br>Non achievement of OMC<br>**LS1** | Recirculation return pipe dislodged from RP3 bore caused approximately 150 kL of saline water to discharge to the environment. The spill emanated approximately 250 m from the production bore into a creek line dotted with Western Myall (*Acacia papryocarpa*) trees.<br>Non-compliance is reported as a SEB is yet to be established for the impacted area. | Currently being addressed | • **Completed:** Undertake audit of existing production bore cleaning process and review minimum requirements for securing recirculation infrastructure to all wells.<br>• **Completed:** Install permanent recirculation infrastructure at all production bores in Southern Borefield to eliminate need to install temporary infrastructure each cleaning cycle.<br>• **Completed:** Establish leak detection system at bores when recirculation is in progress<br>• **Completed:** Update relevant procedures to reflect above changes.<br>• **Completed:** Communicate impact of saline water spills on environment with relevant work groups to ensure shared understanding of risk.<br>• **Completed:** Include impact area in 2024 annual ecology survey to assess the extent of the potential impact to native vegetation.<br>• **2025:** Undertake final vegetation assessment to measure extent of vegetation loss and establish significant environment benefit if required. | Ongoing |
| MPL 153 | 29/11/24 | Operator | Yes | Comprehensive incident report submitted 15 February 2024 | 29/12/24 | Environmental Outcome not met<br>**MPL 153 Schedule 6 Condition 12**<br><br>Non achievement of OMC | Failure of standpipe infrastructure at Turkey Nest 47 on the Western Access Road resulted in approximately 96 to 192 kL of saline water discharging to the environment and potentially impacting native vegetation.<br>Non-compliance is reported as a SEB is yet to be established for the impacted area. | Currently being addressed | • **Completed:** Installation of additional isolation valve.<br>• **Completed:** Repair of the existing knife gate valve, along with an assessment for buildup and contamination.<br>• **Completed:** Update work instructions for poly work on-site to ensure pipes are capped.<br>• **Completed:** Inspection of the Western Access Road infrastructure for open piping.<br>• **Completed:** Evaluation of the feasibility of | Ongoing |

| Tenement | Date of Incident | Detected by operator or DEM | Reportable under Regulation 79? | Date reported to Minister | Date written repot to Minster | Non-complaince Environmental outcome or tenement condition breached | Cause of non-compliance, OMC or lease condition breach | Status | Further Work Planned<br>Actions to rectify non-compliance and prevent reoccurrence | Actions Status |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **LS1** | | | installing a leak detection device on the gravitational line for the hard stand to alert in the event of a leak.<br>• **Completed:** Assessment of the potential for installing leak detection devices on other saline water lines that may be affected.<br>• **2025:** Include impact area in 2025 annual ecology survey to assess the extent of the potential impact to native vegetation.<br>• **2025** Undertake final vegetation assessment to measure extent of vegetation loss and establish significant environment benefit if required. | |
| ML 6471 | 2024 | Operator | No | Monthly compliance meeting<br>28/11/2024 | 12/03/25 | Non achievement of OMC **AQ3/TSF7** | The frequency/timing for the TSF Closure Strategy Verification Report for OMC AQ3/TSF7 is 6/8/10 years after lease grant. The Verification Report was not completed in 2024 (6 years after lease grant) as there has been insufficient time to collect meaningful erosion data from an erosion field study since construction of the Stage 2 Tailings embankment. The other work that is required to be audited as per this OMC (i.e dust lift-off study, air quality update and landform evolution model update) have all demonstrated that the proposed closure strategy remains valid. | Currently being addressed | • **Completed:** AQ5 – Calibration of the air quality model with operational monitoring data and dust threshold lift data established in the tailings beach trials.<br>• **Completed:** AQ6 – Audit by an independent and suitably qualified expert of dust threshold lift data from the tailings beach trials.<br>• **2025:** TSF8/9 – Closure audit report to review timing, method and data requirements for calibration of the Landform Evolution Model with actual erosion data.<br>• **2025:** Finalise the TSF Closure Strategy Verification report and use the report to advise on appropriate erosion field trials, likely to be implemented during Stage 3 operation of the TSF. | Ongoing |

# 12 Disturbance and rehabilitation activities

The current PEPR includes a Native Vegetation Management Plan (NVMP) (BHP 2024a; Appendix D) for disturbance under four gateways and Northern Wellfield:

- Gateway 1 (approved in 2013) allows for 476.15 ha of disturbance. Gateway 1 covers works associated with Retention Lease (RL) 127, MPL 149 and ML 6471 through to approval of PEPR2018/007 in March 2019. Some credits have been allocated in-kind from Gateway 1 to disturbance undertaken outside the RL 127 boundary.
- Gateway 2 (approved March 2019) allows for 708.23 ha of disturbance.
- Gateway 3 allows for 1,012.38 ha of disturbance.
- Gateway 4 allows for 20.46 ha of disturbance.
- Northern Wellfield allows for 237.51 ha of disturbance.

During 2021, OZ Minerals engaged Nature Foundation to assign significant environmental benefit (SEB) points for 203 ha of Gateway 3 to accommodate remaining construction activities associated with the Carrapateena SLC. Following significant delay finalising the application due to a range of issues associated with the pastoral lease for Witchelina, which the relevant government departments were seeking to resolve, the assignment of credits was completed in June 2022.

Each year BHP conducts an audit of the land disturbance database to review and reconcile existing data. During the 2024 audit it was found that the Midway Quarry (total 21.38 ha) had been omitted from previous EPBC footprints and was therefore included in the EPBC footprint published in December 2024.

Updated land disturbance areas for this reporting period can be found in Table 12.1 with land disturbance areas over the NVMP Gateway stages provided from Figure 12.1 to Figure 12.6.

**Table 12.1 | Land disturbance summary**

| Area where disturbance and rehabilitation activity occurred (ha) | Description of rehabilitation works carried out in the reporting period (ha) | Amount of land disturbed during the reporting period (ha) | Estimated amount of land to be rehabilitated in the next reporting period (ha) | Total amount of land where rehabilitation works are completed (ha) |
|---|---|---|---|---|
| RL 127, off lease, or now accounted for on MPL 152, MPL 153, MPL 154 and MPL 156 | 0 | 0<br>(Gateway 1) | 0 | 0 |
| ML 6471, MPL 152, MPL 153 and MPL 154 | 0 | 0<br>(Gateway 2) | 0 | 61.8 |
| ML 6471, MPL 152, MPL 153 and MPL 154 | 0 | 0.071 (Gateway 2)<br>12.44 (Gateway 3)<br>12.10 (Gateway 4) | ~10 | 11.2 |
| MPL 156 | 0 | 0<br>(Northern Wellfield) | 0 | 0 |
| **All tenements (total)** | **0** | **24.61** | **~10** | **73.0** |

| Strategies implemented to avoid or minimise disturbance: |
|---|
| Land Disturbance Permitting process ensures that work areas are safely minimised, and already disturbed land is used for new works as much as reasonably possible. For temporary works the stripping of topsoil is avoided. Land Disturbance Areas are surveyed and barricaded to avoid any disturbance outside of the allowed area. |

| Strategies implemented to avoid or minimise disturbance: |
|---|
| Rehabilitation trials under RL 127 have indicated that no additional treatment is necessary to achieve successful rehabilitation. Formal trials were completed in early stages of ML 6471 to confirm methodology. Two LFA transects are being monitored with additional sites installed in 2022 on the temporary access road from Tjungu Village to the Southern Access Road and at Midway Quarry. |

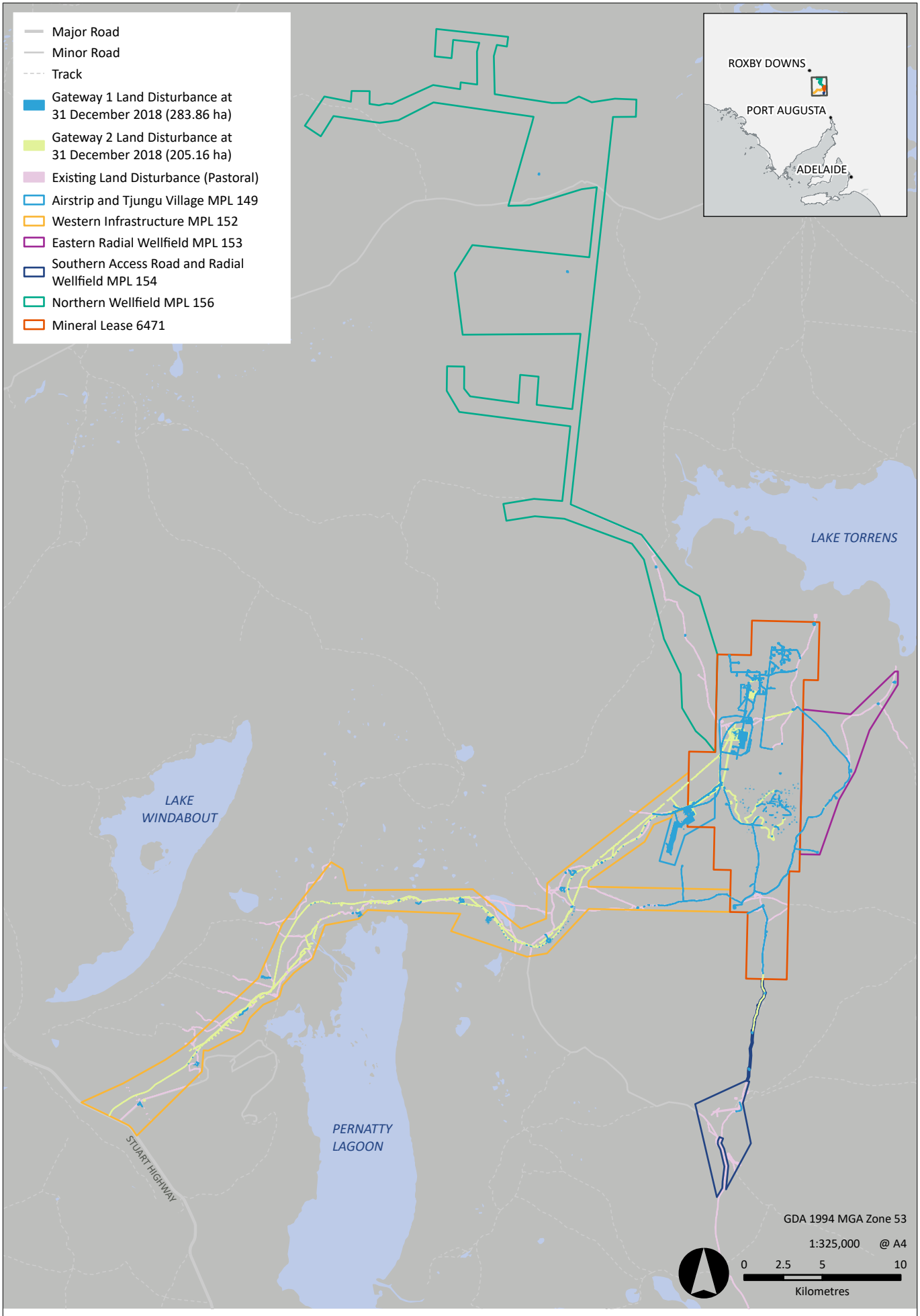


**Figure 12.1 | Land disturbed under NVMP Gateway 1 and 2 (March 2013 – December 2018)**

Carrapateena BHP

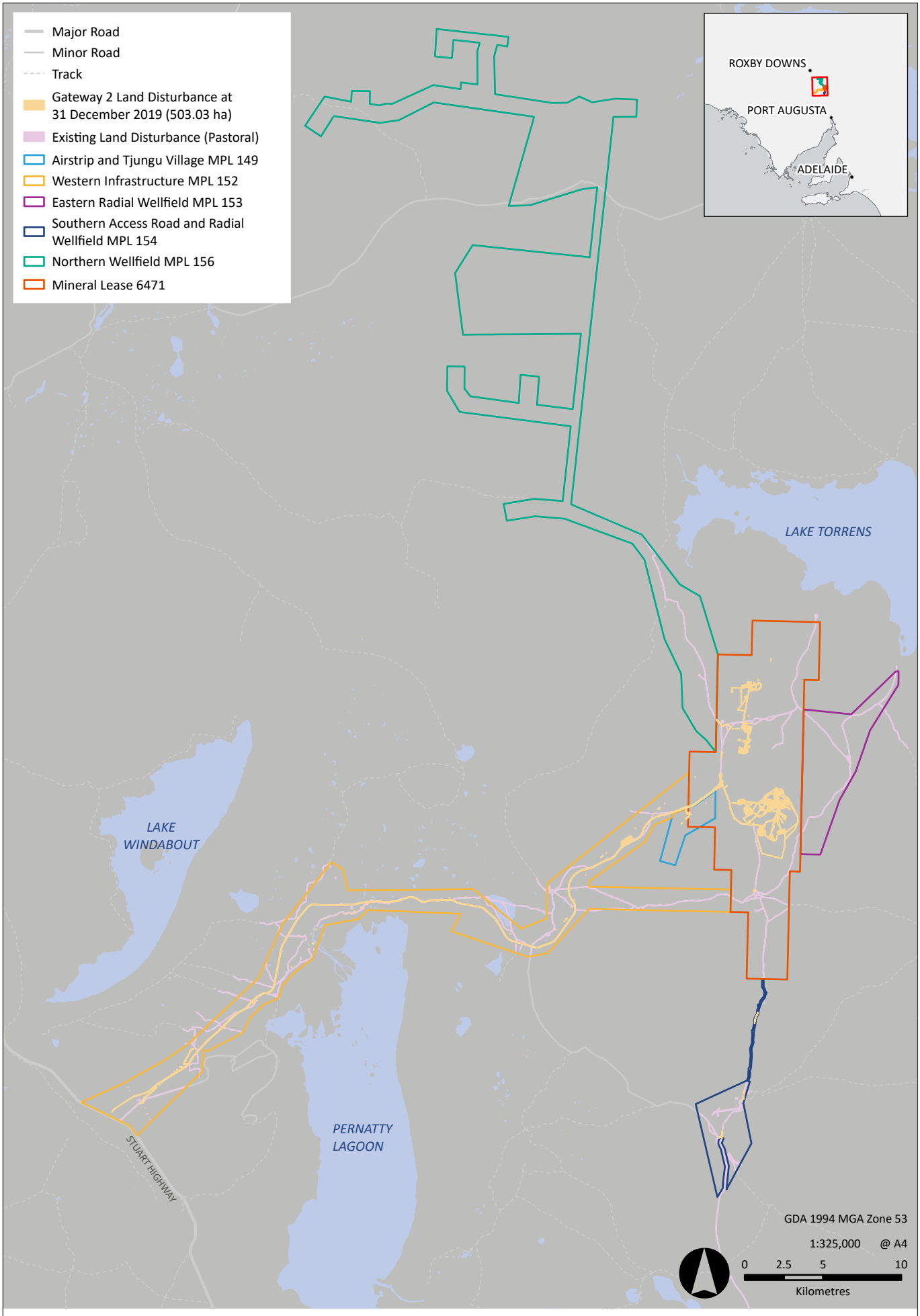


**Figure 12.2 | Land disturbed under NVMP Gateway 2 (January 2019 – December 2019)**

Carrapateena BHP

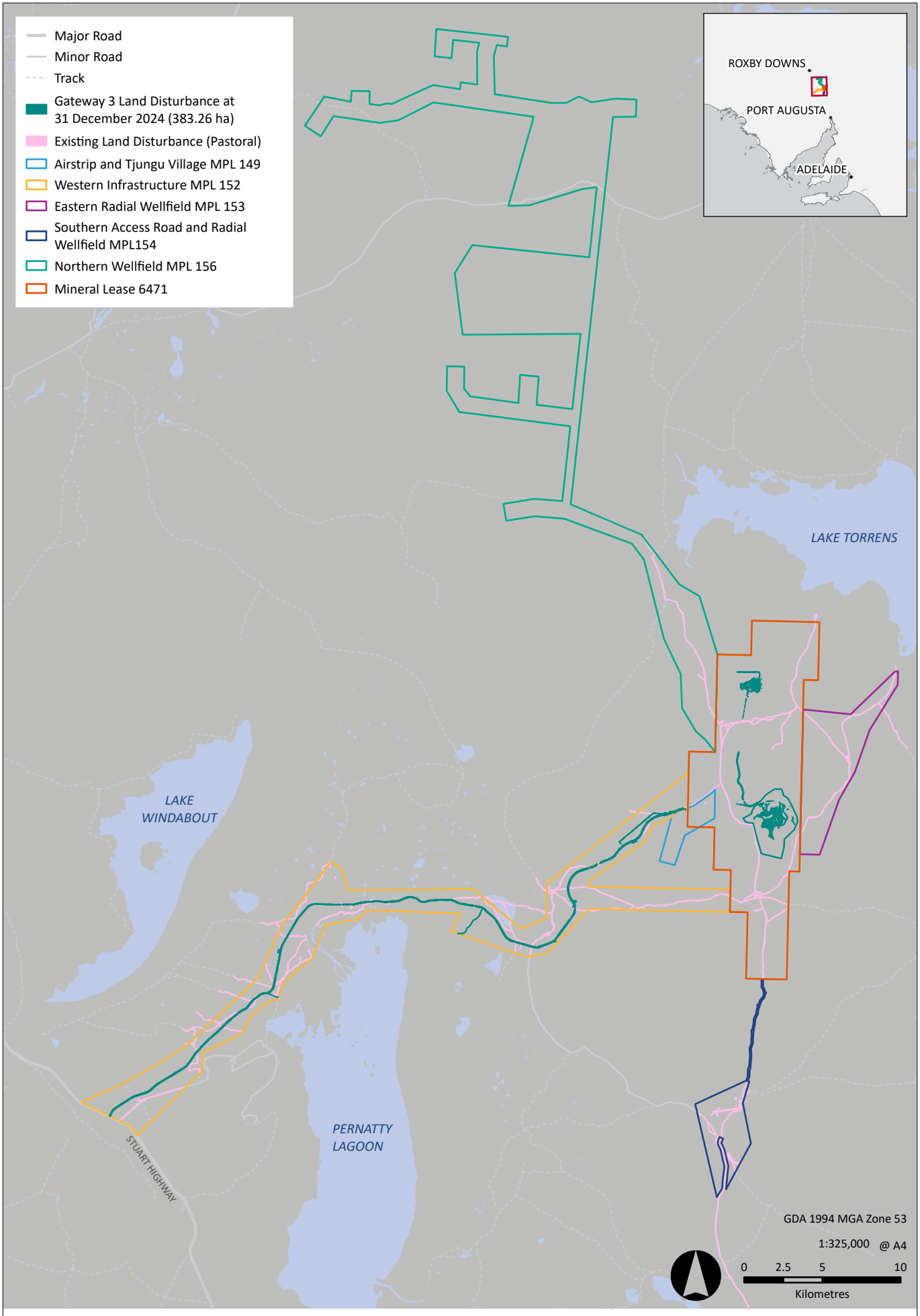


**Figure 12.3 | Land disturbed under NVMP Gateway 3 (January 2020 – December 2024)**

Carrapateena BHP

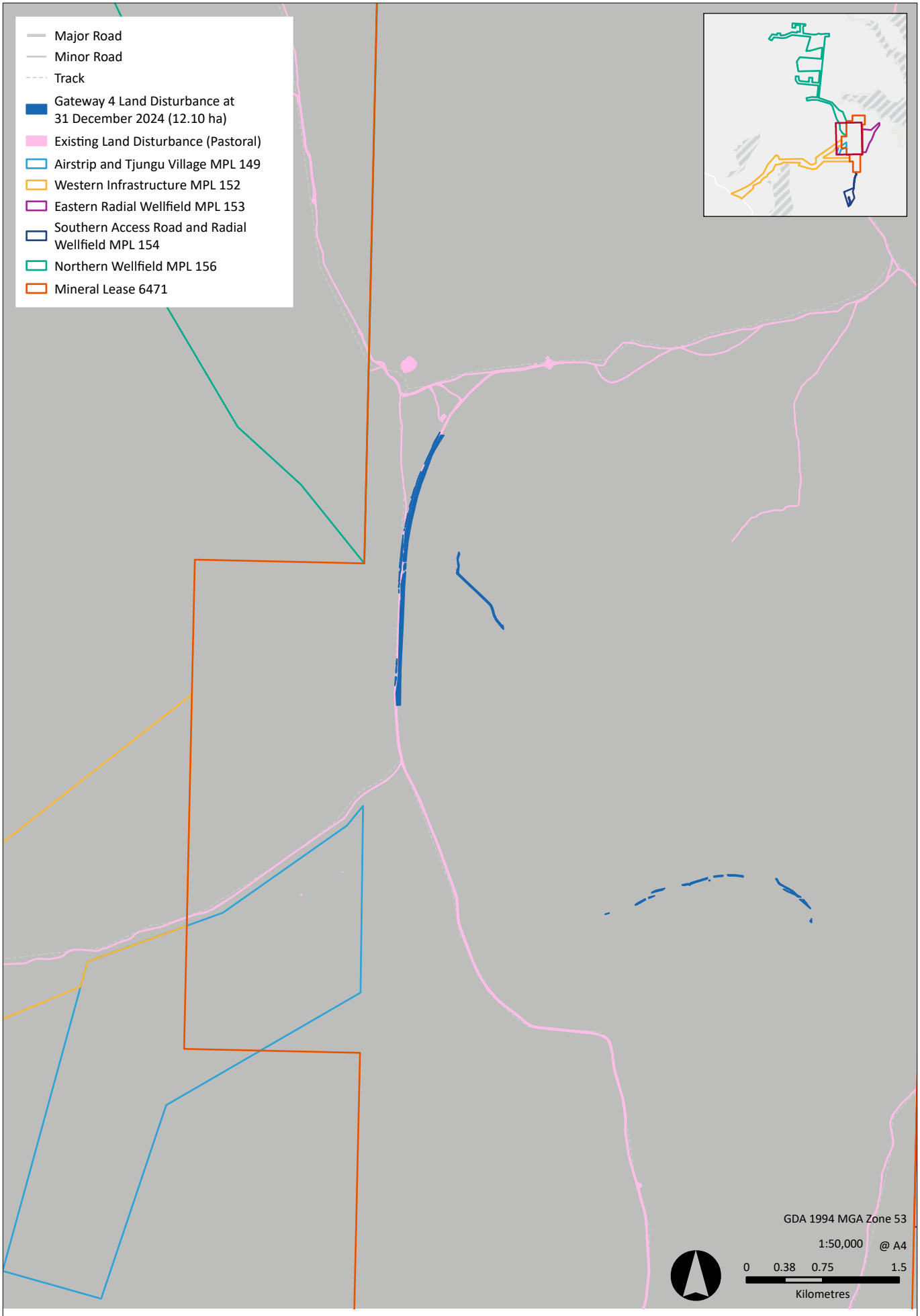


**Figure 12.4 | Land disturbed under NVMP Gateway 4 (January 2020 – December 2024)**

Carrapateena BHP

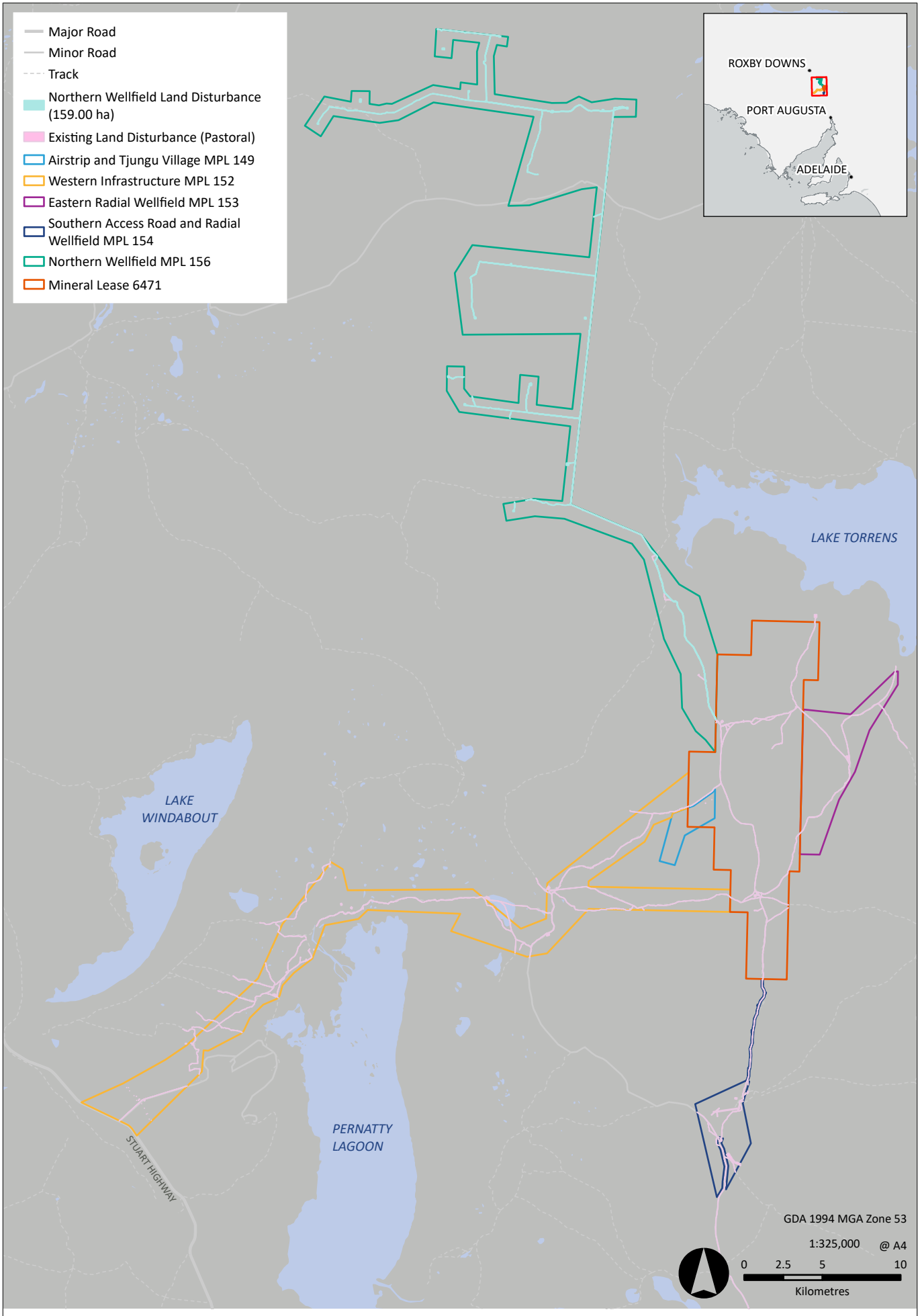


**Figure 12.5 | Northern Wellfield land disturbance under NVMP (January 2019 – December 2024)**

Carrapateena BHP

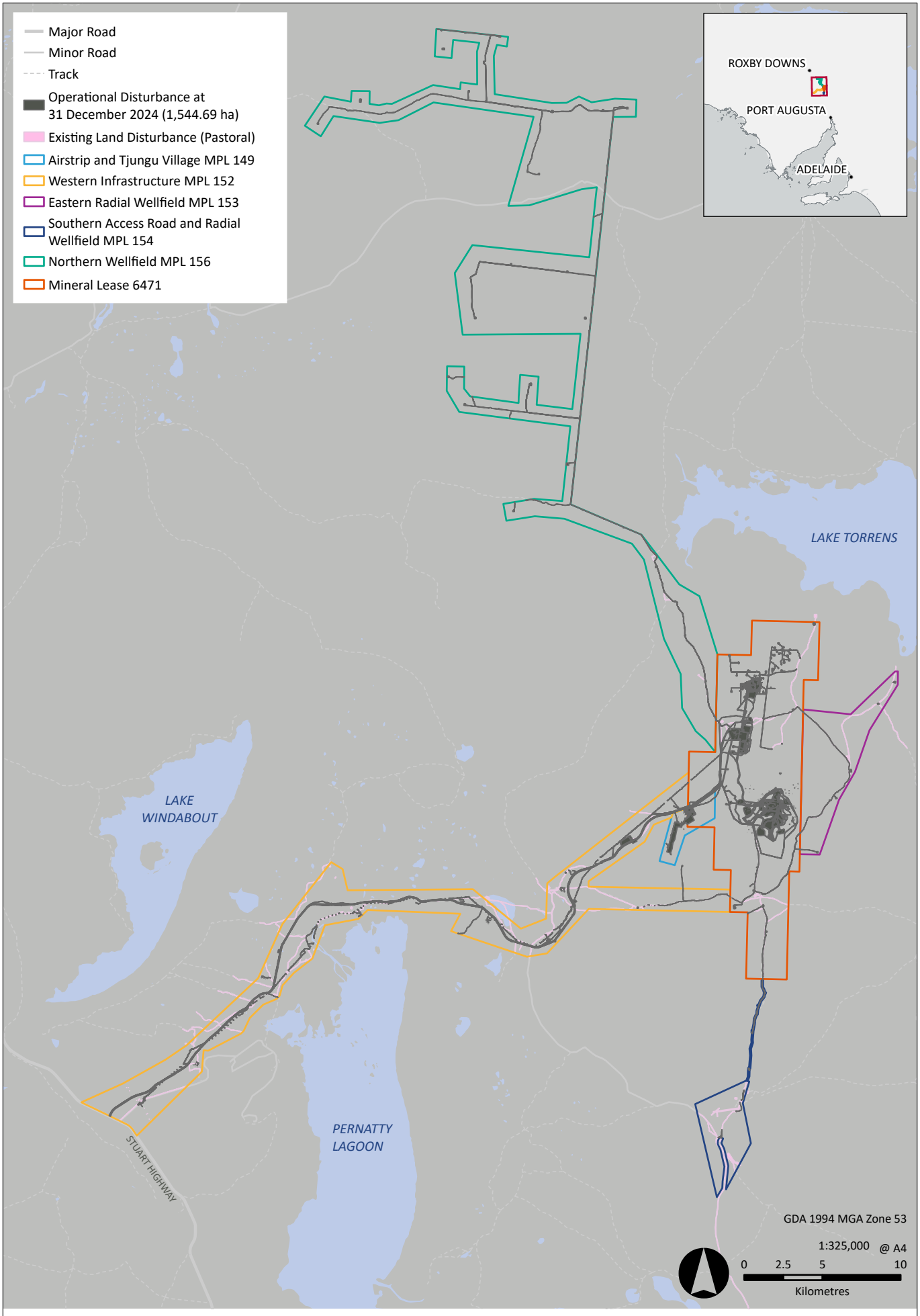


**Figure 12.6 | Operation disturbance footprint (2013 – December 2024)**

Carrapateena BHP

# 13 Reconciliation of native vegetation clearance

**Table 13.1 | Land disturbance under NVMP**

| NVMP Category | Tenement | Approval | Approved maximum clearance (ha) | Total amount cleared in the reporting period (ha) | Estimated amount to be cleared in the next reporting period (ha) |
|---|---|---|---|---|---|
| Gateway 1 | RL 127, MPL 149, ML 6471 | MPEPR2013/003<br>MPEPR2016/007<br>PEPR2017/028<br>PEPR2017/028<br>PEPR2018/003 | 476.15 | 0 | 0 |
| Gateway 2 | MPL 149, ML 6471, MPL 152, MPL 153, MPL 154 | PEPR2017/003<br>PEPR2018/007<br>PEPR2018/019 | 708.23 | 0 | 0 |
| Gateway 3 | MPL 149, ML 6471, MPL 152, MPL 153, MPL 154 | MPEPR2019/026 | 1012.38 | 12.44 | 0 |
| Gateway 4 | Haul Road Expansion, Tailings pipeline duplication, WAT-49 | MPEPR2024/009 | 20.46 | 12.10 | 0 |
| Northern Wellfield | MPL 156 | MPEPR2019/026 | 237.51 | 0 | 0 |

**Table 13.2 | Disturbance by vegetation association**

| Veg Association | Description | Area Approved NVMP (ha) | Area Disturbed Gateway 2 (ha) | Area Disturbed Gateway 3 (ha) | Area Disturbed Gateway 4 (ha) | Area Disturbed NW (ha) |
|---|---|---|---|---|---|---|
| 1 | *Atriplex vesicaria* (Bladder Salt Bush) +/- *Tecticornia medullosa* (Samphire) Low Open Shrubland | 1,847.2 | 503.68 | 248.37 | 11.96 | 135.55 |
| 2 | *Acacia ligulata* (Umbrella Bush)/*Dodonaea viscosa* var. *angustissimus* (Narrow-leaf Hop Bush) Low Open Shrubland +/-*Zygochloa paradoxa* (Sandhill Canegrass) | 0 | 29.81 | 18.11 | 0 | 6.78 |
| 3 | *Acacia aneura* (Mulga) Open Woodland over *Maireana sedifolia*/*Maireana pyramidata*/*Maireana astrotricha*/*Atriplex vesicaria* | 47.2 | 15.79 | 18.71 | 0 | NA |
| 4 | *Acacia papyrocarpa* (Western Myall) Woodland over *Maireana astrotricha* (Low Bluebush) | 67.4 | 23.26 | 22.07 | 0 | NA |
| 5 | *Acacia aneura* (Mulga) +/- *Dodonaea viscosa* ssp. *angustissimus* (Narrow-leaf Hop Bush) Shrubland over *Maireana pyramidata* (Black Bluebush), *Maireana astrotricha* (Low Bluebush) | 26.2 | 10.79 | 10.33 | 0 | NA |
| 6 | *Atriplex vesicaria* (Bladder Saltbush)/*Maireana astrotricha* (Low Bluebush) Low Open Shrubland | 182.5 | 53.27 | 44.47 | 0 | NA |
| 7 | *Acacia papyrocarpa* (Western Myall ssp.) Vey Low Woodland over *Atriplex vesicaria* (Bladder Saltbush) +/- *Ptilotus obovatus* (Silver Mulla Mulla), *Dodonaea lobulata* (Lobe-leafed Hop Bush), *Acacia tetragonophylla* (Dead Finish) and *Eremophila* spp. (Emu Bush) in drainage depressions | 95.7 | 47.65 | 6.29 | 0.14 | 16.71 |
| 8 | *Eucalyptus camaldulensis* var. (River Red Gum) +/- *Acacia papyrocarpa (*Western Myall ssp.*)* Low Woodland | 16.3 | 4.47 | 1.56 | 0 | NA |
| 9 | *Zygochloa paradoxa* (Sandhill Canegrass) Grassland | 20.5 | 6.45 | 5.59 | 0 | NA |
| 10 | *Casuarina pauper* (Black Oak) Open Woodland on calcrete outcrops and sand dune rises | 4 | 1.62 | 0.85 | 0 | NA |
| 11 | *Atriplex vesicaria* (Bladder Saltbush) Shrubland +/- *Dodonaea viscosa* var. *angustissimus* (Narrow-leaf Hop Bush) Open Shrubland | 8.4 | 3.05 | 1.30 | 0 | NA |
| 12 | *Acacia papyrocarpa* (Western Myall) Woodland over *Maireana pyramidata* (Black Bluebush)/*Callitris gracilis* (Native Pine) | 10.2 | 1.18 | 3.48 | 0 | NA |
| 13 | *Tecticornia pergranulata* (Black Seed Samphire) +/- *Melaleuca xerophila* (Boree) Low Shrubland | 0 | 0.27 | 0.14 | 0 | NA |
| 14 | *Eragrostis australasica* (Swamp Canegrass) Tussock Grassland | 2.2 | 0.19 | 0.25 | 0 | 0 |
| 15 | *Duma florulenta* (Lignum) *Tecticornia pergranulata* (Black Seed Samphire) *Maireana pyramidata* (Black Bluebush) Shrubland in flood out zones and alluvial fans | 0.4 | 0.13 | 0 | 0 | NA |
| 16 | *Dodonaea viscosa* ssp. *angustissimus* (Narrow-leaf Hop Bush)/*Acacia ligulata* (Umbrella Bush) Low Shrubland in drainage channels | 88.9 | 0 | 0 | 0 | NA |
| 17 | *Callitris glaucophylla* (Native Pine) Woodland | 0.6 | 0.62 | 0.32 | 0 | NA |
| 18 | *Acacia papyrocarpa* (Western Myall ssp.)/*Eucalyptus camaldulensis* (River Red Gum) Low Woodland | 0.3 | 0 | 0 | 0 | NA |
| 19 | *Melaleuca xerophila* (Boree) Shrubland | 0 | 0 | 0.00 | 0 | NA |
| 20 | *Tecticornia medullosa* (Samphire) Low Open Shrubland | 0.5 | 0 | 0.00 | 0 | NA |
| 21 | Claypan | 0 | 1.85 | 1.07 | 0 | NA |
| - | No data | 38.3 | 4.12 | 0.34 | 0 | NA |
| Total | | **2,456.8** | **708.19** | **383.26** | **12.10** | **159.00** |

# 14 EPBC Act

| Condition number | Condition | Compliance status | Evidence demonstrating compliance with condition |
|---|---|---|---|
| 1 | To manage the impacts of the action on the environment, the person taking the action must implement the conditions of the SA approval. | Compliant | The Compliance Report associated with the granting of the Carrapateena tenements under the *Mining Act 1971* (SA) will be submitted to DEM on 31 March 2025 indicating compliance with the conditions of the state approval. This Compliance Report will be publicly available on the DEM website at: http://www.energymining.sa.gov.au/minerals/mining/mines_and_quarries/carrapateena |
| 2 | The person taking the action must not impact more than 1,740 hectares of Plains Rat habitat within the disturbance footprint. | Compliant | Total disturbance since the commencement of the referred action is 1,546.41 ha, including 280.83 ha of Plains Mouse habitat, as shown in Figure 14.1 and Figure 14.2, respectively. |
| 3 | Prior to commencement of the action, to compensate for residual impacts to the Plains Rat, the person taking the action must acquire an offset property which must contain:<br>a population of the Plains Rat<br>no less than 1,740 hectares of Plains Rat habitat<br>habitat quality equal to that of the Plains Rat habitat within the disturbance footprint. | Compliant | Following on from an 'Agreement to Underlease' (CA-APR-AGR-1037) with the Pastoral Lessee of South Gap Pastoral Station two offset areas, OZ Minerals established two individual Underlease Agreements, one for each offset area, securing a total of 3,251 ha of suitable Plains Mouse habitat (Northern Offset Underlease Agreement 1,882 ha and Southern Offset Underlease Agreement 1,369 ha (CA-APR-LET-1178). The Underlease Agreements have a 10-year expiry term, with successive Agreements to be established totaling the required duration as per the approval conditions.<br>The offset areas consist of Arcoona Tablelands habitat that is similar in quality and structure to the land disturbed at Carrapateena and are considered to represent equally viable Plains Mouse habitat. Historical observations of Plains Mouse have been recorded nearby the northern offset, and within the same stretch of continuous tablelands habitat connecting disturbed Plains Mouse habitat at Carrapateena, to the offset areas on South Gap Station. |
| 4 | The person taking the action must maintain or improve the habitat quality of the existing Plains Rat habitat at the acquired offset property for the life of this approval. | Compliant | BHP Carrapateena has developed an Environmental Offset Management Plan (CA-0000-ENV-PLN-1004) (the Plan) which aims to:<br>• Establish baseline conditions, including the distribution and condition of Plains Mouse habitat, the presence and distribution of target species, and the identification and prioritisation of local threats.<br>• Define the potential presence, distribution and abundance of other target species within the offset (i.e. Thick-billed Grasswren and Night Parrot).<br>• Manage total predation pressure (fox, cat, wild dog/dingo).<br>• Enhance the condition of habitat for the benefit of Plains Mouse, through the management of total grazing pressure (i.e. stock exclusion) and invasive weeds.<br>• Improve knowledge of local target species populations including an understanding of how they respond to management locally.<br>The Plan presents fourteen (14) individual objectives grouped under eleven (11) management strategies to address EPBC Act offset liability, and associated legislative and policy obligations, for the first ten (10)-year period of management. |
| 5 | Within 2 years from commencement of the action, the person taking the action must change the tenure of the offset property for conservation purposes using an appropriate legal mechanism for long term protection. | Compliant | Underlease agreements signed, executed and back-dated from 21 April 2020 (2 years from the commencement of the action) for the Northern Offset Area and the Southern Offset Area. The areas have been officially registered with the Lands Titles Office: two registrations as associated with each offset area. The Agreements to Underlease clearly define that the areas are to be set aside for environmental offset purposes. The change in land use will apply for ten (10) years, after which the change in land use will need to be renewed (permission granted from the Commonwealth Government to manage as rolling terms to achieve the total required tenure). |
| 6 | Prior to the commencement of the action, the person taking the action must engage a suitably qualified expert to undertake a Night Parrot survey within the development envelope. The Night Parrot survey must be undertaken in' accordance with the EPBC Act Night Parrot survey guidelines. Within three months of the Night Parrot survey being completed, the person taking the action must provide the Department with the Night Parrot survey results. | Compliant | OZ Minerals completed a targeted Threatened Species Survey for Night Parrot in March 2018 (CA-ENV-REP-1040). There were no Night Parrots or evidence of Night Parrots detected during the survey. The results of the survey were forwarded to the Australian Government's Department of the Environment and Energy (DoEE, now DCCEEW) in April 2018 (DOE: CA-APR-EML-1077). Night Parrot has not been reconfirmed as locally extinct within South Australia. |
| 7 | Should the Night Parrot or evidence of the Night Parrot be recorded during the survey, the person taking the action must submit for the Minister's approval, a Night Parrot Management Plan that must include:<br>c. Details of the Night Parrot survey results, including the methodology, timing and area surveyed.<br>d. An assessment of the impacts to the Night Parrot that will result from the action.<br>e. Management actions that will avoid, minimise and/or offset both the immediate and long-term impacts of the action on the Night Parrot.<br>f. Monitoring and reporting requirements that demonstrate the management actions are effectively being implemented and achieve the intended results. This should include the frequency, intensity and duration of | Not Applicable | The targeted survey (CA-ENV-REP-1040) did not find evidence of the Night Parrot in the Operation area. Night Parrot has not been reconfirmed as locally extinct within South Australia. |

| Condition number | Condition | Compliance status | Evidence demonstrating compliance with condition |
|---|---|---|---|
| | monitoring.<br>The person taking the action must not commence the action prior to the Minister approving the Night Parrot Management Plan. The approved Night Parrot Management Plan must be implemented. | | |
| 8 | Prior to the commencement of the action, the person taking the action must engage a suitably qualified expert to undertake a *Frankenia plicata* survey within the development envelope. The *Frankenia plicata* survey must be undertaken in accordance with contemporary survey methods. Within three months of the *Frankenia plicata* survey being completed, the person taking the action must provide the Department with the *Frankenia plicata* survey results. | Compliant | OZ Minerals completed a targeted Threatened Species Survey for Frankenia plicata in March 2018 (CA-ENV-REP-1040). Frankenia plicata was not detected during the survey. The results of the survey were forwarded to DoEE in April 2018 (CA-APR-EML-1077).<br>Follow-up work by the engaged consultant uncovered the incorrect classification of locally collected *Frankenia plicata* samples lodged with the SA Herbarium. Consultation with the SA Herbarium coupled with extensive survey work within the Carrapateena tenements and more broadly within the region has failed to detect this species, which is more likely to occur much further north of the Operation. |
| 9 | Should the Frankenia plicata be recorded during the survey, the person taking the action must submit for the Minister's approval, a Frankenia plicata Management Plan that must include:<br>g. Details of the *Frankenia plicata* survey results, including the methodology, timing and area surveyed.<br>h. An assessment of the impacts to the *Frankenia plicata* that will result from the action.<br>i. Management actions that will avoid, minimise and/or offset both the immediate and long-term impacts of the action on the Frankenia plicata.<br>j. Monitoring and reporting requirements that demonstrate the management actions are effectively being implemented and achieve the intended results. This should include the frequency, intensity and duration of monitoring.<br>The person taking the action must not commence the action prior to the Minister approving the *Frankenia plicata* Management Plan. The approved *Frankenia plicata* Management Plan must be implemented. | Not Applicable | The targeted survey (CA-ENV-REP-1040) did not find evidence of Frankenia plicata in the operational area.<br>Follow-up work by the engaged consultant uncovered the incorrect classification of locally collected Frankenia samples lodged with the South Australian Herbarium. |
| 10 | Within 3 months following the change of tenure referred to in condition 5) the person taking the action must provide the Department with written evidence that the offset property has been secured for conservation purposes using an appropriate legal mechanism. | Compliant | Written evidence provided to DoEE via letter dated 16 December 2020 (CA-APR-LET-1178). |
| 11 | Within 30 days after the commencement of the action, the person taking the action must advise the Department in writing of the actual date of commencement. | Compliant | OZ Minerals advised DoEE of the commencement of the action on 21 April 2018 (CA-ENV-LET-1001). |
| 12 | The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, and make them available upon request to the Department. Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Department's website. The results of audits may also be publicised through the general media. | Compliant | BHP Carrapateena maintains an Environmental Management System that includes electronic data management systems for document control (Aconex), obligations management and land access (LandFolio) and consultation/correspondence (INX InForm). Data collected during Carrapateena monitoring is recorded on the site environmental data management system (MonitorPro) or within ArcGIS.<br>Data collected for the environmental offsets on South Gap pastoral station will be collected, managed and reported on by a third party engaged to manage the offset (Nature Foundation) with select information captured back into the Carrapateena systems. |
| 13 | Within 30 days after completion of the action, the person taking the action must advise the Department in writing of the actual date of completion and provide a map clearly defining the date, location and actual impact within the Disturbance footprint of the action and be accompanied with a shapefile. | Not Applicable | BHP Carrapateena is currently undertaking the action. |
| 14 | The approval holder must prepare a compliance report for each 12-month period following the date of commencement of the action, or as otherwise agreed to in writing by the Minister. The approval holder must:<br>k. publish each compliance report on the website within 60 business days following the relevant 12-month period;<br>l. notify the Department by email that a compliance report has been published on the website within five business days of the date of publication;<br>m. keep all compliance reports publicly available on the website until this approval expires;<br>n. exclude or redact sensitive ecological data from compliance reports published on the website; and<br>o. where any sensitive ecological data has been excluded from the version published, submit the full compliance report to the Department within 5 business days of publication.<br>NOTE: The first compliance report may report a period less than 12 months so that it and subsequent compliance reports align with the similar requirement under state approval. | Compliant | The EPBC 2017/7895 Compliance Report is posted annually in April to BHP's website where copies of previous Compliance Reports can also be located. |

| Condition number | Condition | Compliance status | Evidence demonstrating compliance with condition |
|---|---|---|---|
| 15 | Upon the direction of the Minister, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister. The independent auditor must be approved by the Minister prior to the commencement of the audit. Audit criteria must be agreed to by the Minister and the audit report must address the criteria to the satisfaction of the Minister. | Not Applicable | BHP Carrapateena has not been directed by the Minister to commission an independent audit of compliance with the conditions of approval associated with EPBC 2017/7895. |
| 16 | If, at any time after 5 years from the date of this approval, the person taking the action has not commenced the action, then the person taking the action must not commence the action without the written agreement of the Minister. | Not Applicable | OZ Minerals commenced the action in late March 2018, as communicated to DoEE in April 2018 (CA-ENV-LET-1001). |
| 17 | The approval holder must notify the Department in writing of any: incident; non-compliance with the conditions; or non-compliance with the commitments made in plans. The notification must be given as soon as practicable and no later than two business days after becoming aware of the incident or non-compliance. The notification must specify:<br>the condition which is or may be in breach; and<br>a short description of the incident and/or non-compliance. | Compliant | There were no non-compliances with the EPBC 2017/7895 conditions of approval, nor non-compliances with commitments described in any plans required therein during the reporting period.<br>There were no incidents associated with the action during the reporting period that caused, or had the potential to cause, significant impacts to matters of national environmental significance (MNES). |
| 18 | The approval holder must provide to the Department details of any incident or non-compliance with the conditions or commitments made in plans as soon as practicable and no later than 30 days after becoming aware of the incident or non-compliance, specifying:<br>Any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future;<br>the potential impacts of the incident or non-compliance; and<br>the method and timing of any remedial action that will be undertaken by the approval holder. | Compliant | There were no non-compliances with the EPBC 2017/7895 conditions of approval, nor non-compliances with commitments described in any plans required therein during the reporting period.<br>There were no incidents associated with the action during the reporting period that caused, or had the potential to cause, significant impacts to MNES. |

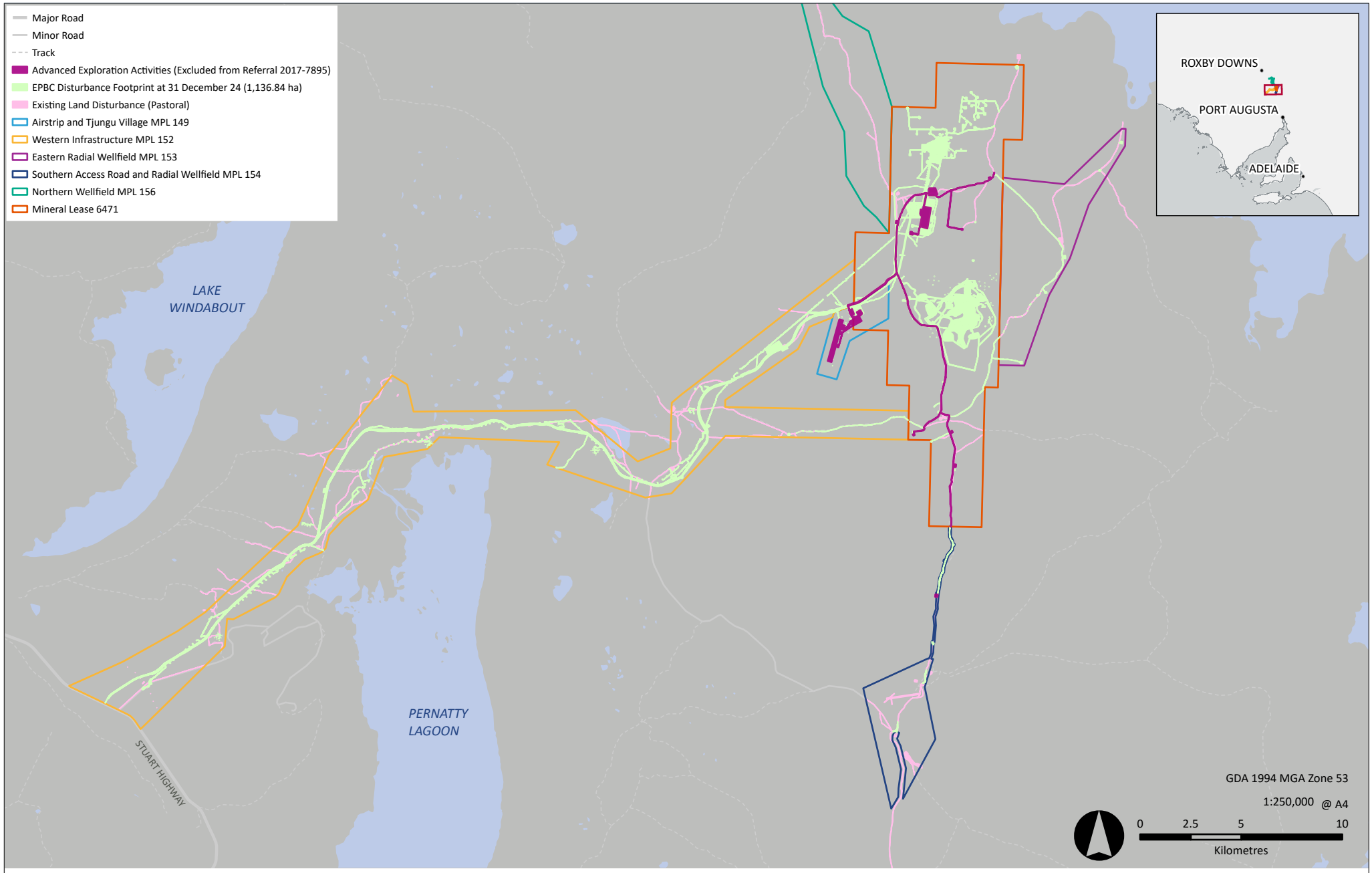


**Figure 14.1 | EPBC disturbance footprint (December 2024)**

Carrapateena BHP

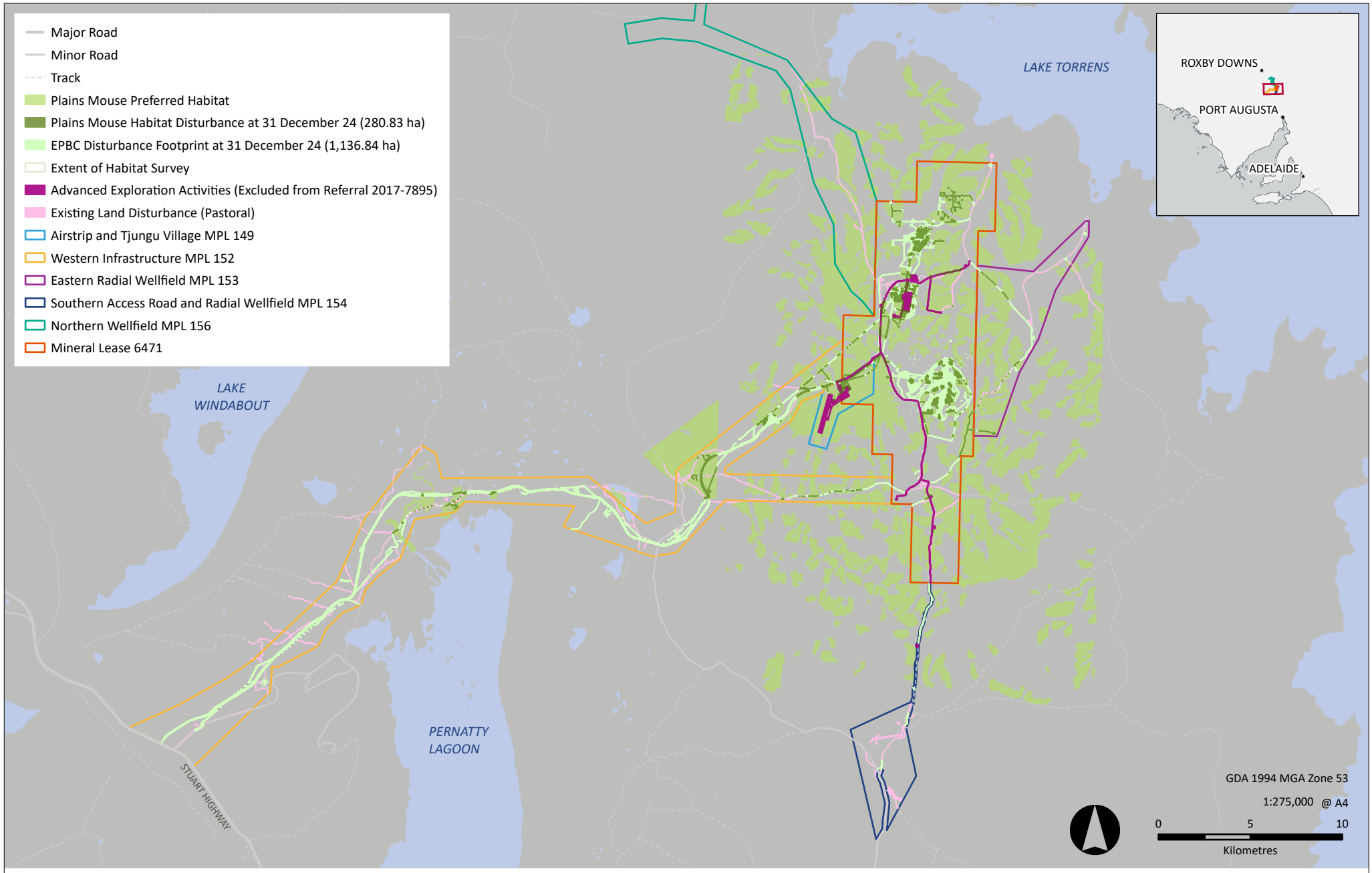


**Figure 14.2 | Plains Mouse (*Pseudomys australis*) habitat disturbance at 31 December 2024**

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# 15 Exempt land

It is required that a statement is provided that all waivers for land relevant to the mining operations are in place and compliant with exempt land provisions in accordance with Section 9 of the *Mining Act 1971* (SA). These statements are provided below.

All required waivers of exemption required for the work undertaken during the compliance period are in place as summarised in Table 15.1 to Table 15.5 and all exempt land is shown on Figure 15.1.

**Table 15.1 | Northen Wellfield MPL 156 exempt land**

| ID | Person entitled to exemption | Structure | Area of exemption (ha)* | Date waiver registered/ obtained | Reason | Relevant conditions |
|---|---|---|---|---|---|---|
| **CL1330/26** | | | | | | |
| 1 | Pernatty Pastoral Lease | South Eliza Hut and Dams | 27.5 | 16/7/2018 | Located within 150 m of existing Southern Access Road and bore field road and pipeline. | Contained in land access and compensation agreement CA-APR-1033 |
| 2 | | Stockyard | 10.1 | | Located within 150 m of access road and common services trench near the MPP and mine surface infrastructure. Location of infrastructure is required in this location to provide mines access and services. | |
| 3 | | North Eliza Dam | 19.7 | Not required | Distance between mining operations and structure is greater than 150 m. | Not applicable |
| 4 | | Well | 7.6 | | | |
| 5 | | Well or borehole | 7.7 | | | |
| 6 | | Dawson Dam | 15.5 | | | |

* Area of exemption includes the footprint of the structure and the buffer of exemption as per Part 9(d) of the *Mining Act 1971* (SA)

**Table 15.2 | Western Infrastructure Corridor MPL 152 exempt land**

| ID | Person entitled to exemption | Structure | Area of exemption (ha)* | Date waiver registered/ obtained | Reason | Relevant conditions |
|---|---|---|---|---|---|---|
| **CL1330/26** | | | | | | |
| 16 | Pernatty Pastoral Lease | Parkes Dam | 13.1 | 16/7/2018 | Location optimised to take advantage of existing pastoral tracks. | Contained in land access and compensation agreement CA-APR-1033 |
| 17 | | Camel Dam | 18.2 | | Located within 150 m of existing pastoral track within tenement. | |
| 18 | | Cattle Yard, Shed and Dam | 25.2 | | | |
| 19 | | Kyolia Dam | 14.4 | | Located within 150 m of Western Access Road. | |
| 20 | | Elizabeth Dam | 14.3 | | | |
| 21 | | Yeltacowie Racecourse Dam | 18.2 | Not required | Located inside tenement but distance between mining operations and structure is greater than 150 m. | Not applicable |
| 22 | | Cattle yard and sheds | 14.0 | | | |
| 23 | | Canegrass Dam and Trap Yard | 15.6 | | | |
| 24 | | Stockyard | 9.4 | | | |
| 25 | | Cement Bank | 8.4 | | | |
| 26 | | Wilsons Tank | 7.6 | | | |
| 27 | | Pressure tank | 7.6 | | | |
| 28 | | Yeltacowie Homestead and outbuildings | 105.5 | | | |
| 29 | | Surface Waterhole 9 | 11.1 | | | |
| 30 | | Elizabeth Catch Waterhole | 11.9 | | | |

| ID | Person entitled to exemption | Structure | Area of exemption (ha)* | Date waiver registered/ obtained | Reason | Relevant conditions |
|---|---|---|---|---|---|---|
| **CL6178/725** | | | | | | |
| 31 | Oakden Hills Pastoral Lease | Electrical transmission pole | 104.9 | In progress | Located within 150 m of mining operations. | To be provided in relevant land access and compensation agreement |
| 32 | | Borrow pit | 10.4 | | Western Access Road and 132 kV transmission intersects Electrical transmission line – ElectraNet. | |
| 33 | | Electrical transmission line – ElectraNet | 11.6 | | | |
| 34 | | Solar Monitoring Station | 7.3 | Not required | Distance between mining operations and structure is greater than 150 m. | Not applicable |
| 35 | | Tower | 7.3 | | | |
| **CT6135/25** | | | | | | |
| 36 | WMC (Olympic Dam Corp) Pty Ltd | Substation | 10.3 | In progress | Location optimised next to existing transmission infrastructure (within 150 m). | To be provided in relevant land access and compensation agreement |
| 37 | WMC (Olympic Dam Corp) Pty Ltd | Electrical transmission line – WMC | 115.3 | | Western Access Road and 132 kV transmission intersects Electrical transmission line – WMC. | |

* Area of exemption includes the footprint of the structure and the buffer of exemption as per Part 9(d) of the *Mining Act 1971* (SA)

**Table 15.3 | Eastern Radial Wellfield MPL 153 exempt land**

| ID | Person entitled to exemption | Structure | Area of exemption (ha)* | Date waiver registered/ obtained | Reason | Relevant conditions |
|---|---|---|---|---|---|---|
| **CL1330/26** | | | | | | |
| 7 | Pernatty Pastoral Lease | Anzac Dam and stock yard | 21.4 | 16/7/2018 | Located within 150 m of existing pastoral track and existing groundwater supply wells. | Contained in land access and compensation agreement CA-APR-1033 |
| 8 | | Tadpole Waterhole | 14.7 | 16/7/2018 | Located outside the tenement and distance between mining operations and structure is greater than 150 m. | Not applicable |

* Area of exemption includes the footprint of the structure and the buffer of exemption as per Part 9(d) of the *Mining Act 1971* (SA)

**Table 15.4 | Southern Access Road and Radial Wellfield MPL 154 exempt land**

| ID | Person entitled to exemption | Structure | Area of exemption (ha)* | Date waiver registered/ obtained | Reason | Relevant conditions |
|---|---|---|---|---|---|---|
| **CL1330/26** | | | | | | |
| 9 | Pernatty Pastoral Lease | Airstrip | 87.2 | 16/7/2018 | Located within 150 m of existing pastoral track and existing groundwater supply wells. | Contained in land access and compensation agreement CA-APR-1033 |
| 10 | | Pernatty Homestead and outbuildings | 83.8 | | | |
| 11 | | Accommodation, stock yard and sheds | 75.9 | | | |
| 12 | | Waterhole | 15.6 | Not required | Distance between mining operations and structure is greater than 150 m. | Not applicable |
| 13 | | Pernatty Dam | 60.0 | | | |
| 14 | | Tank | 7.5 | | | |
| 15 | | Pernatty Well and tanks | 18.6 | | | |

* Area of exemption includes the footprint of the structure and the buffer of exemption as per Part 9(d) of the *Mining Act 1971* (SA)

**Table 15.5 | Northern Wellfield MPL 156 exempt land**

| ID | Person entitled to exemption | Structure | Area of exemption (ha)* | Date waiver registered/ obtained | Reason | Relevant conditions |
|---|---|---|---|---|---|---|
| **CL 6213/627** | | | | | | |
| 38 | Pernatty Pastoral Lease | Hogan Dam | 25.87 | 16/7/2018 | Proposed well access/pipeline near Hogan Dam | Contained in land access and compensation agreement CA-APR-1033 |
| **CL 6211/35** | | | | | | |
| 39 | Arcoona Pastoral Lease | Bosworth Hut, Stockyard, Tank and Well NC | 18.11 | 13/12/2018 | Proposed well access/pipeline near Bosworth Hut, stockyard, tank, Well NC | Contained in land access and compensation agreement CA-APR-1046 |
| 40 | | Hilda Tank and Infrastructure | 7.76 | | Proposed well access/pipeline near Hilda Tank/Infrastructure | |
| 41 | | Alexander Tank | 8.36 | | Proposed well access/pipeline near Alexander Tank | |
| 42 | | White Dam, Stockyard, Tank and Pipeline | 37.58 | | Proposed well access/pipeline near White Dam, stockyard, tank, pipeline | |

* Area of exemption includes the footprint of the structure and the buffer of exemption as per Part 9(d) of the *Mining Act 1971* (SA)

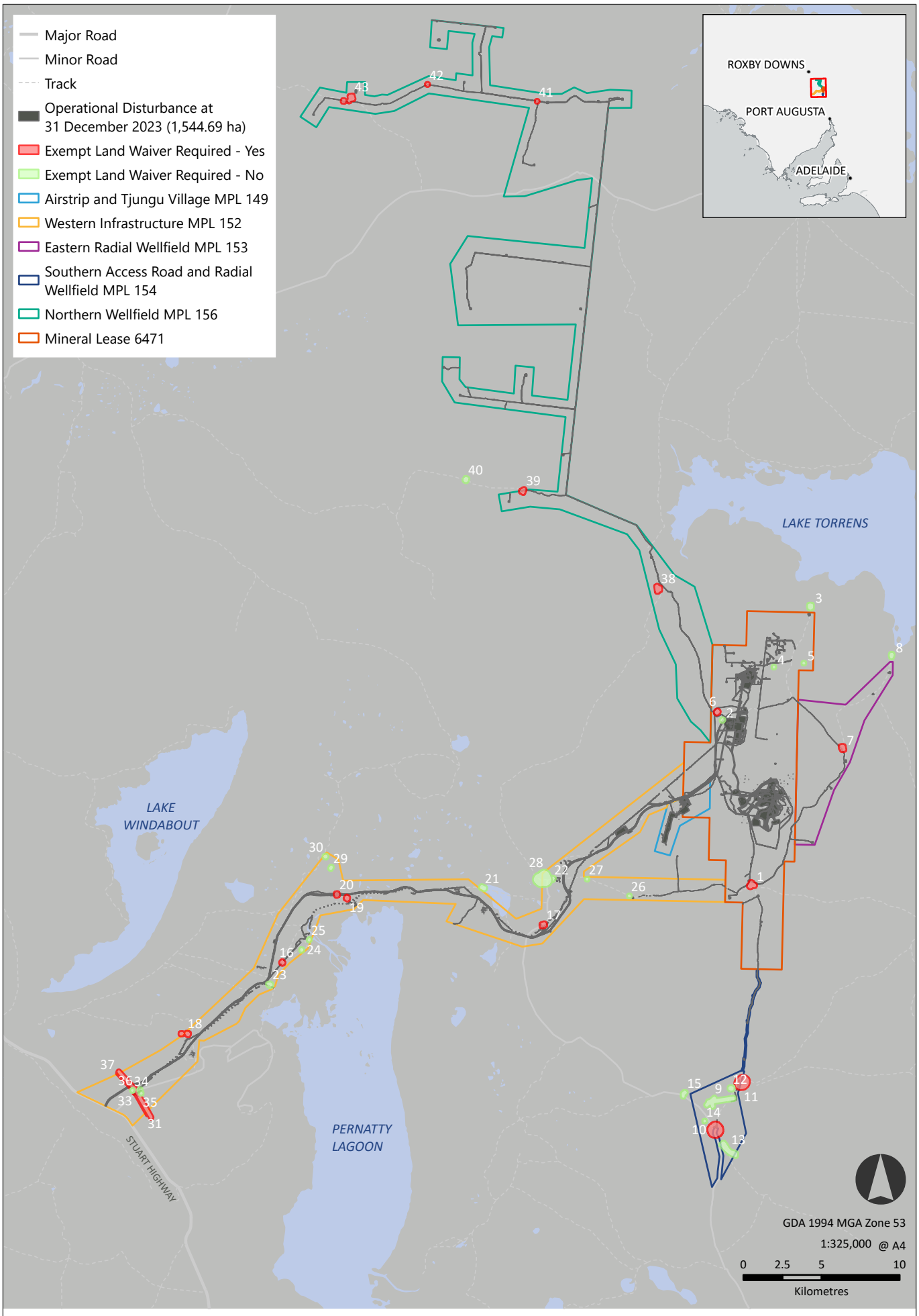


**Figure 15.1 | Exempt land and operation footprint 2025**

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# 16 Complaints

One complaint was received in the 2024 reporting period. Information on the complaint is detailed below.

**Unauthorised driving on unformed tracks on Pernatty Station:**

Date: 20/11/2024

What: Survey contractors driving on unformed/off-road tracks on Pernatty Station. This was initially reported by the Pernatty Station Managers to the BHP Environment team.

Immediate Action: The Environment team escalated to BHP Survey team to instruct contractors to always stay on formed tracks.

Closed: 20/11/2024

# 17 Management system reviews

There were no management system reviews undertaken at Carrapateena during the reporting period.

# 18 Verification of uncertainties

| Description of assumption or uncertainty | Estimated date to resolve | Progress in reporting period | Confirmed | Forward work plan |
|---|---|---|---|---|
| **Air Quality – Modelling**<br>**Strategy – AQ13** Develop an appropriate tailings beach trial methodology (air quality) to the satisfaction of the Director of Mines (or other authorised officer) prior to Stage 1 of the Tailings Storage Facility to establish dust threshold lift off speed for tailings including monitoring of tailings change over time and representation of final landform including modelling input assumptions of moisture content, crust thickness, wind speed, and particle size (Appendix C1 Air Quality Modelling and Assessment of Effects)#<br># **Air Quality Strategy (Schedule 6 Condition 15)**<br>**Strategy – AQ14** Implement the tailings beach trial to the satisfaction of the Director of Mines (or other authorised officer) during Stage 1 of the Tailings Storage Facility to establish dust threshold lift off speed including monitoring of tailings change over time including modelling input assumptions of moisture content, crust thickness, wind speed, and particle size (Appendix C1 Air Quality Modelling and Assessment of Effects)#<br># Air Quality Strategy (Schedule 6 Condition 15) | Completed | BHP Carrapateena developed an in-field dust lift off trial methodology in conjunction with Engineer of Record, WSP Golder, which was completed in March 2024.<br>Originally developed for a similar study at Glencore's Integrated Nickel Operation in Sudbury, Ontario Canada, the Carrapateena study includes deployment of a PI-SWERL at the TSF to characterise wind erosion emissions parameters.<br>Preliminary data was presented to DEM and EPA in January 2024 and a final report was submitted in June 2024.<br>The Air Quality Model was updated in 2024 and in-field validation of wind erosion parameters can be reincorporated into future air quality assessments. | Yes | NA |
| **Surface Water – Design Detail**<br>**Strategy – SWES7 Detailed design of the surface water management infrastructure (Figure 4.40) undertaken by a suitably qualified expert is undertaken prior to the commencement of construction and demonstrates the surface water management infrastructure basis of design (Section 4.12) has been achieved and will adopt strategies to ensure erosion and sedimentation is suitably managed#**<br># Surface Water Strategy (Schedule 6 Condition 19.1, 19.2 and 19.3) | Completed | Detailed design of the MPP and above-ground mining infrastructure completed by a suitably qualified expert. | Yes | NA |
| **Topsoils**<br>**Strategy – SWES8 During land clearing activities topsoil must be stockpiled and measure adopted to preserve stockpiled materials until the material is reused or determined to be no longer required#**<br># Surface Water Strategy (Schedule 6 Condition 19.4) | Ongoing | Topsoil is progressively stockpiled near infrastructure and mapped in spatial database.<br>LFAs progressing to determine future need for topsoil during rehabilitation. | Ongoing | Updated locations as operations progress. LFA will determine future need of topsoil. |
| **Surface Water Modelling**<br>**Strategy – SWRF2 Develop an appropriate methodology for the ongoing review and calibration of the surface water model (Appendix C3 Surface Water Monitoring and Assessment of Effects) associated with reduced flows in Eliza Creek as a result of the Sub Level Cave Subsidence Zone and Tailings Storage Facility (Figure 4.1) prior to the commencement of construction activities to address modelling uncertainty including long-term site-specific rainfall and evaporation data#**<br># Surface Water Strategy (Schedule 6 Condition 18)<br>**Strategy – SWRF3 Implement the surface water model Appendix C3 Surface Water Monitoring and Assessment of Effects) calibration methodology from the commencement of construction activities associated with reduced flows in Eliza Creek as a result of the Sub Level Cave Subsidence Zone and Tailings Storage Facility (Figure 4.1) to establish long-term site-specific rainfall and evaporation data#**<br># Surface Water Strategy (Schedule 6 Condition 18)<br>**Strategy – SWRF4** Calibration of the surface water model (Appendix C3 Surface Water Monitoring and Assessment of Effects) undertaken at year 2022 using site specific rainfall and evaporation data and validates modelling outputs associated with reduced flows in Eliza Creek as a result of the Sub Level Cave Subsidence Zone and Tailings Storage Facility (Figure 4.1 and Table 8.1). Any significant variations in surface water modelling during operations from those must result in a review of the effectiveness of surface water strategies to demonstrate that the outcomes are achievable#<br># Surface Water Strategy (Schedule 6 Condition 18) | Completed | BHP completed SWRF2 in 2018 and subsequently engaged a suitably qualified consultant to update the Eliza Creek Surface Water Model in 2020.<br>In alignment with SWRF4 a stream gauge was installed in Eliza Creek in November 2021 to reduce modelling uncertainty and validate outputs.<br>BHP engaged EMM to update the Eliza Creek Surface Water Model in 2022 (Calibration Methodology for Eliza Creek Models), as referenced in Appendix H of the 2022 Carrapateena PEPR Compliance Report. | Yes | N/A |

| Description of assumption or uncertainty | Estimated date to resolve | Progress in reporting period | Confirmed | Forward work plan |
|---|---|---|---|---|
| **Tailings Storage Facility – Design Update**<br>**Strategy – TSF30 The design (Appendix B1 Tailings Storage Facility Design) of the Tailings Storage Facility (Figure 4.1) must be updated prior to the commencement of construction and address the various items.**<br>Also related to strategies identified in SWES9, SWED10, SWES11, SWES12 | Completed | Updated TSF Design was provided on 17 July 2018 addressing the design items listed in Strategy TSF30.<br>The Tailings Pipeline Detailed Design, Construction Quality Assurance Plan, Seepage Assessment and TSF Design Independent Peer Review undertaken by ATC Williams were sent to DEM on 12 November 2018 to support the design.<br>One matter remains unresolved relating to the size of the lined decant cell. Updated seepage modelling was provided to support the current size of the decant cell and DEM have identified residual uncertainty.<br>Detailed design to increase the size of the lined decant cell completed in February 2019 and construction completed before end of 2019. DEM approved the design via approval of the 2020 PEPR (OZ Minerals 2020). | Yes | Detailed design to increase the size of the lined decant cell completed in February 2019 and construction completed before end of 2019. DEM to formally respond to design through 2024 PEPR review. |
| **Tailings Storage Facility – Landform Evolution Modelling**<br>**Strategy – TSF33 Develop an appropriate erosion field study methodology to the satisfaction of the Director of Mines (or other authorised officer) prior to Stage 1 of the Tailings Storage Facility for the Stage 2 embankment surface and isolated areas of the tailing beach to establish run-off and sediment load including modelling input assumptions of embankment geometry, rock armouring, particle sizes, and rainfall intensity (Appendix B1 Tailings Storage Facility Design (Landform Evolution Modelling))#**<br># Surface Water Strategy (Schedule 6 Condition 19.5)<br>**Strategy –TSF34 Implement the erosion field study during Stage 2 of the Tailings Storage Facility to establish run-off and sediment load including modelling input assumptions of embankment geometry, rock armouring, particle sizes, and rainfall intensity (Appendix B1 Tailings Storage Facility Design (Landform Evolution Modelling))#**<br># Surface Water Strategy (Schedule 6 Condition 19.5) | December 2025 | Draft methodology developed by SRK Consulting. Model parameters to be validated using TSF Stage 2 Embankment construction material and operational tailings parameters.<br>Update of the Landform Evolution Model was undertaken in 2022 and presented as Appendix G to the 2022 Carrapateena PEPR Compliance Report.<br>Engagement with DEM and EPA to be undertaken to confirm adequacy of the methodology.<br>Implementation of methodology during TSF Stage 2. | Ongoing | Engagement with DEM and EPA to be undertaken to confirm adequacy of the methodology.<br>Implementation of methodology during Stage 2 TSF. |
| **Acid and Metalliferous Drainage**<br>**Strategy – AMD7 Develop an appropriate AMD Management Plan for stockpile locations (Figure 4.32) prior to the commencement of construction activities that includes the following:**<br>• Develop a program to investigate the potential for metalliferous drainage to be generated by NAF material which contains sulphides (Surface Water Strategy (Schedule 6 Condition 21.4.2))<br>• Refine the sulphur cut-off grade for PAF material through further testing of waste units (Surface Water Strategy (Schedule 6 Condition 21.4.3))<br>• Develop an ore, waste rock and sulphur block model (Surface Water Strategy (Schedule 6 Condition 21.4.4))<br>• Develop the block model to include the sulphur distribution of all waste and ore to be mined for the purpose of determining the distribution and estimating the volume of NAF and PAF using the sulphur cut-off grade (Surface Water Strategy (Schedule 6 Condition 21.4.5))<br>• Regular updating of the block model with new geological and sulphur assay data in the course of operations and aligning to the materials handling program (Surface Water Strategy (Schedule 6 Condition 21.4.6))<br>• Develop a QA/QC process for validation of Acid Base Accounting (ABA) characteristics (Surface Water Strategy (Schedule 6 Condition 21.4.7))<br>• Develop a QA/QC process for the waste rock block model and testing to ensure the correct rock is placed in the correct destination (Surface Water Strategy (Schedule 6 Condition 21.4.8))<br>• Segregation of PAF waste rock, NAF waste rock, and waste rock with the potential for metalliferous drainage (based on a classification process) and a mining schedule for each (Surface Water Strategy (Schedule 6 Condition 21.4.9))<br>• Ensure stockpiles containing PAF material are appropriately located (Surface Water Strategy (Schedule 6 Condition 21.4.10))<br>• Develop appropriate stockpile management strategies (Surface Water Strategy (Schedule 6 Condition 21.4.11))<br>• Confirm final end uses for waste rock and marginal ore based on geochemical classification (Surface Water Strategy (Schedule 6 Condition 21.4.12)) | Completed | Review of AMD Management Plan and remove uncertainty around low potential for metalliferous drainage of NAF to simplify stockpile management.<br>EGI completed review of the AMD database in Q1 2024. | Yes | Continuous review of AMD Management Plan and remove uncertainty around low potential for metalliferous drainage of NAF to simplify stockpile management. |

| Description of assumption or uncertainty | Estimated date to resolve | Progress in reporting period | Confirmed | Forward work plan |
|---|---|---|---|---|
| **Groundwater Modelling**<br>**Strategy – GW6** Calibration of the Groundwater Model (Appendix C5 Groundwater Modelling and Assessment of Effects) is undertaken in year 2022 with operational monitoring data from monitoring sites (Figure 8.7) and validates modelling outputs. If modelling outputs vary an assessment will be undertaken to consider whether strategies are still appropriate#<br># Groundwater Strategy (Schedule 6 Condition 26.4) | Completed | Monitoring well network installed and continuation of groundwater monitoring data collection. Groundwater model reviewed by CDM Smith in 2021 using groundwater abstraction/monitoring data. As per GW6 another review was undertaken by EMM and reported as Appendix I to the 2022 PEPR Compliance Report (OZ Minerals 2023). | Yes | Monitoring of established groundwater well network |
| **Tailings AMD Geochemistry**<br>**Strategy – TSF31** Undertake stage two geochemical assessment program involving kinetic testing of the tailings prior to the commencement of construction of the Tailings Storage Facility (Figure 4.1) and update the Tailings Storage Facility Design (Appendix B1 Tailings Storage Facility Design) and Geochemical model (Appendix C4 Tailings Discharge and Seepage Geochemical Model) in the event that tailings properties and solute parameters vary when compared to Appendix B2 Geochemical Characterisation of Tailings (Surface Water Strategy (Schedule 6 Condition 21.1 and 21.4.1)). | Completed | Updated surface water and geochemical assessment of effects was provided on 18 December 2019. | Yes | NA |
| **Seepage and Discharge**<br>**Strategy – TSF32 Review the Geochemical model (Appendix C4 Tailings Discharge and Seepage Geochemical Model) prior to the commencement of construction of the Tailings Storage Facility (Figure 4.1) and address the following items#:**<br>• Review the input concentrations for elements and metals used.<br>• Based on the review provide an updated or revised solute transport geochemical model.<br>• Revise strategies associated with seepage and discharge if required.<br># Surface Water Strategy (Schedule 6 Condition 20.5) and Groundwater Strategy (Schedule 6 Condition 26.2) | Completed | Updated surface water and geochemical assessment of effects was provided on 18 December 2019. | Yes | NA |
| **Groundwater Modelling**<br>**Strategy – GW6** Calibration of the Groundwater Model (Appendix C5 Groundwater Modelling and Assessment of Effects) is undertaken in year 2022 with operational monitoring data from monitoring sites (Figure 8.7) and validates modelling outputs. If modelling outputs vary an assessment will be undertaken to consider whether strategies are still appropriate#<br># Groundwater Strategy (Schedule 6 Condition 26.4) | Completed | Monitoring well network installed and continuation of groundwater monitoring data collection. Groundwater model reviewed by CDM Smith in 2021 using groundwater abstraction/monitoring data. As per GW6 another review was undertaken by EMM and reported as Appendix I to the 2022 PEPR Compliance Report (OZ Minerals 2023). | Yes | Monitoring of established groundwater well network. |

# 19 Changes to mining operations

| Description of change to existing mining operation | Significance level (1–4) | Date submitted to DEM | Date endorsed by DEM | Current status at the end of the reporting period |
|---|---|---|---|---|
| Miscellaneous Purposes License Management Plan – Airstrip, Workers' Accommodation Village and Ancillary Infrastructure | 4 | December 2016 | 15/09/2017 (PEPR) | PEPR2017/028 approved for MPL 149 |
| TSF Stage 1 Construction Sequencing Amendment (April 2018), CA-APR-REP-1001 | 4 | 05/07/2018 | 16/08/2018 | Approved – Completed |
| Updated TSF Design Report, CA-APR-REP-1003 | 4 | 05/07/2018 | 16/08/2018 | Approved – Completed |
| Tenement Reduction ML 6471, MPL 149, MPL 152, MPL 153 and MPL 154, CA-APR-REP-1008 | 4 | 12/12/2018 | 14/12/2018 | Approved – Completed |
| Minor Change Notification – Mine Water Storage Dams and Pipeline to the TSF. OZ Minerals sought approval to construct a pipeline from the mine water storage dams to the TSF to utilise surplus mine dewater for construction activities. CA-APR-NOT-1028 | 4 | 08/12/2018 | 14/12/2018 | Approved – Completed |
| Minor Change Notification – TSF Borrow Pit Excavation Depth. OZ Minerals sought approval to expand the excavation depth at the TSF Borrow Pit from 3 m to 8 mBGL for the purpose of winning suitable material for construction of the TSF Stage 1 embankment. CA-APR-NOT-1032 | 4 | 07/02/2019 | 08/02/2019 | Approved – Completed |
| TSF Stage 1 Temporary Sprinkler Farm CA-APR-NOT-1038 | 4 | 15/04/2019 | 9/5/2019 | Approved – Activity completed and decommissioned |
| Injection Well Water Management CA-APR-NOT-1041 | 4 | 8/05/2019 | 28/5/2019 | Approved – Secondary approval gained, not yet implemented |
| TSF Lined Decant Cell Expansion and Borrow Pit 1 Expansion CA-APR-NOT-1044 | 4 | 26/06/2019 | 12/11/2020 | Approved – Completed |
| TSF Second Sprinkler Bed CA-APR-NOT-1045 | 4 | 12/07/2019 | 15/8/2019 | Approved – Completed |
| Temporary Concentrate Haulage CA-APR-NOT-1047 | 4 | 9/09/2019 | 11/10/2019 | Approved – Completed |
| Sourcing clay for Mine Water Environmental Dam | 4 | 5/08/2019 | 12/08/2019 | Approved – Completed |
| Program Notification Temporary Accommodation Camp at Yeltacowie – MPL 152 | 4 | 28/10/2020 | 26/11/2020 | Approved – Completed |
| Program Notification Extension to Midway Quarry | 4 | 30/10/2020 | 26/11/2020 | Approved – Completed |
| Program Notification Midway Quarry Temporary Batch Plant CA-ENV-LET-1022 | 3 | 21/01/2021 | 04/02/2021 | Approved – Completed |
| Program Notification Midway Quarry Eastern Stockpile Extension | 3 | 20/04/2021 | 7/05/2021 | Approved – Completed |
| Program Notification Stage 1 Tailings Storage Facility Interim Bund Works | 3 | 30/04/2021 | 24/05/2021 | Approved – Completed |
| Program Notification Waste Dump to Tailings Storage Facility Haul Road and TSF Stage 2 Design Amendments | 3 | 17/08/2021 | 28/09/2021 | Approved – Completed |
| Program Notification Temporary Concentrate Storage Pad | 3 | 22/02/2022 | 22/03/2022 | Approved – Completed |

| Provide a description of any new or emerging environmental hazards that apply, or appear to be arising, in relation to mining operations |
|---|
| No new or emerging environmental hazards have been identified that relate to mining operations |

# 20 Technical reports

The following table outlines the management system reviews undertaken at Carrapateena for the reporting period.

| Report Title | Authors |
|---|---|
| Appendix C 2024 Groundwater and Surface Water | BHP |
| Appendix D 2024 Carrapateena Flora and Fauna Survey | Lathwida Environmental |
| Appendix E 2024 Air Quality Monitoring Report | Lathwida Environmental |
| Appendix F 2024 Environmental Radiation Impact Assessment | BHP |
| Appendix G 2024 South Gap Offset Annual Report | Nature Foundation |

# 21 Voluntary information

The following table outlines the management system reviews undertaken at Carrapateena for the reporting period.

| Item | Description |
|---|---|
| Operation footprint | 1,521.77 ha |
| Greenhouse gas emissions | BHP triggers reporting thresholds for greenhouse gas emissions under the *National Greenhouse and Energy Reporting Act 2007* (Cth) (NGER Act). Carrapateena's energy and emissions are included in the total emissions and energy published for BHP, available at Corporate emissions and energy data (cleanenergyregulator.gov.au) |
| No. of employees (company and contractors) | **Tjungu Village**<br>Average personnel on site per day for the 2024 reporting period totalled 661 employees and contractors (peaking at 716 in November 2024 during a shutdown of the MPP). Total rooms is now 788 with an additional 72 coming online in February 2025.<br>**Exploration Village**<br>Average personnel on site per day for the 2024 reporting period totalled 99 employees and contractors (peaking at 149 in November 2024). Personnel on-site is expected to average approximately 100 per day in 2025, peaking every quarter for MPP shutdowns. |
| Resource development | The 2024 Mineral Resources and Ore Reserves are reported in the BHP Annual Report 2024, Additional Information; Section 6, which can be found on the BHP website at www.bhp.com/investors/annual-reporting/annual-report-2024 (BHP 2024b) |
| Community or wider environment support activities | BHP Carrapateena provides extensive sponsorship opportunities for local community groups particularly for those with an educational and/or sustainable focus.<br>BHP Carrapateena works closely with the Kokatha Aboriginal Corporation (KAC) and as part of our NTMA obligations to oversee education, training and employment opportunities via the Partnering Management Committee (PMC). The PMC is made up of BHP Carrapateena employees, KAC Board members and staff and meets quarterly.<br>In 2016 a Partnering Agreement was signed between KAC and OZ Minerals. The agreement states that KAC and OZ Minerals will work together to create suitable benefits by leveraging, developing and building on ours shared values aspirations, whilst protecting and respecting country and culture.<br>Carrapateena is represented on numerous government, industry and community groups within the area including the Gawler Ranges District Landscapes Australia Group as well as being a major sponsor for the Royal Flying Doctor Service (RFDS), Clontarf Foundation, Shooting Stars, Uni Hub Spencer Gulf and the Remote and Isolated Children's Exercise activity days. |
| Community engagement activities | The operation has immediate neighbours on Pastoral Land and has ongoing communication with them.<br>BHP Carrapateena participates in presentations with community groups and provides formal and informal updates to local councils and industry chambers groups. Operational and local sourcing opportunity updates were given at various conferences and events throughout the reporting period. |
| Environmental research information | Activities have been ongoing at site as part of our monitoring to improve our understanding of the natural environment. We continue to collect data around air quality, flora and fauna, surface water flows and groundwater. This will further support our understanding of the environment and further expand on the baseline data collected in previous years. |

# 22 Community engagement

The following table summarises community engagement activities during the reporting period.

| Report Title | Authors |
|---|---|
| Pernatty Pastoral Station consultation | Operating Protocol annual meeting 21/02/2024 |
| | Ad hoc and regular emails and phone calls recorded into Borealis |
| South Gap Pastoral Station consultation | Meetings in field relating to Western Access Road and other operational matters |
| | Ongoing meetings and in-person engagements across 2024 |
| Arcoona Pastoral Station and Bosworth Pastoral Station consultation | Operating Protocol annual meeting 15/01/2024<br>Ad hoc and regular emails and phone calls to provide operational and updates<br>Recorded in Borealis |
| Regular (~monthly) email updates to all pastoralists connected to Carrapateena | Email to pastoralists providing an update on each work element of the operation and other additional relevant information |
| Regular Kokatha Operations (LEAN) meetings | Regular (~monthly) meetings with Kokatha operational personnel |
| Kokatha PMC – quarterly | Review of compliance with NTMA including business development, employment and training, heritage safety and environment for KAC. PMC numbers 26, 27 and 28 held in 2024. PEPR update given in PMC 26 and Change in Operations (CiO) application discussed in PMC 28. |
| Kokatha Partnering Health Check | Partnering Health Check held with Kokatha members in May 2024. Various site inspections (including the TSF, Western Access Road and subsidence zone) undertaken. |
| Local supply engagements | Continued strategic relationship with TACTIC. Continued regular local engagement through tours and workplace visits. Sponsored and attended the annual TACTIC Conference and Trade Expo in Port Augusta in August. |
| Local government engagements | Engaged twice with Spencer Gulf Cities (Independent association of Upper Spencer Gulf (USG) councils) on the Northern Water Project, local economic conditions, industry developments (particularly hydrogen) and community issues. |
| Remote and Isolated Children's Exercise communications and conference | Ongoing support of events for 2024 |
| Quorn Cup | Sponsors of community event 2024 |
| Caltowie Music Festival | Sponsors of community event 2024 |
| Glendambo Gymkhana | Sponsors of community event 2024 |
| Steel City Nats (Whyalla) | Sponsors of community event 2024 |
| Carrieton Rodeo | Sponsors of community event 2024 |

# 23 Forward works plan

The following table summarises the actions raised throughout this Compliance Report. These actions will form the basis of the forward work plan for BHP Carrapateena during the 2025 reporting period. These actions are the responsibility of various operational departments at Carrapateena.

| Action No. | Action description | Proposed completion date | Report reference |
|---|---|---|---|
| 1 | Undertake expert audits of TSF every 3 months as per **ML 6471 Second Schedule Condition 4.3 (in accordance with Conditions 12, 13 and 14)** | Ongoing | Section 10 |
| 2 | Present tailings beach trial methodology (air quality) to establish dust threshold lift off speed for tailings to DEM and EPA as per MPEPR2019/026 **Strategy AQ13** | Completed 2024 | Section 18 |
| 3 | Implement tailings beach trial methodology (air quality) to establish dust threshold lift off speed for tailings to DEM and EPA as per MPEPR2019/026 **Strategy AQ14** | Completed 2024 | Section 18 |
| 4 | Submission of a revised MPEPR 2019/026, which will capture block cave enabling activities, archive conditions which pertain to the construction phase and CTP. MPEPR2024/009 approved in October 2024. | Completed 2024 | Section 1 |
| 5 | Audit (TSF Closure Strategy Verification Report) undertaken by an independent suitably qualified expert approved by the Director of Mines (or other authorised officer). Report to be completed in 2025 including options for in-field erosion validation. **Strategy AQ3/TSF7** | 2025 | Section 18 |
| 6 | Undertake final vegetation assessment for saline water spill at RP3 to determine required offset with SEB credits. **Strategy LS1** | 2025 | Section 8 |
| 7 | Undertake initial vegetation assessment for saline water spill at Turkey Nest 47 to determine required offset with SEB credits. **Strategy LS1** | 2025 | Section 8 |
| 8 | Update locations of monitoring points to be outside the predicted TSF zone of influence. **Strategy GW1** | 2025 | Section 9 |
| 9 | Update groundwater model with increased observed seepage rates to demonstrate that the outcome can be met. Update OMC accordingly. **Strategy GW2** | 2025 | Section 9 |

# 24 Ministerial checklist

This Compliance Report has been completed in general accordance with the TOR 009 Mining Compliance Reports (DEM 2020) and associated Mineral Regulatory Guideline (MG3) (DEM 2021). Table 24.1 provides a cross-reference of the requirements of MG3 (DEM 2021) with the associated section of the Compliance Report for the required information.

**Table 24.1: Checklist of Compliance Report against the Ministerial Determination requirements**

| Section | Included? Or N/A |
|---|---|
| **Public liability insurance** | |
| Provide a copy of the cover note | Section 3 |
| **Identification** | |
| Tenement number(s) | Section 4 |
| Name of the mine operation | Section 1 |
| General location details | Section 1 |
| Name(s) of the mine owner and mine operator(s) | Section 1 |
| Site Contact | Section 1 |
| Reference and approved date of relevant PEPR being reported against | Section 1 |
| Dates of the reporting period for the report | Section 1 |
| Date of preparation of the report. | Section 1 |
| **Tenements** | |
| Summary table of all tenements including ML, MPL, EML etc. | Section 4 |
| Plan of the mining operations showing all tenement boundaries covered by the approved PEPR | Section 4 |
| **Other Licences, Permits, Waivers, Native Title and Agreements** | |
| Summary table of all licences, permits, waivers, native title and other agreements relevant to the PEPR. | Section 5 |
| **Ore reserves and mineral resources** | |
| Summary of mineral resource and ore reserves | Section 6 |
| New delineation or exploration drilling activities on or off the lease (if required) | Section 6 |
| Estimated mine life | Section 6 |
| **Mining processing and waste storage activities** | |
| Quantity of ore mined and stockpiled | Section 7 |
| Amount of overburden/waste | Section 7 |
| Volumes of concentrate produced | Section 7 |

| Section | Included? Or N/A |
|---|---|
| **7. Compliance with environmental outcomes and leading indicators** | |
| Provide a summary of compliance for each environmental outcome specified in the tenement conditions or approved PEPR | Section 8/Section 9 |
| Summarise data relating to any leading indicator criteria in the approved PEPR | Section 8/Section 9 |
| **8. Compliance with non-outcome based tenement conditions** | |
| If you have any lease conditions which do not have an outcome measurement criteria relating to it please list the compliance status and evidence against each condition in a summary table | Section 10 |
| **9. Rectification of non-compliance** | |
| If a 'not complied' is recorded, the following must be included: | Section 11 |
| Date of the incident | Section 11 |
| What environmental outcome or tenement condition was breached | Section 11 |
| The date of incident was reported under Regulation 87 of the Mining Regulation | Section 11 |
| The cause of non-compliance | Section 11 |
| Actions taken to rectify the non-compliance | Section 11 |
| Where non-compliance under Regulation 86 or initial incident reports under Regulation 87 of the Mining Regulations have previously been reported in compliance reports and not fully rectified at the time of reporting, a progress report must be included to assess the effectiveness of rectification | Section 11 |
| **10. Disturbance and rehabilitation activities** | |
| The amount of land disturbed and activity that created disturbance in the reporting period | Section 12 |
| Rehabilitation worked carried out in the reporting period | Section 12 |
| The amount of land where rehabilitation works are completed | Section 12 |
| An estimated amount of land to be rehabilitated in the next reporting period | Section 12 |
| Any potential improvements learned from previous rehabilitation activities | Section 12 |
| **Reconciliation of native vegetation clearance** | |
| Where the PEPR includes an approved native vegetation management plan for clearance of native vegetation under the *Native Vegetation Act 1991*, include: | Section 13 |
| The approved maximum vegetation clearance | Section 13 |
| The amount of native vegetation cleared in the reporting period | Section 13 |
| The total amount cleared to date | Section 13 |
| An estimated amount proposed to be cleared in the next reported period | Section 13 |
| Provision of information, including annual monitoring and progress reports to demonstrate compliance with the NVMP where Significant Environmental Benefit (SEB) is being provided | Section 13 |
| **12. *Environment Protection and Biodiversity Conservation Act 1999* reporting** | |
| Demonstration of compliance with EPBC conditions (if required) | Section 14 |

| Section | Included? Or N/A |
|---|---|
| **13. Exempt land** | |
| Provide a statement that waivers for land relevant to the mining operation are in place and compliance with exempt land provisions in accordance with Section 9 of the Mining Act | Section 15 |
| The status of exempt land, including name of person entitled to exemption, certificate of title, reason for exemption, area of exemption, date waiver registered and any relevant conditions | Section 15 |
| A plan showing all exempt land relevant to the mining operations | Section 15 |
| **14. Complaints** | |
| Summary table of complaints made by members of the public during the reporting period and include:<br>the date of complaint<br>the nature of complaint<br>whether or not it related to non-compliance<br>what action was taken to address the complaint<br>the date the complaint was resolved | Section 16 |
| **15. Management system reviews** | |
| Provide a summary of any management system review undertaken during the reporting period in order to ensure compliance with relevant tenement conditions and environmental outcomes, including: | Section 17 |
| When the audit ore review was undertaken | Section 17 |
| Who undertook the audit or review | Section 17 |
| What aspect(s) of the management system was/were audited/reviewed | Section 17 |
| What issues, or recommendations for improvement, were noted | Section 17 |
| An assessment of the potential for any issues identified in the audit/ review to lead to a noncompliance with approved environmental outcomes | Section 17 |
| What corrective action that has or will be taken to address any issues. | Section 17 |
| **16. Verification of uncertainties** | |
| Provide a description and status of works undertaken during the reporting period or proposed undertaken to address any identified uncertainties made in the approved PEPR (or any additional uncertainties or assumptions identified since PEPR approval) | Section 18 |
| **17. Technical Reports** | |
| Summary of technical data studies and reports generated in reporting period | Section 20 |

# 25 References

ANZG (Australian and New Zealand Guidelines) (2018) *Australian and New Zealand Guidelines for Fresh & Marine Water Quality. Default guideline values*. Australian Government Initiative. Accessed at www.waterquality.gov.au/anz-guidelines/guideline-values/default.

BHP (2024a) *Carrapateena Operation Program for Environment Protection and Rehabilitation for ML 6471 Mineral Lease, MPL 149 Airstrip, MPL 152 Western Infrastructure Corridor, MPL 153 Eastern Radial Wellfield and MPL 154 Southern Access Road and Radial Wellfield and MPL 156 Northern Wellfield*. June 2024. MPEPR2024/009.

BHP (2024b) *Annual Report 2024*. 27 August 2024. Accessed at: www.bhp.com/investors/annual-reporting/annual-report-2024

BHP (2024c) *BHP Operational review for the year ended 30 June 2024*. 27 August 2024. Accessed at bhpoperationalreviewfortheyearended30june2024.pdf

DEC (2005) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South*

*Wales.* Department of Environment and Conservation (NSW). August 2005, Sydney.

DEM (Department for Energy and Mining) (2020) *Determination Terms of Reference 009 (TOR 009) Mining Compliance Reports*. Notice under Regulation 77 of the Mining Regulations 2020. Dated 11 December 2020. Government of South Australia's Department for Energy and Mining, South Australia, Adelaide.

DEM (Department for Energy and Mining) (2021) *Preparing a mining compliance report*. Mineral Regulatory Guidelines MG3, Mineral Resources Division. Dated August 2021. Government of South Australia's Department for Energy and Mining, South Australia. Adelaide.

OZ Minerals (2017a) *Carrapateena Project Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans*. May 2017. Version A. OZ Minerals, South Australia, Adelaide.

OZ Minerals (2017b) *Carrapateena Project Program for Environment Protection and Rehabilitation, Miscellaneous Purposes Licence 149, Airstrip, Workers' Accommodation Village and Ancillary Infrastructure*. August 2017.

OZ Minerals (2017c) *Carrapateena Project Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans Response Document*. September 2017. Version A. OZ Minerals, South Australia, Adelaide.

OZ Minerals (2020) *Carrapateena Project Program for Environment Protection and Rehabilitation. ML 6471 Mineral Lease, MPL 149 Airstrip, Workers' Accommodation Village, Access Road and Ancillary Infrastructure, MPL 152 Western Infrastructure Corridor, MPL 153 Eastern Radial Wellfield, MPL 154 Southern Access Road and Radial Wellfield, MPL 156 Northern Wellfield, MPEPR2019/026*. February 2020. OZ Minerals, South Australia, Adelaide.

OZ Minerals (2023) *Carrapateena Operation PEPR Compliance Report 2022*. Issue date March 2023. Dated 31 March 2023. OZ Minerals, South Australia, Adelaide.

# 26 Abbreviations and units of measure

## 26.1 Definition of acronyms

| Acronym | Expansion |
|---|---|
| ABA | acid base accounting |
| AMD | acid mine drainage |
| AN | ammonium nitrate |
| ANFO | ammonium nitrate fuel oil |
| BDSA | Biological Database of South Australia |
| CiO | Change in Operations |
| CQA | Construction Quality Assurance |
| CTP | Concentrate Treatment Plant |
| CS02 | Crusher Station 2 |
| DCCEEW | Department of Climate Change, Energy, the Environment and Water |
| DEM | Department for Energy and Mining |
| DEW | Department for Environment and Water |
| DoEE | Australian Government's Department of the Environment and Energy (now DCCEEW) |
| DPTI | Department of Planning, Transport and Infrastructure<br>(now Department for Infrastructure and Transport (DIT) |
| DSEP | Dam Safety Emergency Plan |
| EC | electrical conductivity |
| EMS | Event Management System |
| EPA | Government of South Australia's Environment Protection Authority |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* (Cth) |
| ERML | Environmental Radiation Monitoring Location |
| GLUP | Global Land Use Permit |
| HE | high explosives |
| ITP | Inspection and Test Plan |
| KAC | Kokatha Aboriginal Corporation |
| LDP | Land Disturbance Permit |
| LEM | landform evolution model |
| LFA | landscape function analysis |
| LoM | life-of-mine |
| LOR | limit of reporting |
| LPG | liquefied petroleum gas |
| Mining Act | *Mining Act 1971* (SA) |
| ML | Mining Lease |
| MPL | Miscellaneous Purposes Licence |

| Acronym | Expansion |
|---|---|
| MPP | mineral processing plant |
| MNES | matters of national environmental significance |
| NAF | non-acid forming |
| NATA | National Association of Testing Authorities |
| NEPM | National Environment Protection Measure |
| NGER Act | *National Greenhouse and Energy Reporting Act 2007* (Cth) |
| NPI | non-process infrastructure |
| NTMA | Native Title Mining Agreement |
| NVMP | Native Vegetation Management Plan |
| OMC | Outcome Measurement Criteria |
| OMS | Operations, Maintenance and Surveillance |
| PAF | potentially-acid forming |
| PCQ | Point Centred Quarter |
| PEPR | Program for Environment Protection and Rehabilitation |
| PIRSA | Department of Primary Industries and Regions, South Australia |
| PMC | Partnering Management Committee |
| PSD | particle size distribution |
| QA/QC | quality assurance/quality control |
| RFDS | Royal Flying Doctor Service |
| RL | Retention Lease |
| ROM | run-of-mine |
| SDS | safety data sheet |
| SEB | significant environmental benefit |
| SLC | sub-level cave |
| SWL | standing water level |
| THA | Tent Hill Aquifer |
| TOR | Terms of Reference |
| TSF | tailings storage facility |
| USG | Upper Spencer Gulf |
| WRD | waste rock dump |
| WWTP | wastewater treatment plant |

## 26.2 Units of measure

| Acronym | Expansion | Acronym | Expansion |
|---|---|---|---|
| $ | Australian dollars(s) | $m^3$ | cubic metres |
| US$ | United States dollar(s) | m | metre |
| % | percent | mAHD | metres Australian Height Datum |
| µGy | microgray | mBGL | metres below ground level |
| µS | microsiemen | mg | milligram |
| cm | centimetre | ML | megalitre |
| D | day | mm | millimetre |
| dmt | dry metric tonne | mSv | millisieverts |
| G | gram | Mt | million tonnes |
| ha | hectare | pH | measure of acidity or basicity |
| kg | kilogram | s | second |
| kL | kilolitre | t | tonnes |
| km | kilometre | | |
| L | litre | wt% | weight percentage |
| $m^2$ | square metre | w/w | weight per weight |
| $m^3$ | cubic metres | | |

# Appendices

# Appendix A Public liability insurance

# STEIN INSURANCE COMPANY LIMITED

PO Box 230
Heritage Hall
Le Marchant Street
St Peter Port
Guernsey GY1 4JH
Telephone +44 (0) 1481 737100
Fax +44 (0) 1481 729046

24 June 2024

To Whom It May Concern

## Certificate of Placement – Public & Products Liability

This certificate is issued as a matter of information only and confers no rights upon the holder. It does not amend, extend or alter the coverage afforded by the policy/policies listed. It is issued as a summary only of the cover provided and is current only at the date of issue. For full particulars reference should be made to the current policy wording.

| | |
|---|---|
| **Named Insured:** | BHP Group Limited and all subsidiary companies and all related and/or affiliated and/or controlled, managed, administered and associated companies or corporations (now existing or hereinafter acquired, formed or incorporated) and/or related joint ventures and/or partnerships and other entities named or described herein for their respective rights and interests. |
| **Insurer(s):** | Stein Insurance Co. – a Captive Insurance Company and wholly owned subsidiary of BHP Group Ltd currently rated A- by Standard & Poor's |
| **Policy Number:** | PL/0001/24 |
| **Period of Insurance:** | 1st July 2024 to 30th June 2025, both days inclusive, local standard time at the location of the property, operations or activities insured. |

# STEIN INSURANCE COMPANY LIMITED

**Interest Insured:** The Insurers will indemnify the Insured up to the Limit of Liability for all amounts which the Insured shall become legally liable to pay by way of compensation (including claimants' costs and expenses) for and/or arising out of Personal Injury and/or Property Damage occurring during the Period of Insurance in connection with the Business of the Insured and/or the Insured's Products and/or Completed Operations.

**Situation and/or Premises:** Anywhere in the world but the Insurers shall not be liable to pay any claim or indemnity hereunder to the extent that payment of such would expose the Insurers to any sanction, prohibition or restriction under any United Nations resolutions or any trade or economic sanctions, laws or regulations of any applicable jurisdiction.

**Limit of Liability:** US$25,000,000 any one occurrence in respect of Public Liability

US$25,000,000 any one occurrence and in the annual aggregate in respect of Products Liability

US$25,000,000 any one occurrence and in the annual aggregate in respect of Medical Malpractice

US$25,000,000 any one occurrence and in the annual aggregate in respect of Professional Indemnity

**Notice of Occurrence:** The Insured shall promptly furnish the Insurers with all information available respecting any Claim, and the Insurers shall have the right to appoint adjusters, assessors or surveyors and to control all negotiations, adjustments and settlements in connection with such Claim, subject always to the terms and conditions of the policy wording.

All other terms and conditions as per the full policy wording.

Signed for and on behalf of
Stein Insurance Company
J. Stewart - Manager

# Appendix B Exploration on ML 6471

## Appendix B1 Exploration liabilities

Has Exploration, Exploration Rehabilitation, or Do Outstanding Exploration Liabilities Exist on the Mining Lease

| | | |
|---|---|---|
| Have any exploration activities been conducted during the current reporting period? | **No**/Yes | <If yes, complete all sections of form.> |
| Have rehabilitation activities been undertaken during the reporting period? | **No**/Yes | <If yes, complete all sections of form.> |
| Is there any outstanding rehabilitation from current or previous reporting periods to be undertaken? | **No**/Yes | <If yes, complete all sections of form.> |
| | If NO to all of above, no further information on exploration activities required. | |

# Appendix C

# 2024 Groundwater and Surface Water Monitoring Report

BHP

## CARRAPATEENA OPERATION

# 2024 Groundwater and Surface Water Monitoring Report

# Contents



# List of tables

# List of figures

# 1 Introduction

The purpose of this report is to demonstrate compliance with Groundwater and Surface Water Outcome Measurement Criteria in accordance with MPEPR2024/009. This report will be submitted as an Appendix to the Program for Environment Protection and Rehabilitation (PEPR) Compliance Report 2024.

# 2 Surface water

## 2.1 Erosion and sedimentation

The Outcome Measurement Criteria (OMC) below relates to surface water sampling to monitor the potential for erosion and sedimentation downstream of the mine.

| ID | Outcome Measurement Criteria | Result |
|---|---|---|
| Outcome Measurement Criteria – SWES1 | Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) at surface water sampling sites (SW01 to SW12, SW-1 to SW-7, SW-14 to SW-17, Gorge Spring and Euro Spring) at least once a year within seven days of a rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (whichever is greater); pH, EC, SS, and hydrocarbons). | A total of 32 monitoring locations were sampled throughout the monitoring period.<br>Exceedances:<br>• pH (7)<br>• Electrical conductivity (2).<br>• Hydrocarbon (1). |

Opportunistic surface water sampling is required at least once a year at surface water monitoring locations SW01 to SW12, SW-1 to SW-7, SW-14 to SW-17, Gorge Spring and Euro Spring (Figure 2). As a guideline, surface water collection is possible when rainfall intensity is >20mm as this can induce overland & streamflow into ephemeral creek systems, tributaries, culverts and dams.

Significant rain events accumulating >20 mm were recorded three times throughout 2024 (the monitoring period) and are summarised in Table 1. In general, the rainfall was received over multiple days. Rainfall at the TSF All Weather Station (AWS) in 2024 was observed in early-March (19.0 mm), between 6 & 8 July (36.6 mm) and between 11 November to 6 December 2024 (76.4 mm) (Figure 1). Total rainfall for the reporting period was 192.0 mm.

The requirement for sampling within seven days of a rain event to create flow was not possible for the March 2024 event as pooled surface water from rainfall was dispersed rapidly and sites were initially inaccessible due to flooding of access tracks. Sampling was successfully achieved within seven days of the rainfall in July 2024 however the November and December rainfall events were spread out over 24

days (from the onset of recorded rainfall), with sampling undertaken as soon as reasonable possible due to inaccessibility. All samples were submitted to and analysed by a NATA accredited facility (Australian Laboratory Services). A minimum of one sample was collected from each major surface drainage.

The Eliza Creek monitoring locations recorded one pH exceedance at SW06, two exceedances of EC at SW05 following separate rainfall events and SW07 reported the presence of minor hydrocarbons (Table 2). Future sampling will determine whether hydrocarbon sources are likely biogenic, mine or pastoral origin. Water quality analytical results from site SW02 (Table 3) were not obtained due to the scarceness of pooled water.

Sampling occurred in the Salt Creek at 4 locations (SW08, SW09, Euro Spring & Gorge Spring) during 2024 (Table 4 to Table 6). SW01 and SW03 were unable to be sampled due to the rapid cessation of flow following rainfall which is exacerbated by the difficulty to access sampling locations following rainfall.

One sample each from SW08, SW09, Euro Spring and Gorge Spring was outside pH guideline limits for ANZECC Freshwater (2000) and baseline surface water quality (Table 5 and Table 6). All EC results recorded from SW08, SW09, Euro and Gorge Spring were within the baseline surface water quality.

There were no exceedances of suspended solids (SS) or hydrocarbons in Salt Creek, its tributaries or watercourse spring monitoring locations during 2024 (Table 5 and Table 6). SW08 and Gorge Spring locations recorded lower SS results compared to baseline range.

Four samples were collected from Yeltacowie Creek monitoring locations in 2024, two from SW11 and a single sample at SW10 and SW12. One pH result outside of ANZECC guidelines was recorded at SW11. SW11 sampling location recorded lower SS results comparted to the baseline range.

Site SW-16 in Bosworth Creek did not exceed the ANZECC Freshwater or baseline ranges and aligns with results obtained from neighbouring ephemeral creek systems (Table 8). Site SW-15 recorded a pH result below the ANZECC guideline.

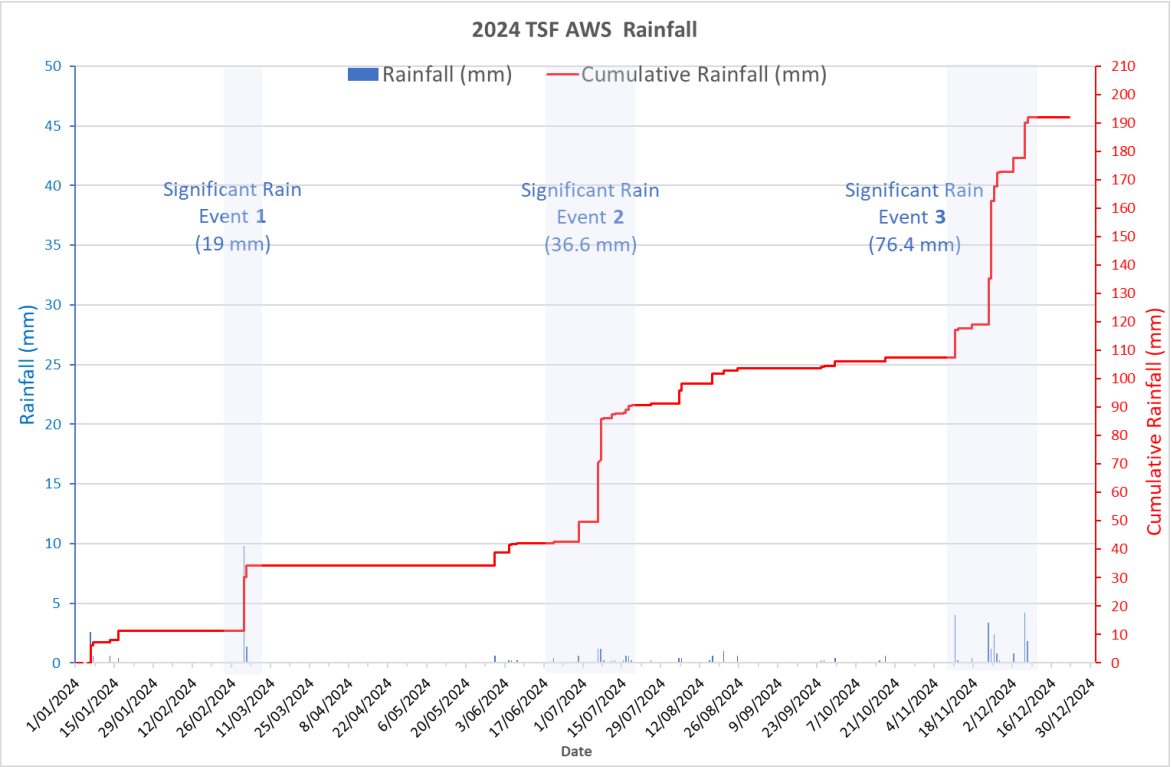



**Figure 1: Carrapateena Rainfall TSF AWS – 2024**

**Table 1: Summary of Significant Rainfall Events 2024 (TSF AWS)**

| Date | Significant Rainfall Event # | Rainfall (mm) | Total Rainfall per Event (mm) |
|---|---|---|---|
| 1/3/2024 | 1 | 19.0 | 19.0 |
| 6/7/2024 | 2 | 20.8 | 36.6 (*sampling and analysis performed) |
| 7/7/2024 | | 15.6 | |
| 8/7/2024 | | 0.2 | |
| 11/11/2024 | 3 | 9.6 | 76.4 (*sampling and analysis performed) |
| 12/11/2024 | | 0.6 | |
| 23/11/2024 | | 16.4 | |
| 24/11/2024 | | 27.2 | |
| 25/11/2024 | | 5.0 | |
| 26/11/2024 | | 5.0 | |
| 6/12/2024 | | 12.6 | |

**Table 2: Water quality results from Eliza Creek monitoring locations**

*Data includes analytical results from samples sourced at nearby surface water monitoring location IT 1.5.

| Variable | ANZECC / ARMCANZ (2000) Freshwater Guideline | Baseline range | *SW05 | **SW06 | SW07 |
|---|---|---|---|---|---|
| No. of samples | | | | | |
| pH (units) | 6.5 – 9 | - | 6.62 – 8.06 | 6.4 – 8.1 | 6.65 – 8.09 |
| EC (µS/cm) | 100 – 5,000 | - | 5420 – 6320 | 334 – 412 | 224 – 253 |
| Suspended solids (mg/L) | - | 26 - 164 | <5 – 18 | <5 – 24 | 21 - 22 |
| Hydrocarbons (>C10 - C40 fraction) (µg/L) | 0 | Not tested | <50 | <50 | <50 - 190 |

**Data includes analytical samples from samples sourced at nearby surface water monitoring location EC-2.

**Table 3: Carrapateena surface water monitoring locations (PEPR Figure 9.5)**

| Variable | ANZECC / ARMCANZ (2000) Freshwater Guideline | Baseline range | SW02 |
|---|---|---|---|
| No. of samples | - | - | 0 |
| pH (units) | 6.5 – 9 | - | (unable to sample) |
| EC (µS/cm) | 100 – 5,000 | - | |
| Suspended solids (mg/L) | - | 26 – 164 | |
| Hydrocarbons (>C10-C40 fraction) (µg/L) | 0 | Not tested | |

**Table 4: Water quality results from Salt Creek tributaries monitoring locations**

| Variable | ANZECC / ARMCANZ (2000) Freshwater Guidelines | Baseline range | SW01 | SW03 |
|---|---|---|---|---|
| No. of samples | - | - | 0 | 0 |
| pH (units) | 6.5 – 9 | 7.6 – 10.3 | (unable to sample) | (unable to sample) |
| EC (µS/cm) | 100 – 5,000 | 265 – 24,800 | | |
| Suspended solids (mg/L) | - | 8 - 604 | | |
| Hydrocarbons (>C10-C40 fraction) (µg/L) | 0 | Not tested | | |

**Table 5: Water quality results from Salt Creek monitoring locations - SW08 – SW09**

| Variable (mg/L) | ANZECC / ARMCANZ (2000) Freshwater Guideline | Baseline range | SW08 | SW09 |
|---|---|---|---|---|
| No. of samples | - | - | 1 | 2 |
| pH (units) | 6.5 – 9 | 7.6 – 10.3 | 6.32 | 6.43 – 7.76 |
| EC (µS/cm) | 100 – 5,000 | 265 – 24,800 | 2480 | 6730 - 15500 |
| Suspended solids (mg/L) | - | 8 - 604 | 8 | <5 - 15 |
| Hydrocarbons (>C10 - C40 fraction) (µg/L) | 0 | Not tested | <50 | <50 |

**Table 6: Water quality results from Salt Creek monitoring locations - Euro Spring and Gorge Spring**

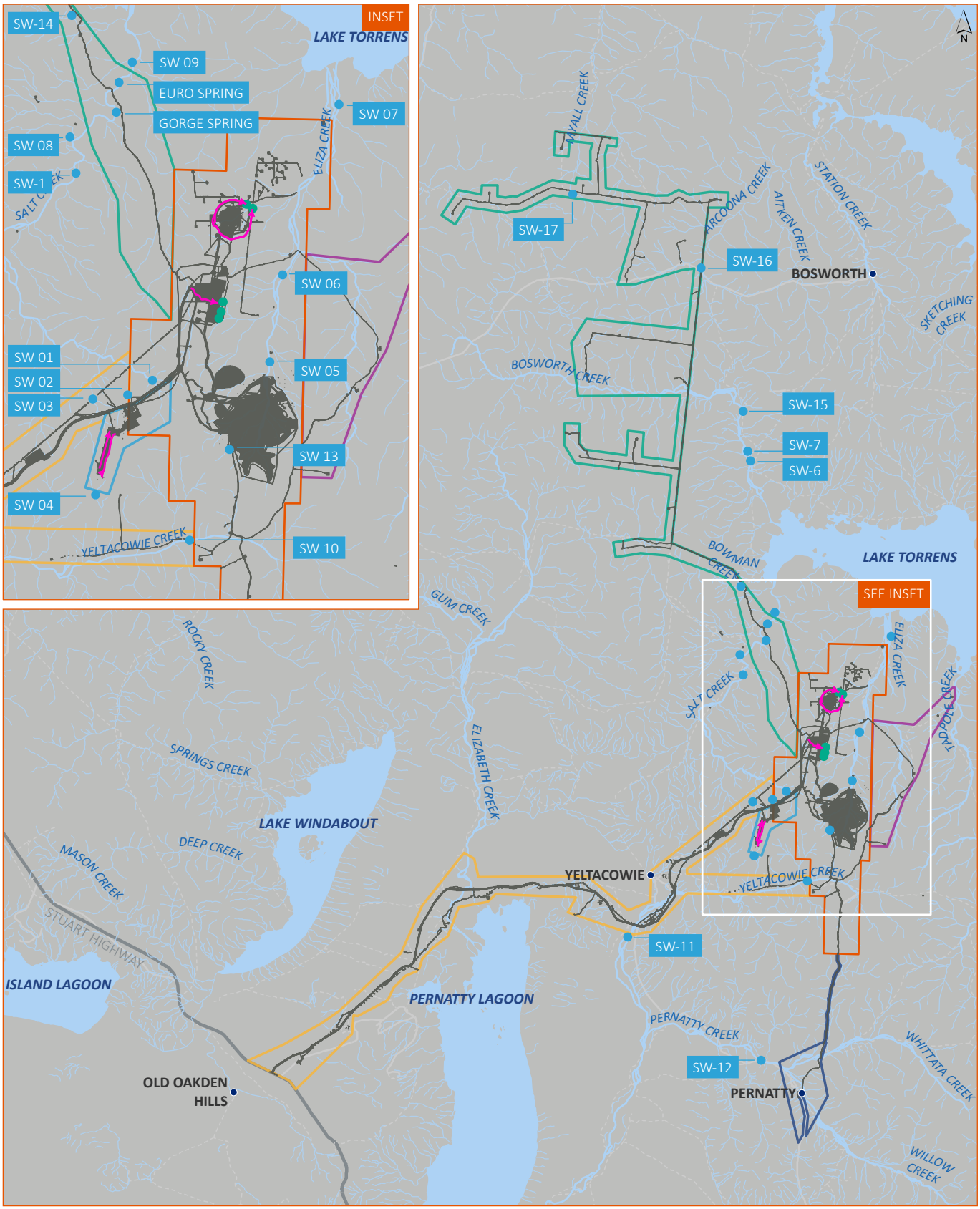
| Variable (mg/L) | ANZECC / ARMCANZ (2000) Freshwater Guideline | Baseline range | Euro Spring | Gorge Spring |
|---|---|---|---|---|
| No. of samples | - | - | 2 | 2 |
| pH (units) | 6.5 – 9 | 7.6 – 10.3 | 6.32 – 7.45 | 6.27 – 8.41 |
| EC (µS/cm) | 100 – 5,000 | 265 – 24,800 | 3620 - 3860 | 2790 - 6480 |
| Suspended solids (mg/L) | - | 8 - 604 | 13 - 14 | 5 |
| Hydrocarbons (>C10 - C40 fraction) (µg/L) | 0 | Not tested | <50 | <50 |

**Table 7: Water quality results from Yeltacowie Creek monitoring locations**

| Variable (mg/L) | ANZECC / ARMCANZ (2000) Freshwater Guideline | Baseline range | SW10 | SW11 | SW12 |
|---|---|---|---|---|---|
| No. of samples | - | - | 1 | 2 | 1 |
| pH (units) | 6.5 – 9 | - | 6.59 | 6.39 – 7.94 | 7.28 |
| EC (µS/cm) | 100 – 5,000 | - | 255 | 1640 – 2260 | 204 |
| Suspended solids (mg/L) | - | 25 - 350 | 29 | <5 | 178 |
| Hydrocarbons (>C10 - C40 fraction) (µg/L) | 0 | Not tested | <50 | <50 | <50 |

**Table 8: Water quality results from Bosworth Creek monitoring locations**

| Variable (mg/L) | ANZECC / ARMCANZ (2000) Freshwater Guideline | Baseline range | SW-15 | SW-16 |
|---|---|---|---|---|
| No. of samples | - | - | 1 | 1 |
| pH (units) | 6.5 – 9 | - | 6.3 | 6.51 |
| EC (µS/cm) | 100 – 5,000 | - | 2200 | 244 |
| Suspended solids (mg/L) | - | - | 19 | 32 |
| Hydrocarbons (>C10 -C40 fraction) (µg/L) | 0 | - | <50 | <50 |




KEY

- Mineral Lease 6471
- Airstrip and Tjungu Accommodation Village MPL 149
- Western Infrastructure Corridor MPL 152
- Eastern Radial Wellfield MPL 153
- Southern Access Road and Radial Wellfield MPL 154
- Northern Wellfield MPL 156
- Project Layout
- Major Watercourse
- Watercourse
- Diversion Drain
- Surface Water Sampling Location
- Surface Water Management Infrastructure
- Homestead

0 7.5 15 km

GDA 1994 MGA Zone 53

**Figure 2: Carrapateena Surface Water monitoring locations (PEPR Figure 9.5)**

Carrapateena BHP

## 2.2 Tailings storage facility

### 2.2.1 Shallow monitoring wells

The following OMCs relate to groundwater monitoring at shallow monitoring wells (TSFMB1s, TSFMB2s, TSFMB3s, TSFMB4s) downstream of the Tailings Storage Facility (TSF) to monitor the potential for shallow lateral seepage.

| ID | Outcome Measurement Criteria | Result |
|---|---|---|
| Outcome Measurement Criteria – TSF1 | Quarterly sampling of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1s – TSFMB4s) and analysis of pH, Metals and EC demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (pH, EC and metals) whichever is greater. | In TSFMB3s, EC, aluminium, barium, cobalt, copper, iron, strontium and uranium (Table 9) were above the ANZEC/ARMCANZ (2000) or baseline guidelines for shallow alluvial weather Proterozoic groundwater.<br><br>TSFMB1s, TSFMB2s and TSFMB4s continue to present as dry and are unable to be sampled. |
| Outcome Measurement Criteria – TSF2 | Quarterly monitoring of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1s – TSFMB4s) demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well. | Standing water level is trending in accordance with predictions at TSFMB3s however has exceeded maximum predicted drawdown. This is influenced by water levels and recharge by rainfall prior to operation of the TSF.<br><br>TSFMB1s, TSFMB2s and TSFMB4s continue to present as dry and are unable to be sampled. |
| Outcome Measurement Criteria – TSF37 | Quarterly sampling of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1s – TSFMB4s) at the cessation of tailings discharge for a period of no less than one (1) year and analysis of pH, metals and EC demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (pH, EC and metals) whichever is greater. | Carrapateena is within an operational phase, this is a completion criteria and as such, is not relevant. |

Shallow monitoring wells downstream of the TSF were installed in April and May 2019 (TSFMB1s – TSFMB4s) (Figure 4). The wells screen the shallow alluvium at depths ranging from 14 to 46 metres below ground level (mbgl) and do not intercept the water table, except for TSFMB3s.

No baseline groundwater quality or standing water level (SWL) data was collected for dry wells in 2024 (TSFMB1s, TSFMB2s, TSFMB4s). The modelled groundwater levels for the shallow monitoring wells ranges from 60 to 88 mAHD which exceed the depth of the wells.

Quarterly sampling and laboratory analysis of the shallow monitoring wells as required by Outcome Measurement Criteria TSF1 occurred at TSFMB3s in all quarters throughout the monitoring period.

Electrical conductivity, aluminium, barium, cobalt, copper, iron, strontium and uranium were above the ANZEC/ARMCANZ (2000) or baseline guidelines for shallow alluvial weather Proterozoic groundwater (Table 9). The recent groundwater quality data demonstrates an increase in metals compared to baseline. This may be due to lateral seepage and hydrostatic loading from the TSF embankment and/or unlined portion of the Decant Dam.

Groundwater levels in TSFMB3s are displayed in Figure 3. The increase in groundwater levels of this shallow unconfined aquifer correlates with rainfall events in July and November 2024.

Due to paucity of data, baseline comparisons in shallow TSF bores are limited. BHP continues to closely monitor TSFMB3s ensuring supernatant seepage is controlled from the TSF whilst better understanding the groundwater characteristics at this monitoring location. Site-specific guideline values (SSGVs) are currently being established to replace leading indicator baseline ranges at TSF monitoring wells, groundwater, surface water and sediment sites. This review will support a future PEPR update.

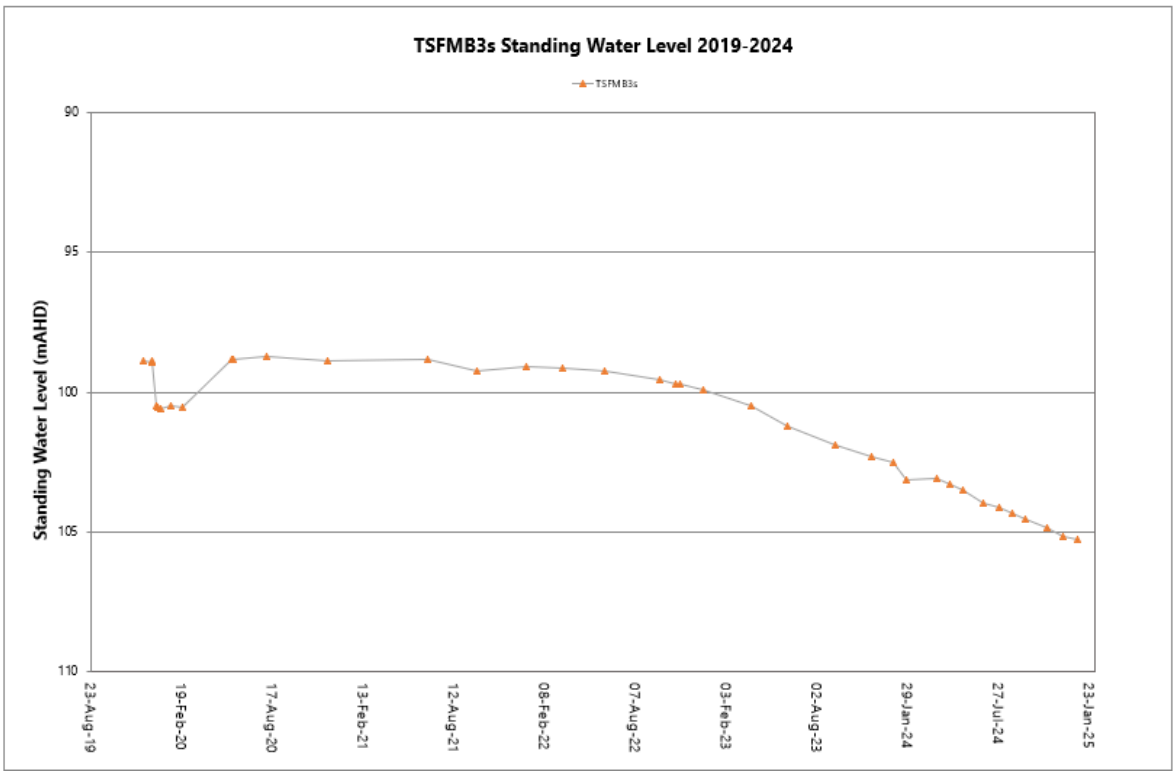
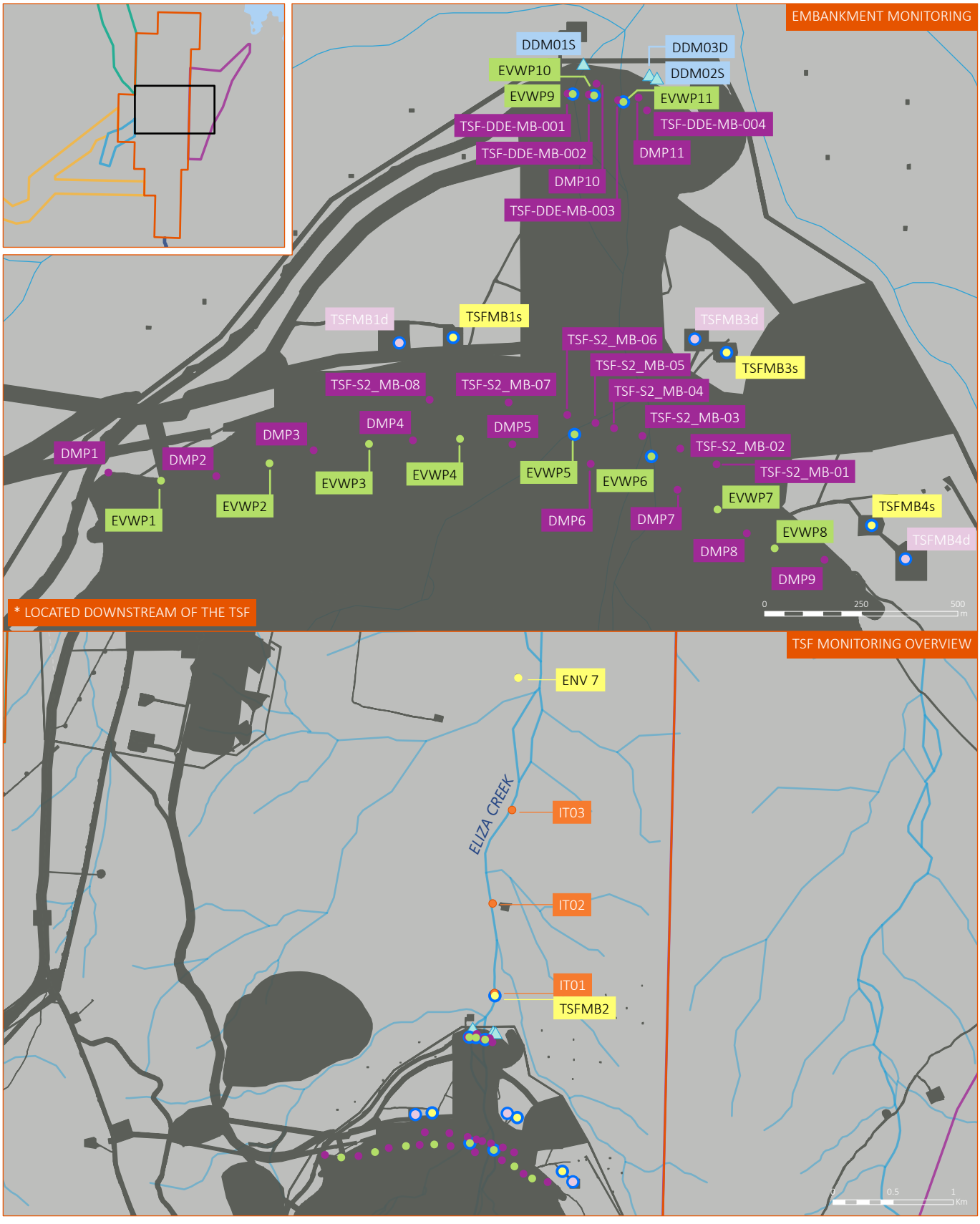



**Figure 3: TSFMB3s Standing Water Level**

**Table 9: TSFMB3s shallow monitoring well groundwater quality data**

| Parameter | ANZECC / ARMCANZ (2000) Freshwater Guideline | Baseline data for shallow alluvial and weathered Proterozoic (HSU1) | TSFMB3s |
|---|---|---|---|
| No. of samples | | | 11 |
| pH | 6.5 – 9 | 7.25 – 7.9 | 7.11 – 7.73 |
| EC | 100 – 5,000 | - | 17,800 – 21,300 |
| Suspended Solids | *no threshold* | - | 6 – 170 |
| Aluminium | - | 0.02 – 3.33 | 0.02 – 6.94 |
| Arsenic | 0.024 | - | < 0.001 – 0.003 |
| Barium | - | 0.043 – 0.067 | 0.016 – 0.079 |
| Cobalt | 0.0028 | 0.001 – 0.003 | 0.026 – 0.042 |
| Copper | 0.013 | 0.005 – 0.016 | 0.002 – 0.022 |
| Iron | 0.3 | 0.05 – 2.22 | 0.08 – 6.53 |
| Lead | 0.0034 | 0.001 – 0.004 | < 0.001 – 0.003 |
| Manganese | 1.9 | 0.073 – 0.091 | 0.002 – 0.09 |
| Selenium | 0.011 | 0.01 – 0.04 | 0.02 – 0.03 |
| Strontium | - | 1.15 – 1.7 | 6.97 – 8.9 |
| Uranium | 0.0005 | 0.014 – 0.026 | 0.028 – 0.039 |
| Zinc | 0.008 | 0.046 – 0.69 | 0.022 – 0.556 |




KEY

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- Western Infrastructure Corridor MPL 152
- Eastern Radial Wellfield MPL 153
- Southern Access Road and Radial Wellfield MPL 154
- Northern Wellfield MPL 156
- Project Layout
- Track
- Vibrating Wire Piezometer
- Displacement Monitoring Beacons
- Shallow Monitoring Well
- TSF Inspection Transects 100m
- TSF Tent Hill Aquifer Monitoring Wells
- Surface Water Sampling Locations
- Seepage Monitoring and Dewatering Wells

**Figure 4: Tailings Storage Facility monitoring locations (PEPR Figure 9.6)**

Surface water quality

The OMC below relates to surface water monitoring in Eliza Creek downstream of the TSF to monitor the potential for shallow lateral seepage.

| ID | Outcome Measurement Criteria | Result |
|---|---|---|
| Outcome Measurement Criteria – TSF3 | Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) within Eliza Creek (SW05 – SW09) within seven days of a rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (pH, EC and metals) whichever is greater. | • SW05 exceeds EC, barium, copper, strontium & zinc.<br>• SW06 exceeds pH, aluminium, barium, copper, iron, lead & zinc.<br>• SW07 exceeds aluminium, iron & zinc. |

Outcome Measurement Criteria TSF3 states that opportunistic surface water sampling is required at Eliza Creek monitoring locations (SW05 – SW09) (Figure 2). As discussed in previous Groundwater and Surface Water Monitoring Reports, only sites SW05, SW06 and SW07 are reported under OMC TSF3 (Table 9) as SW08 and SW09 are within Salt Creek, not Eliza Creek.

Throughout the monitoring period surface water sampling was possible in South Eliza Creek due to >20mm rainfall events resulting in streamflow (Figure 1). Analytical results are available for SW05, SW06 & SW07 (Table 10). All three sites were below both ANZECC Freshwater and Baseline Data for SS, As, Co, and Se. Analytical results for uranium at these sites are at the limit of reporting (LOR) therefore negligible. BHP Carrapateena is establishing site-specific guideline values (SSGVs) to replace leading indicator baseline ranges at TSF monitoring wells, groundwater, surface water and sediment. This review will support a future PEPR update.

SW05 marginally exceeded the freshwater guidelines (2000) for EC at 6320 µS/cm. The exceedance is likely related to seepage and migration of supernatant into Eliza Creek when the Decant Dam operated outside the lined portion throughout early 2023 following significant rainfall in late 2022. Quarterly drone surveillance inspections continued during 2024 within Eliza Creek (IT-01 to IT-03) to monitor vegetation impacts in the area. Field analysis, pumping and monitoring of water ponding in Eliza Creek continues as required.

SW07 exceeded baseline range for hydrocarbon however hydrocarbon is unlikely to have derived from mine activities due to remote separation from the mine footprint and the mining activity early maturity.

**Table 10: Surface water quality results from Eliza Creek monitoring locations**

| Variable | ANZECC / ARMCANZ (2000) Freshwater Guideline | Baseline Range | SW05 | *SW06 | SW07 |
|---|---|---|---|---|---|
| No. of samples | - | - | 2 | 2 | 2 |
| pH (units) | 6.5 – 9 | - | 6.62 – 8.06 | 6.4 – 8.1 | 6.65 – 8.09 |
| EC (µS/cm) | 100 – 5,000 | 397-491 | 5420 – 6320 | 334 – 412 | 224 – 253 |
| Suspended solids | - | 26 - 164 | <5 – 18 | <5 – 24 | 21 - 22 |
| Hydrocarbons (>C10 -C40 fraction) (µg/L) | 0 | Not tested | <100 | <100 | 180 |
| Aluminium | - | 0.72 – 1.67 | 0.31 | 11.8 | 4.33 |
| Arsenic | 0.024 | 0.002-0.004 | 0.002 | 0.003 | 0.002 |
| Barium | - | 0.095 – 0.11 | 0.327 | 0.123 | 0.071 |
| Cobalt | 0.0028 | 0.0005 | <0.001 | 0.002 | 0.001 |
| Copper | 0.013 | 0.006-0.009 | 0.022 | 0.014 | 0.006 |
| Iron | 0.3 | 0.5 – 0.86 | 0.22 | 7.32 | 2.46 |
| Lead | 0.0034 | 0.0005-0.002 | <0.001 | 0.003 | 0.002 |
| Manganese | 1.9 | 0.018-0.072 | 0.01 | 0.076 | 0.051 |
| Selenium | 0.011 | 0.005 | <0.01 | <0.01 | <0.01 |
| Strontium | - | 0.12 - 0.157 | 1.87 | 0.151 | 0.039 |
| Uranium | 0.0005 | 0.12-0.157 | <0.001 | <0.001 | <0.001 |
| Zinc | 0.008 | 0.015 - 0.029 | 0.034 | 0.043 | 0.026 |

*Data includes analytical samples from samples sourced at nearby surface water monitoring location EC-2.

### 2.2.2 Sediment quality

The OMC below relates to sediment quality monitoring in Eliza Creek downstream of the TSF to monitor the potential for shallow lateral seepage.

| ID | Outcome Measurement Criteria | Result |
|---|---|---|
| Outcome Measurement Criteria – TSF4 | Annual sediment sampling and laboratory analysis for metals shall be undertaken within Eliza Creek (IT01 - IT03) and demonstrates sediments meet ANZECC/ARMCANZ (2000) Sediment Quality Guidelines or baseline ranges, whichever is greater. | All sites within sediment quality guidelines or baseline ranges except Uranium at IT02. |

Sediment sampling was undertaken at sites IT01, IT02 & IT03 within Eliza Creek in March 2024 (Figure 2) with one sample collected and analysed for each site. Sediment quality results for contaminants of interest are presented in Table 11. Metals concentrations for all sites are within the relevant ANZECC trigger values except for uranium at IT02.

**Table 11: Baseline sediment quality results for Eliza Creek**

| Total Metals (mg/kg) | Baseline range (mg/kg dry weight)[1] | ANZECC / ARMCANZ (2000) Sediment Quality Guidelines | | CSIRO revision of ANZECC / ARMCANZ (2000) Guideline[4] | | 2024 monitoring results (mg/kg) | | |
|---|---|---|---|---|---|---|---|---|
| | | ISQG-Low (Trigger Value)[2] | ISQG-High[3] | Guideline Value | SQG-High | IT01 | IT02 | IT03 |
| Cadmium | <0.1 | 1.5 | 10 | 1.5 | 10 | <0.1 | <0.1 | <0.1 |
| Chromium | 8.6 – 10.7 | 80 | 370 | 80 | 370 | 9.6 | 32.6 | 13.1 |
| Copper | 5.8 – 7.6 | 65 | 270 | 65 | 570 | 6.8 | 25.5 | 8.1 |
| Lead | 4.6 - 8 | 50 | 220 | 50 | 220 | 4 | 11.7 | 5.7 |
| Silver | <0.1 – 0.1 | 1 | 3.7 | 1.0 | 4.0 | - | - | - |
| Zinc | 14 – 20.2 | 200 | 410 | 200 | 410 | 16 | 53.9 | 22.9 |
| Uranium | 0.1 – 0.2 | - | - | - | - | 0.1 | 0.5 | 0.2 |

[1] Baseline ranges taken from 2019 results for IT01 – IT03

[2] ANZECC/ARMCANZ (2000); interim sediment quality guideline (ISQG) – lowest effect value

[3] ANZECC/ARMCANZ (2000); ISQG – median effect value

[4] Simpson SL et al (2013); revision of ANZECC/ARMCANZ Sediment Quality Guidelines

### 2.2.3 Acid and metalliferous drainage

The OMC below relates to surface water monitoring in Eliza Creek downstream of the TSF (SW06, SW07 and SW09) to monitor the potential for acid and metalliferous drainage.

| ID | Outcome Measurement Criteria | Result |
|---|---|---|
| Outcome Measurement Criteria – AMD1 | Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) within Eliza Creek (SW05, SW06 and SW07) at least once a year within seven days of rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (pH, EC and metals), whichever is greater. | • SW05 exceeds EC, Ba, Cu, Sr & Zn.<br>• SW06 exceeds pH, Al, Ba, Cu, Fe, Pb & Zn.<br>• SW07 exceeds Al, Fe & Zn and recorded traces of hydrocarbons. |

Opportunistic surface water sampling was undertaken in Eliza Creek during 2024 with all monitoring points exceeding baseline for zinc. Baseline ranges for iron were also exceeded at SW06 and SW07 whereas copper was above the freshwater guidelines (2000) for SW05 and SW06. Electrical conductivity was slightly above the freshwater guideline at SW05 only. Water quality results from the three Eliza Creek locations can be found in Table 10.

The kinetic test work program continued during 2024 to verify the NAF classification of tailings. Throughout the monitoring period there was no evidence of a PAF reaction within tailings water, both supernatant and decant, with pH remaining constant and near neutral. As a part of the Carrapateena expansion project involving an increase to the TSF capacity, a geochemical study was conducted on potential TSF liquor. The investigation involved various kinetic leach column tests over a period of six months and demonstrated that the tailings are non-acid forming (NAF) and are unlikely to generate acid rock drainage (ARD) on exposure to air (EGi 2024).

# 3 Groundwater

## 3.1 Tailings storage facility

### 3.1.1 Groundwater quality

The OMC below relates to groundwater quality monitoring of Tent Hill Aquifer (THA) wells downstream of the TSF (TSFMB1d, TSFMB3d & TSFMB4d).

| ID | Outcome Measurement Criteria | Result |
|---|---|---|
| Outcome Measurement Criteria – GW1 | Quarterly sampling of Tent Hill Aquifer Wells downstream of the Tailings Storage Facility (TSFMB1d, TSFMB3d and TSFMB4d) demonstrates water quality are within the site groundwater baseline composition ranges. | • TDS for TSFMB1d remains above baseline with a maximum of 86,400 mg/L recorded.<br>• Exceedances of baseline aluminium, iron and strontium occurred at all wells. |

Groundwater monitoring wells TSFMB1d, TSFMB3d & TSFMB4d were installed in May 2019 for the purpose of monitoring the potential for vertical & lateral seepage of tailings solutes to the underlying aquifer. The wells screen the Tent Hill Aquifer at depths ranging from -02.3 to 39.9 mAHD. Baseline groundwater quality data was recorded following well installation in September 2019 and throughout 2020.

During the reporting period total dissolved solids within TSFMB1d reached 86,400 mg/L which correlated with hydraulic loading and leakage from the TSF. Aluminium, strontium and iron exceeded at all wells whilst barium was above baseline at TSFMB3d. Uranium was above baseline at TSFMB1d.

Water quality results for contaminants of interest from the baseline groundwater composition (PEPR Table 9.22) is presented in Table 12 for sampling completed during the reporting period.

**Table 12: TSF monitoring wells groundwater quality data**

| Parameter* (mg/L) | Tent Hill Aquifer Baseline** | TSFMB1d, TSFMB3d, TSFMB4d Baseline*** | TSFMB1d Monitoring Bore | TSFMB3d Monitoring Bore | TSFMB4d Monitoring Bore |
|---|---|---|---|---|---|
| No. Of Samples | - | - | 11 | 11 | 11 |
| pH | 6.31 – 8.05 | 7.44 – 7.88 | 6.51 - 7.29 | 6.83 - 7.45 | 6.92 - 7.56 |
| TDS | 12900 – 33500 | 22000 – 24100 | 49400 - 86400 | 21200 - 31200 | 18900 - 29400 |
| Aluminium | 0.01 – 0.02 | <0.01 | <0.05 - 0.06 | <0.02 - 0.08 | <0.02 - 0.1 |
| Barium | 0.025 – 0.161 | 0.027 – 0.030 | 0.053 - 0.077 | 0.03 - 0.036 | 0.024 - 0.03 |
| Cobalt | 0.001 – 0.0029 | <0.001 – 0.001 | 0.018 - 0.028 | <0.002 - <0.005 | <0.002 - <0.005 |
| Copper | 0.001 – 0.013 | <0.001 | <0.005 - 0.009 | <0.002 - <0.005 | <0.002 - <0.005 |
| Iron | 0.05 – 5.58 | <0.05 | 1.48 - 11.8 | 7.5 - 9.83 | 5.34 - 10.5 |
| Lead | 0.0005 – 0.004 | <0.001 | <0.005 | <0.002 - <0.005 | <0.002 - <0.005 |
| Manganese | 0.192 – 1.03 | 0.629 – 0.690 | 2.45 - 3.19 | 0.834 - 0.938 | 0.873 - 0.976 |
| Selenium | 0.01 – 0.02 | <0.01 | <0.05 | <0.002 - <0.005 | <0.02 - <0.05 |
| Strontium | 15.6 – 25.7 | 20.5 – 20.9 | 46.5 - 71.4 | 22.2 - 27.7 | 19.9 - 26.3 |
| Uranium | 0.005 – 0.016 | <0.001 – 0.006 | 0.03 - 0.039 | <0.002 - <0.005 | <0.002 - <0.005 |
| Zinc | 0.005 – 0.636 | <0.005 | 0.027 - 0.055 | <0.010 - 0.012 | <0.010 - 0.012 |

* Sub-set of parameters (predominantly metals) from PEPR Table 9.22.

** As presented in PEPR Table 9.22 – Baseline concentrations based on two sampling rounds from the THA beneath the Mineral Lease (19 wells)

*** Baseline concentrations based on one round of sampling from TSFMB1d, TSFMB3d, TSFMB4d (formerly referred to as THA1 to THA3)

### 3.1.2 Standing water levels

The OMC below relates to groundwater levels monitoring of THA wells downstream of the TSF (TSFMB 1d, TSFMB3d and TSFMB4d).

| ID | Outcome Measurement Criteria | Result |
|---|---|---|
| Outcome Measurement Criteria – GW2 | Quarterly monitoring of Tent Hill Aquifer monitoring wells downstream of the Tailings Storage Facility (TSFMB1d, TSFMB3d and TSFMB4d) demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed maximum predicted drawdown at each well. | • All three wells have a shallower SWL (mAHD) than the previous reporting period, suggesting hydraulic loading of the THA aquifer in the immediate vicinity of the TSF.<br>• SWLs do not align with modelled predictions. |

Figure 5 to Figure 7 presents the standing water level data in comparison to the predicted head for THA wells TSFMB1d, TSFMB3d and TSFMB4d.

The SWL recorded at all three bores is higher than the groundwater modelled prediction and have continued to increase in elevation (mAHD) over the reporting period. These observations imply hydraulic loading of the THA aquifer in the immediate vicinity of the TSF.

Standing water levels are shallower in all three wells. TSFMB1d gained 2.733m to 85.493 mAHD, TSFMB3d increased 2.565 m to 80.595 mAHD and TSFMB4d increased 2.567 m to 85.147 mAHD (Figure 5, Figure 6 and Figure 7).

The models used for groundwater have been updated with observed seepage rates. The outcomes of the updated modelling demonstrate that the relevant environmental outcomes can be achieved and provide updated predictions for Leading Indicators and OMC in terms of observed groundwater response. This will be presented in the future PEPR.

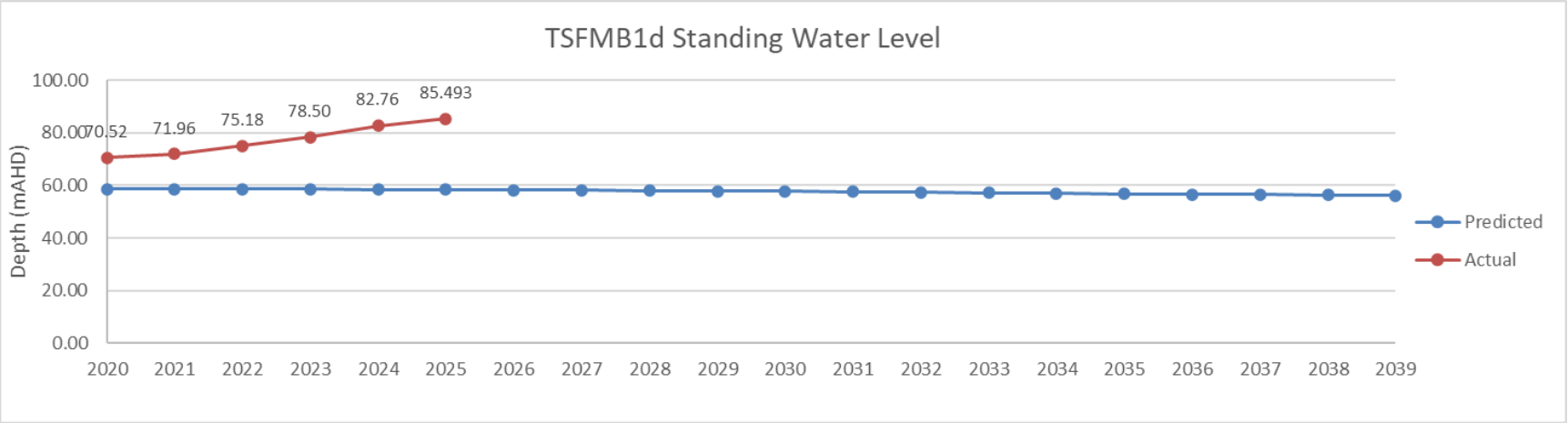


**Figure 5: Predicted vs actual standing water levels for TSFMB1d**

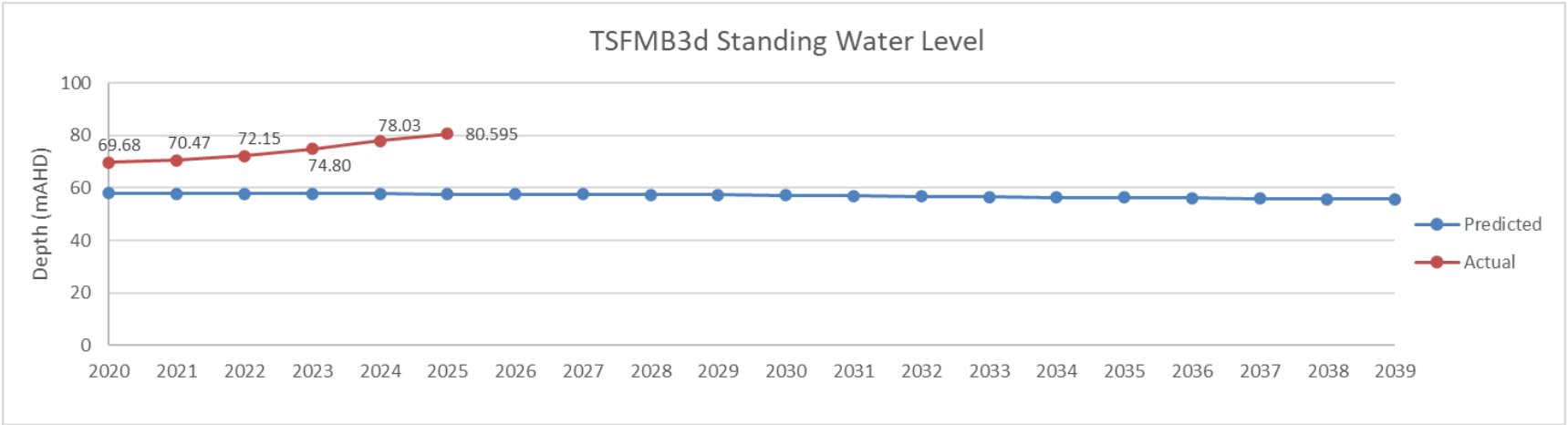


**Figure 6: Predicted vs actual standing water levels for TSFMB3d**

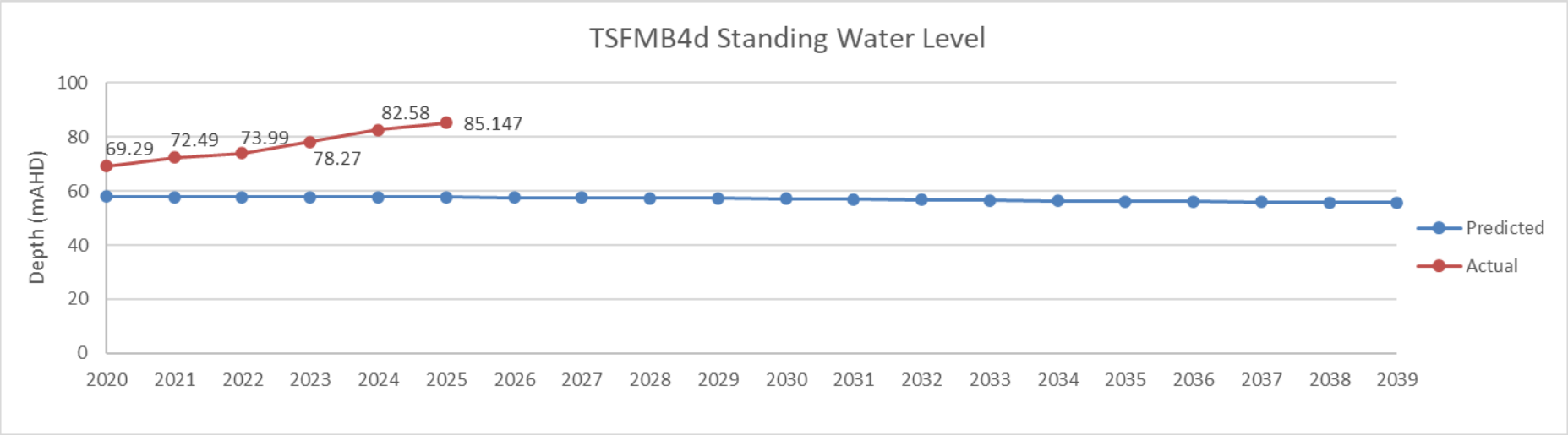


**Figure 7: Predicted vs actual standing water levels for TSFMB4d**

## 3.2 Drawdown

### 3.2.1 Compliance groundwater levels

The OMC below relates to regional groundwater level monitoring at compliance wells (Figure 14) to monitor groundwater drawdown.

| ID | Outcome Measurement Criteria | Result |
|---|---|---|
| Outcome Measurement Criteria – GW3 | Quarterly monitoring of groundwater compliance monitoring wells in the groundwater model (MS2, MS3, MD3, ENV S2 and ENV W3) demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well.<br><br>Quarterly monitoring of groundwater compliance monitoring wells not simulated in the groundwater model (ENV N4, ENV N8) demonstrate no evidence of a trend in standing water levels over three consecutive quarters. | • Groundwater levels at MS2 are now trending in accordance with the predicted hydrographs (Figure 10).<br>• Stable groundwater levels observed in ENV N4 and ENV N8. |

The seven groundwater compliance wells consist of five wells simulated in groundwater modelling (ENV S2, ENV W3, MS2, MS3, MD3) and two wells not simulated in modelling (ENV N4 and ENV N8).

Outcome Measurement Criteria GW3 was compliant in 2024. Compliance with this OMC is assessed through comparison of groundwater model predicted standing water levels against actual during the reporting period. The predicted SWL is based on the predicted head (mAHD) that was simulated in the original Groundwater modelling and assessment of effects report (CDM Smith, 2018) which is also presented in Table 9.20 within MPEPR2024/009 (BHP, 2024). The converted SWL, which is only available for MS2 and MS3, is based on predicted head (mAHD) that was corrected to reflect actual site conditions and terrain at Carrapateena. This survey was undertaken after the original groundwater was developed and the corrected values have not yet been updated in the current PEPR. Predicted standing water levels with accurate survey data will be incorporated in the latest groundwater model and updated in the future PEPR

Groundwater levels at ENV S2 and ENV W3 continue to demonstrate negligible drawdown (Figure 8 and Figure 9) and groundwater levels remain similar to that reported at well construction.

Groundwater levels at MS2 are now trending in accordance with drawdown as per the predicted hydrograph (Figure 10). Total drawdown is 2.58 mAHD since well construction.

The groundwater level at MS3 is demonstrating drawdown less than predicted. Stable groundwater levels were recorded throughout 2024 (Figure 11). Groundwater level at MD3 is demonstrating a similar rate of drawdown against modelled predictions (Figure 12).

An updated groundwater model will inform future PEPRs.

Predicted groundwater levels for ENV N4 and ENV N8 are un-simulated in the model, but both wells are reported as stable (Figure 13) and showed no evidence of a declining trends due to mining activities.

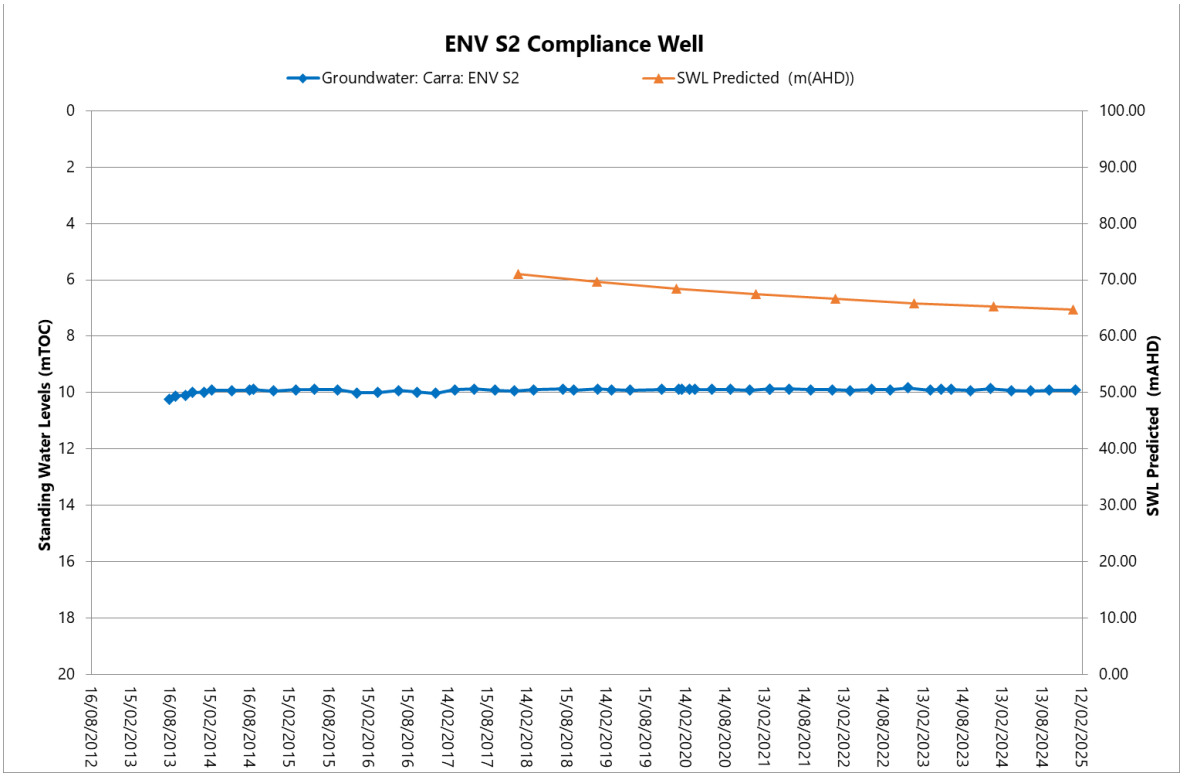


**Figure 8: Standing water level for Compliance Well ENV S2**

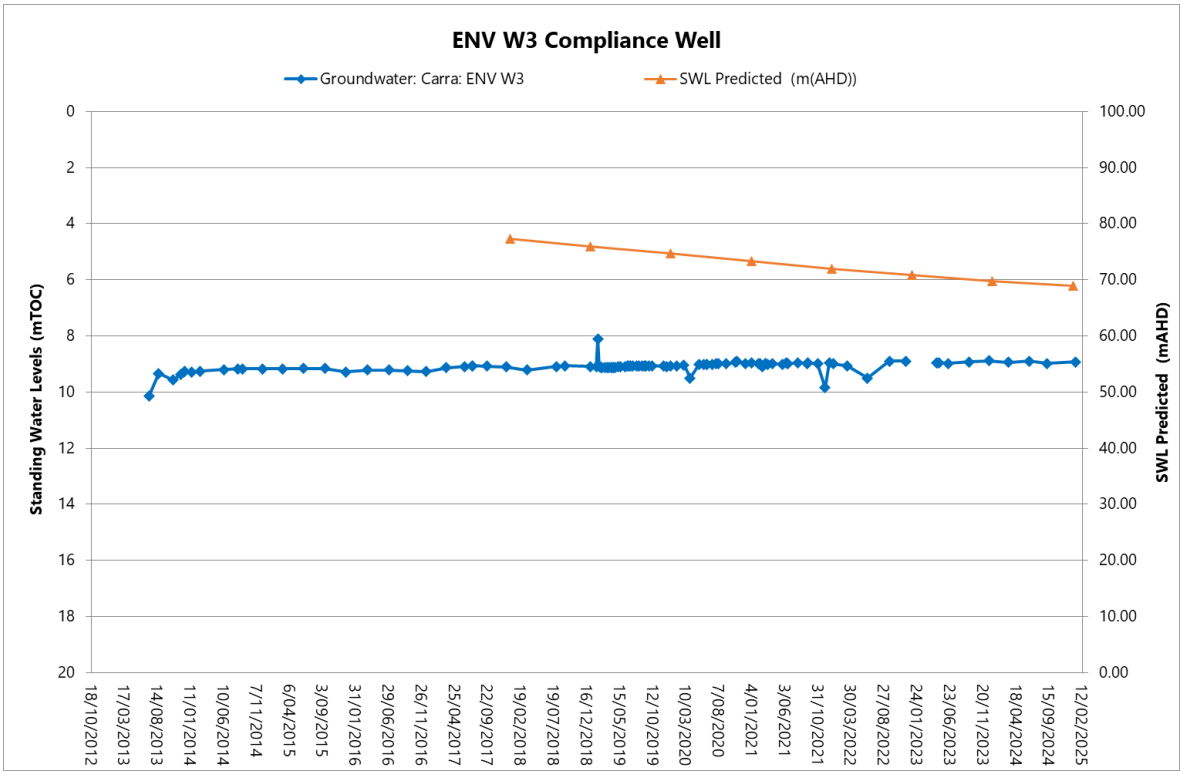


**Figure 9: Standing water level for Compliance Well ENV W3**

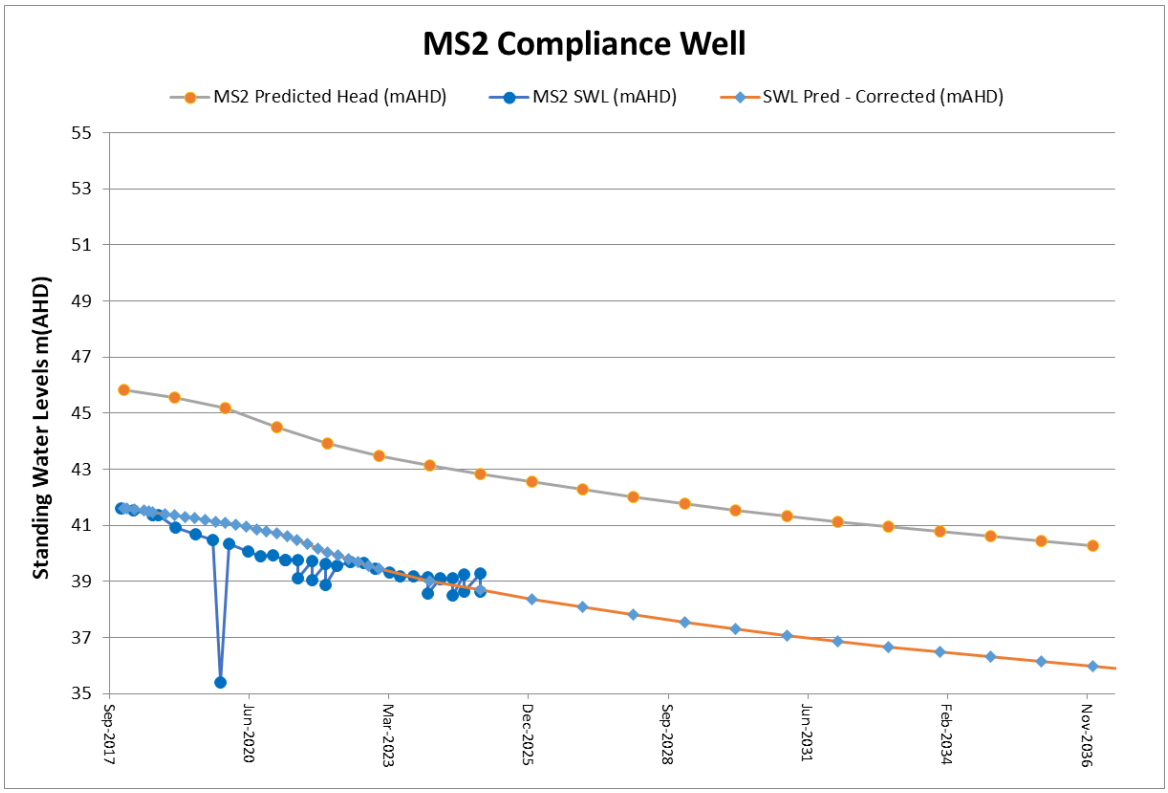


**Figure 10: Standing water level for Compliance Well MS2**

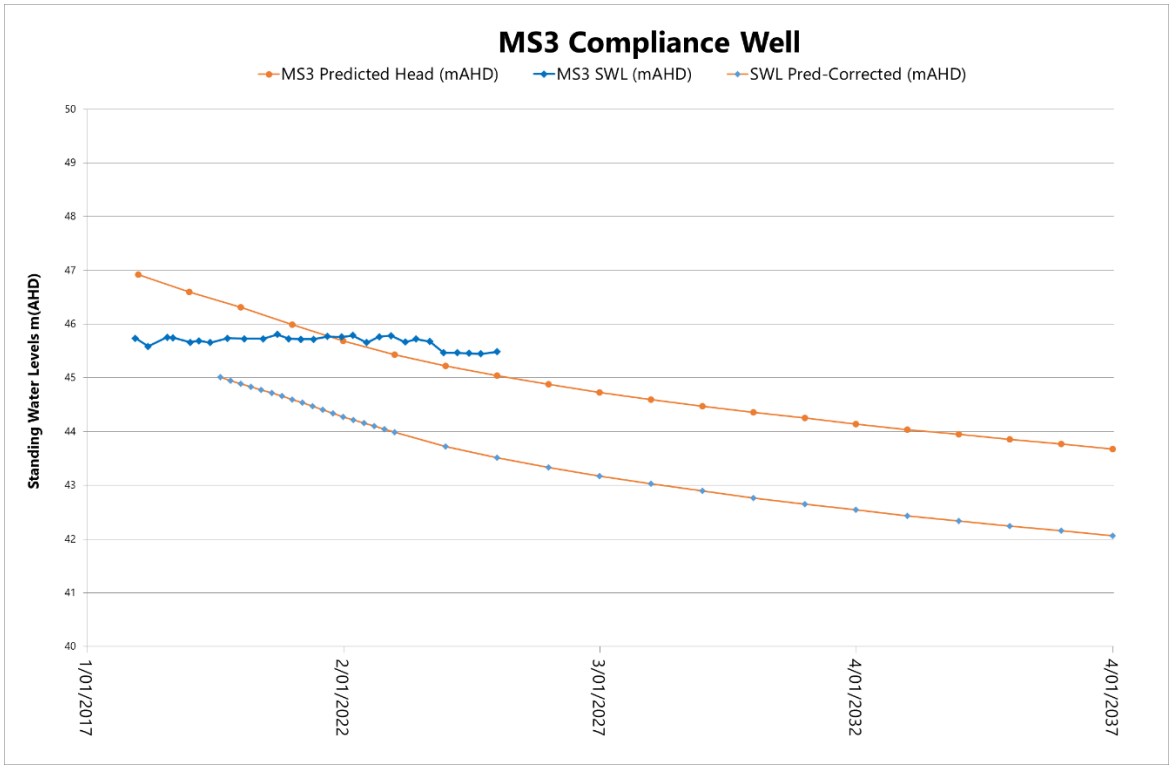


**Figure 11: Standing water level for Compliance Well MS3**

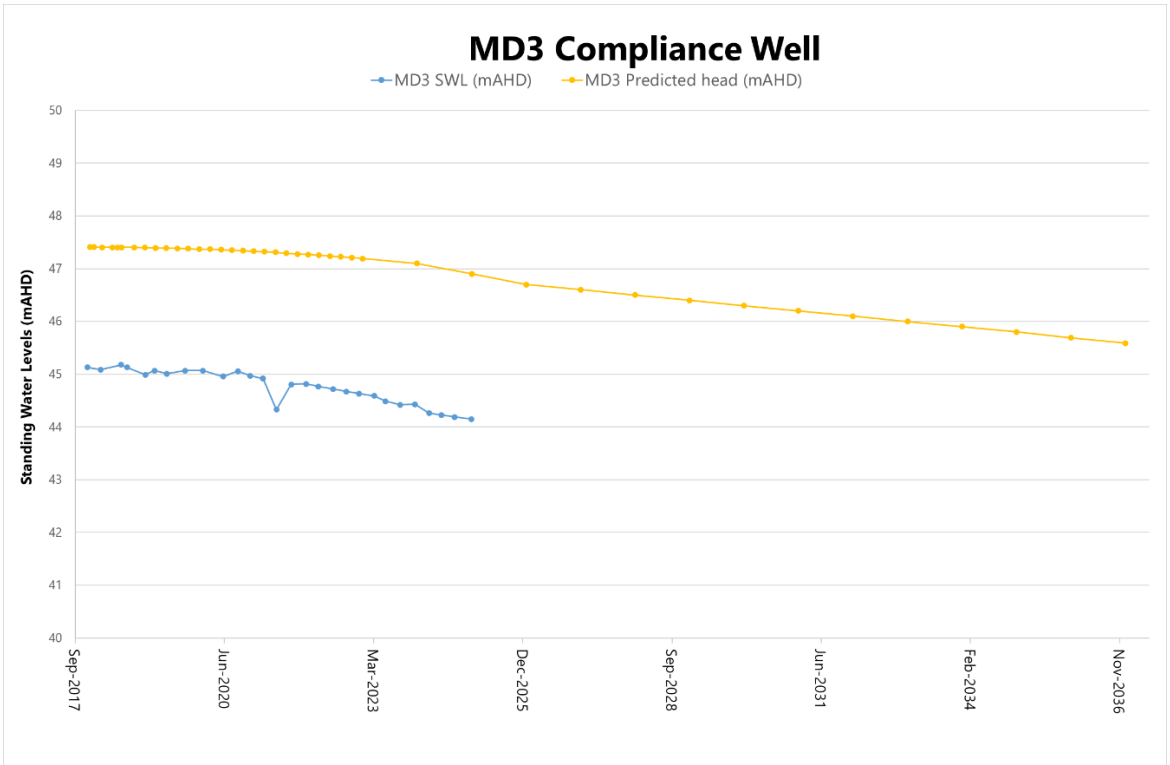


Figure 12: Standing water levels for Compliance Well MD3

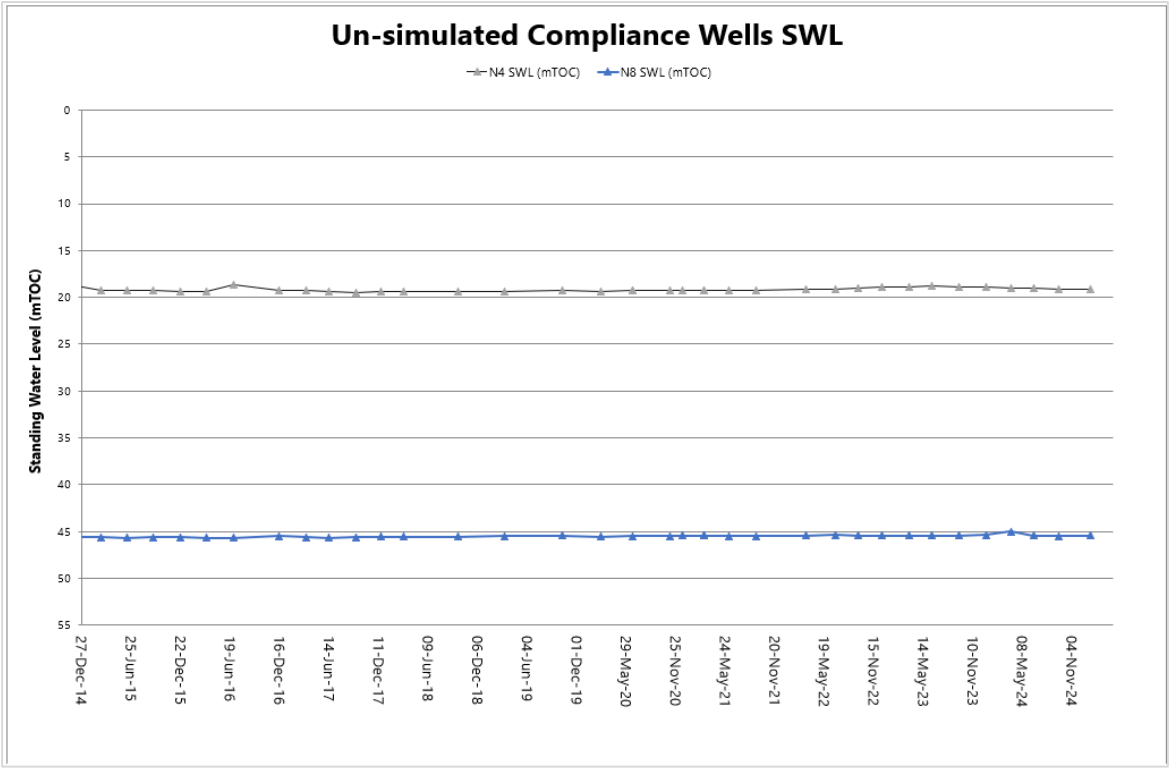


Figure 13: Standing water levels for Compliance Wells ENV N4 & ENV N8

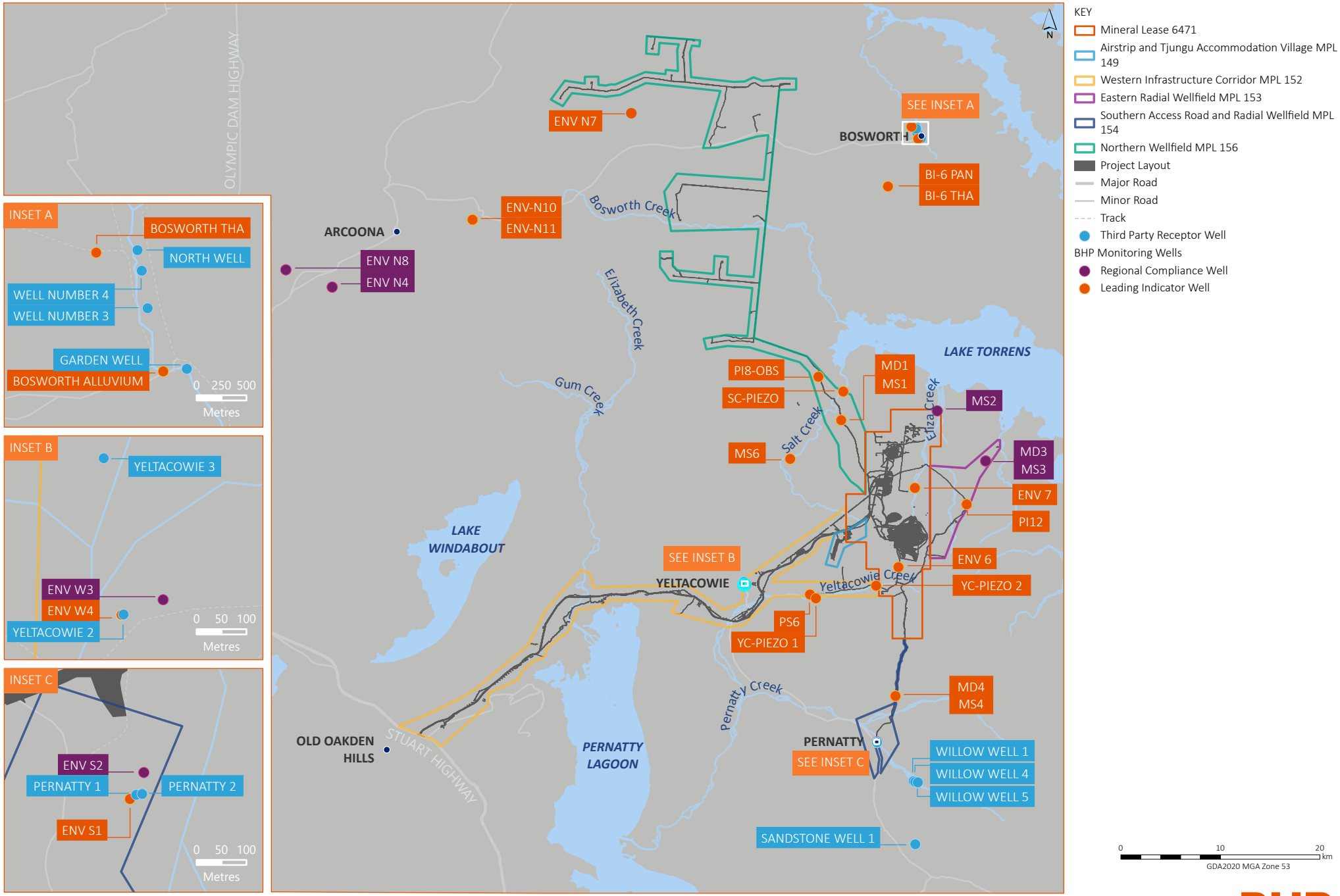


**Figure 14: Groundwater compliance monitoring wells (MS2, MS3, MD3, ENV S2 and ENV W3)**

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### 3.2.2 Leading Indicator groundwater levels

The Leading Indicator below relate to regional groundwater level monitoring at leading indicator wells to monitor groundwater drawdown.

| ID | Outcome Measurement Criteria | Result |
|---|---|---|
| Leading Indicator – GW5 | Quarterly monitoring of groundwater leading indicator monitoring wells simulated in the groundwater model demonstrates that standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well.<br><br>Quarterly monitoring of groundwater leading indicator monitoring wells not simulated in the groundwater model shows no evidence of a trend in standing water levels over three consecutive quarters. | • PI12 and MS1 both exceed drawdown predictions with SWLs below predicted levels in 2024.<br>• PS6 SWL was below the predicted level in 2024. |

Groundwater leading indicator wells comprise the following: ENV 6, ENV 7, ENV S1, ENV W4, MS4, MD4, PS6, MS6, YC Piezo 1, YC Piezo 2, SC Piezo, PI12, MS1, MD1, PI8-Obs, BI-6 THA, BI-6 PAN, ENV N-10, ENV N-11, Bosworth THA and Bosworth Alluvium. SC-Piezo, YC-Piezo 1 and YC-Piezo 2 were not able to be monitored due to the piezometers being dry, all other leading indicator wells were monitored quarterly throughout 2024 which fulfills the quarterly monitoring requirement of Leading Indictor GW5.

Results are displayed in Figure 15 to Figure 25 and include an actual SWL, predicted SWL and a converted SWL. The predicted SWL is based on the predicted head (mAHD) that was simulated in the original Groundwater modelling and assessment of effects report (CDM Smith, 2018) which is also presented in Table 9.20 within MPEPR2024/009 (BHP, 2024). The converted SWL is based on predicted head (mAHD) that was corrected to reflect actual site conditions and terrain at Carrapateena. This survey was undertaken after the original groundwater was developed and the corrected values have not yet been updated in the current PEPR. Predicted standing water levels with accurate survey data will be incorporated in the latest groundwater model and updated in the future PEPR.

A summary of the results from the monitoring period is included below:

- ENV 6 (Figure 15) monitors the Tent Hill Aquifer to the south of the mine. The well is indicating a gradual drawdown. The trend of drawdown is less than predicted.
- ENV 7 (Figure 16), which intercepts the shallow alluvium aquifer, exhibited a continued drawdown trend. This drawdown trend remains less than predicted.
- MS4 (Figure 17), intercepting the THA, continued to exhibit stable drawdown within the modelled prediction.
- The rate of change for drawdown observed at MD4 (Figure 18) continues misalignment with predicted model. During 2024, recharge continued to occur at MD4, with SWL exceeding the predicted level as of December 2024. It is assumed that drawdown/recharge in MD4 is influenced

by recharge and abstraction boundary conditions of the pumping infrastructure of the Southern Wellfield and is reported slightly deeper than the predicted hydrograph for 2024.

- PS6, MS6 and PI8-Obs showed no major deviation from modelled predictions with water levels closely following those simulated (Figure 19, Figure 20 and Figure 24). SWL for PS6 was marginally below the predicted level in 2024.
- PI12 and MS1 wells indicate a drawdown rate exceeding the modelled predictions. Both wells have current SWL below the predicted levels for 2024 (Figure 21 and Figure 22).
- MD1 (Figure 23) remains stable with a current SWL significantly higher when compared to the predicted level. Drawdown remains stable and continues a downward trend at a reduced rate compared to the modelled drawdown.
- Leading indicator wells BI-6 THA, ENV N-10 and Bosworth THA which un-simulated in the numerical groundwater model (Figure 25) showed no evidence of a declining trends in SWLs due to operations.
- ENV N-11 standing water level indicates a ~6 m decrease since construction and ENV S1 at Pernatty Homestead remained steady during 2024 (Figure 25).
- ENV W4 at Yeltacowie Homestead is a Shallow Alluvial completed well and demonstrates unconfined response to rainfall and pastoral pumping activities. Depth to water is stable (Figure 25).

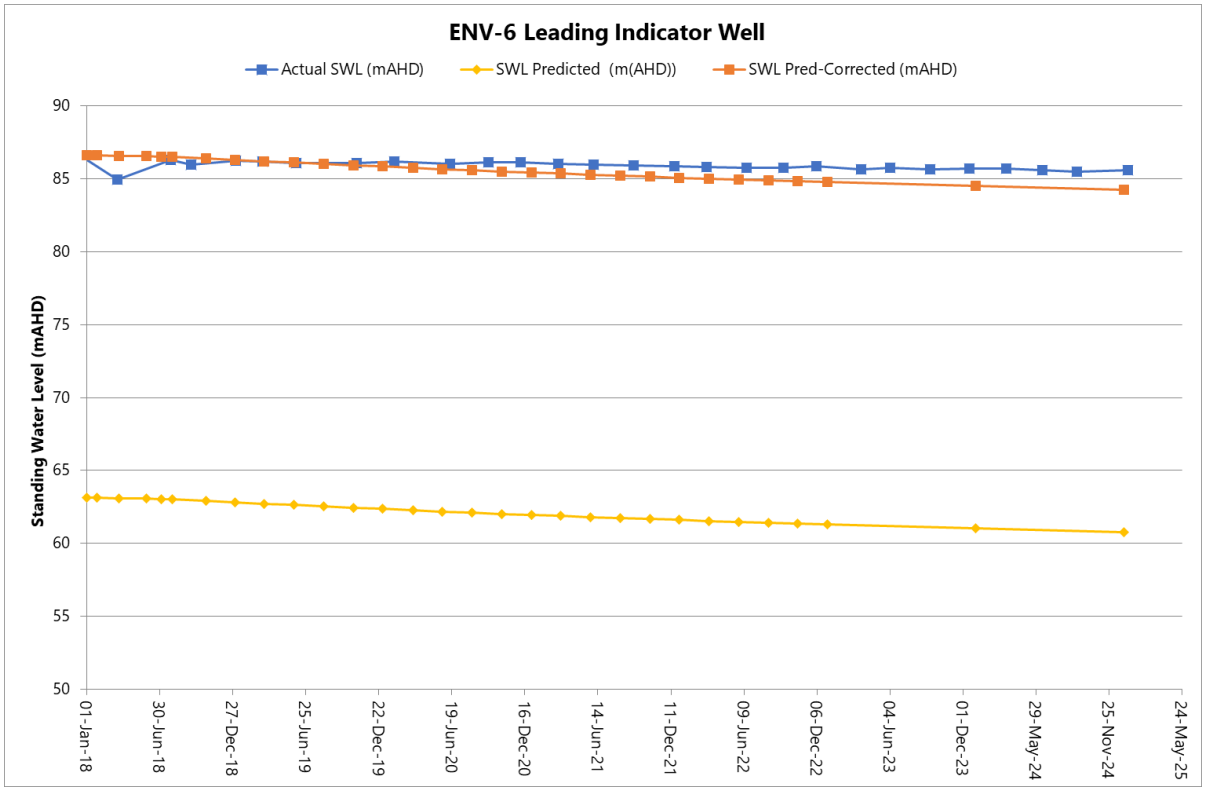


**Figure 15: Standing water level for Leading Indicator Well ENV 6**

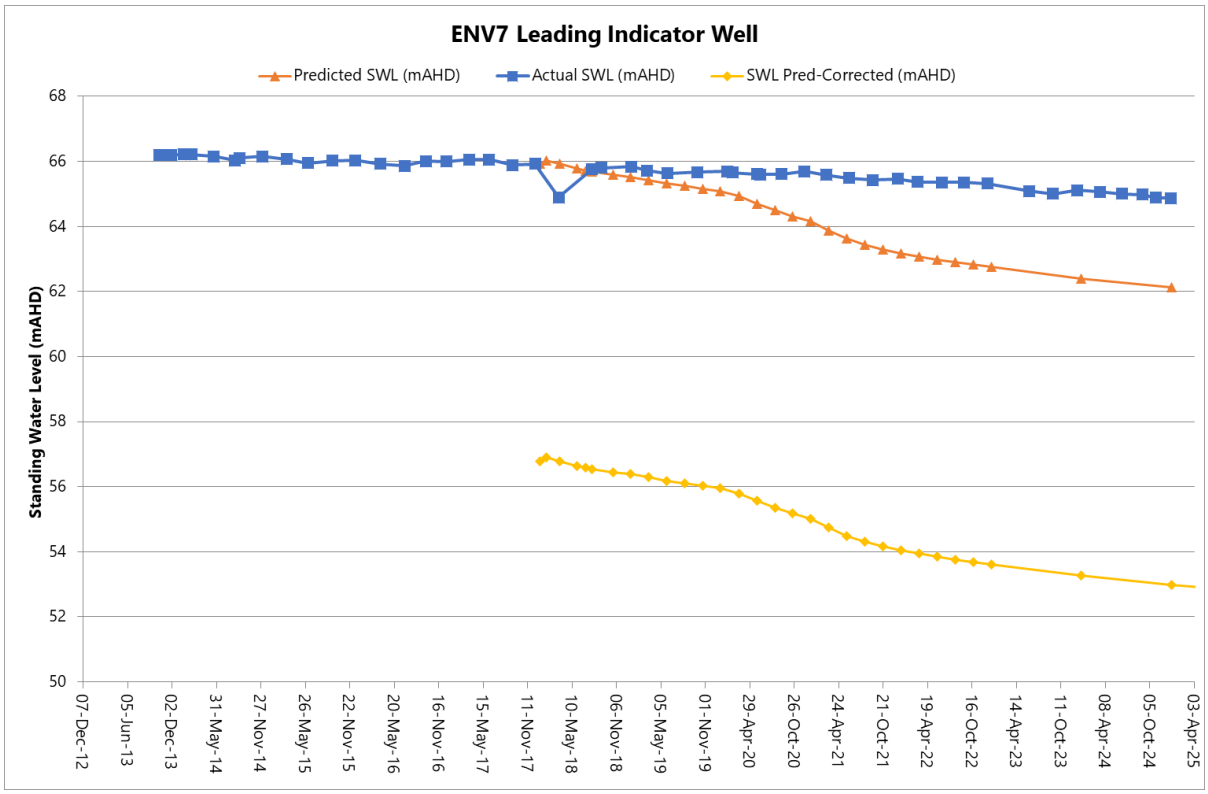


Figure 16: Standing water level for Leading Indicator Well ENV7

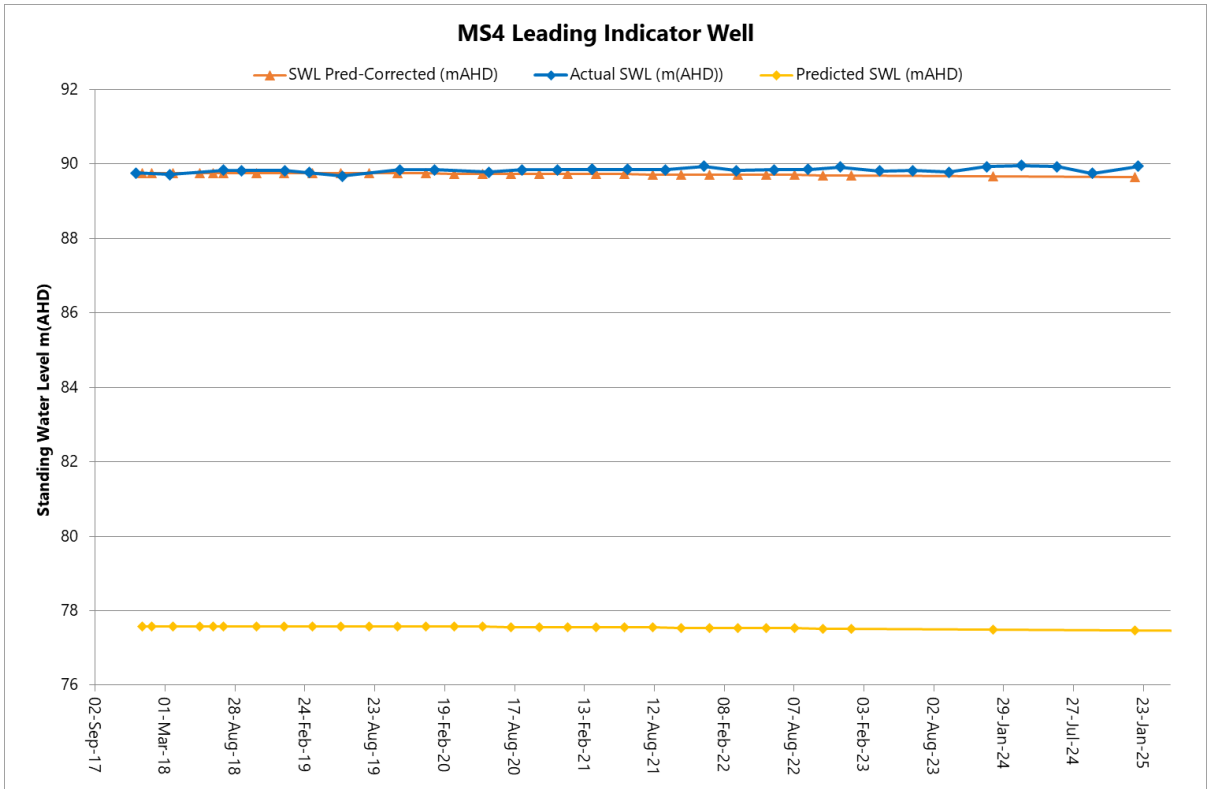


Figure 17: Standing water level for Leading Indicator Well MS4

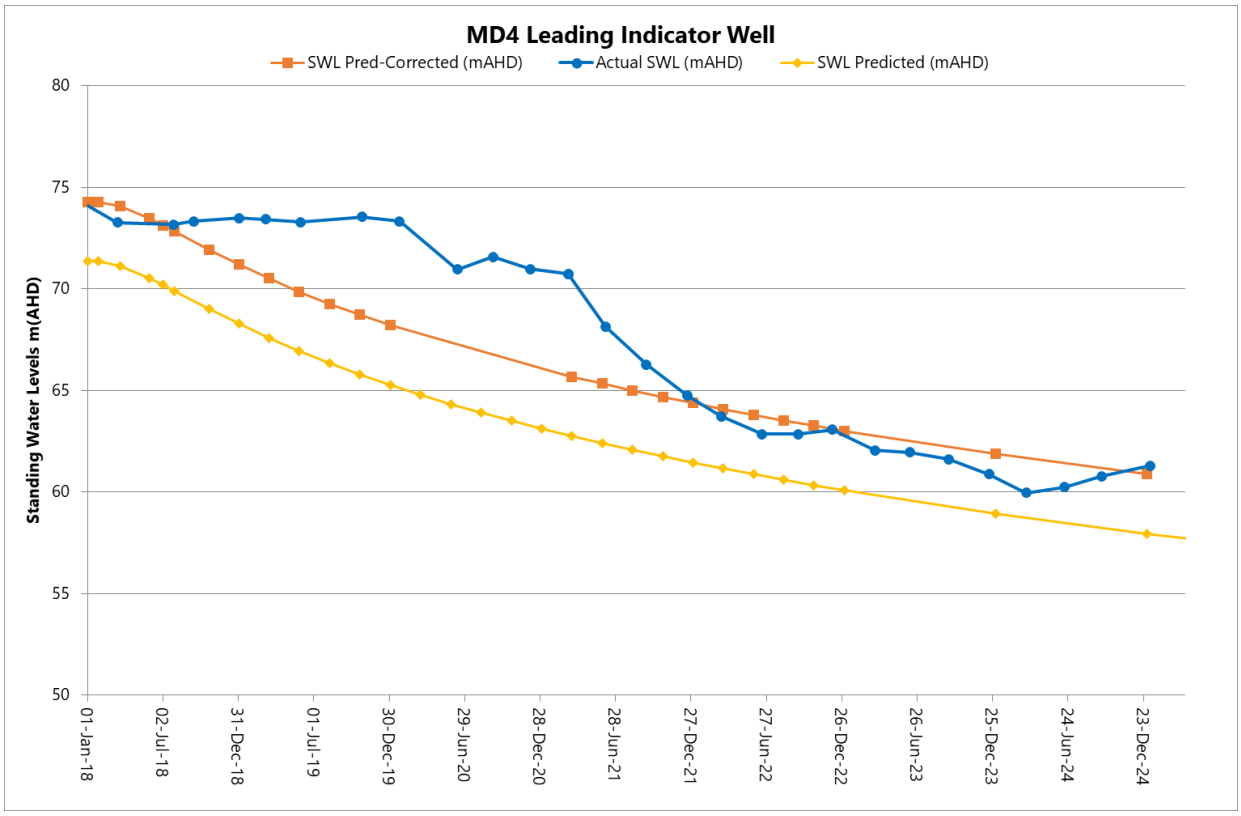


Figure 18: Standing water level for Leading Indicator Well MD4

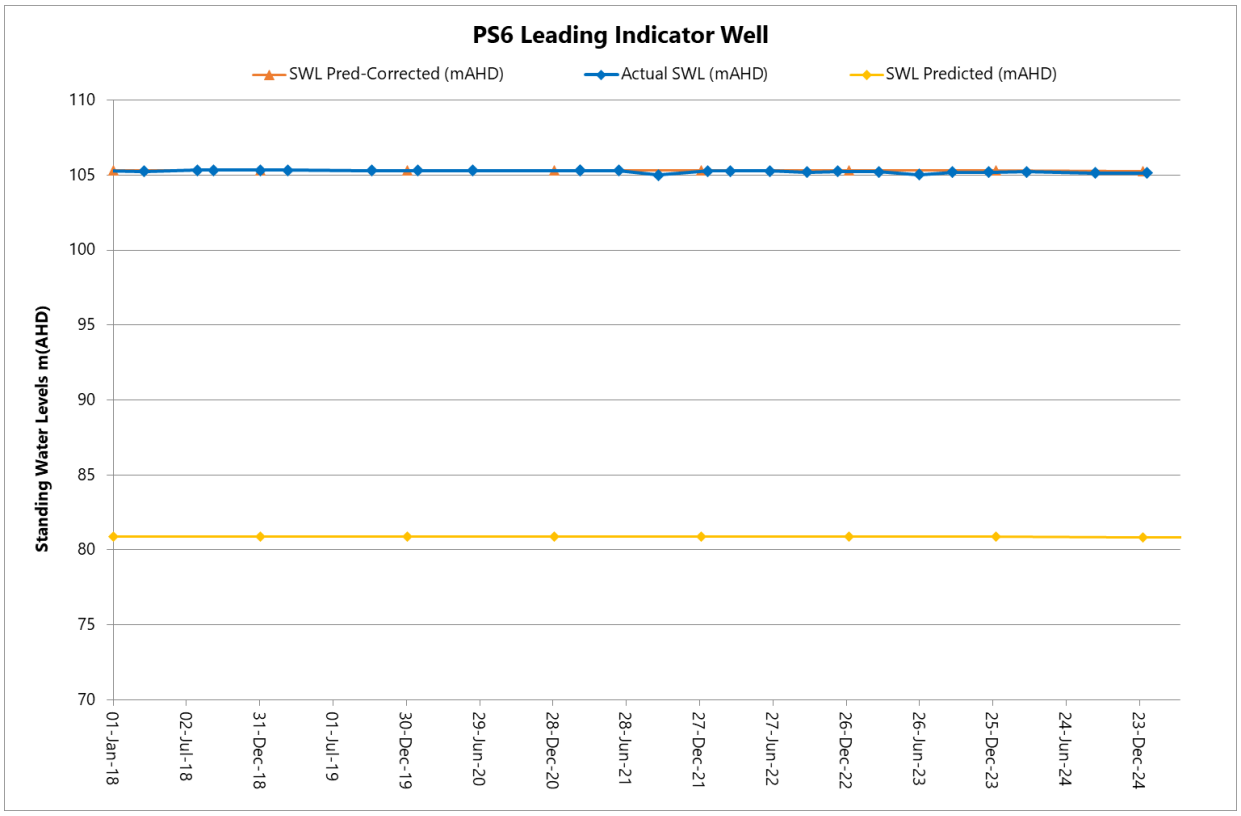


Figure 19: Standing water level for Leading Indicator Well PS6

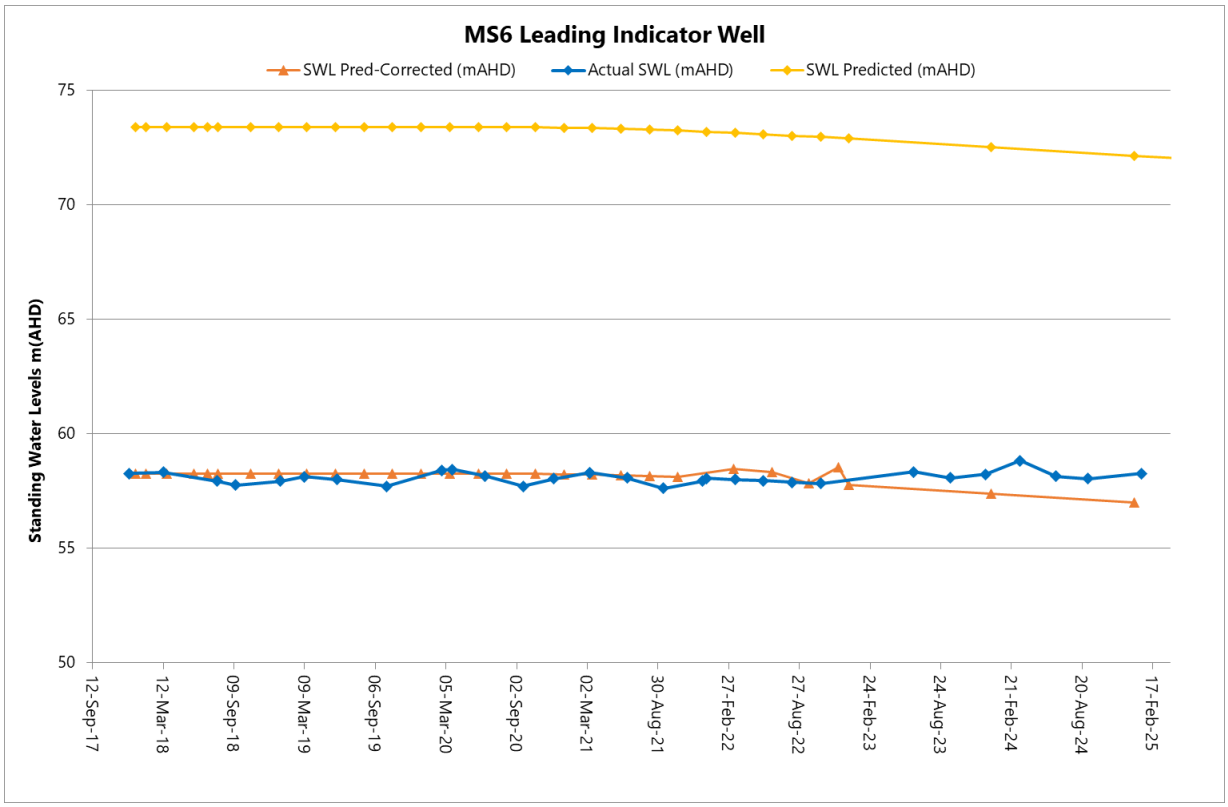


Figure 20: Standing water level for Leading Indicator Well MS6

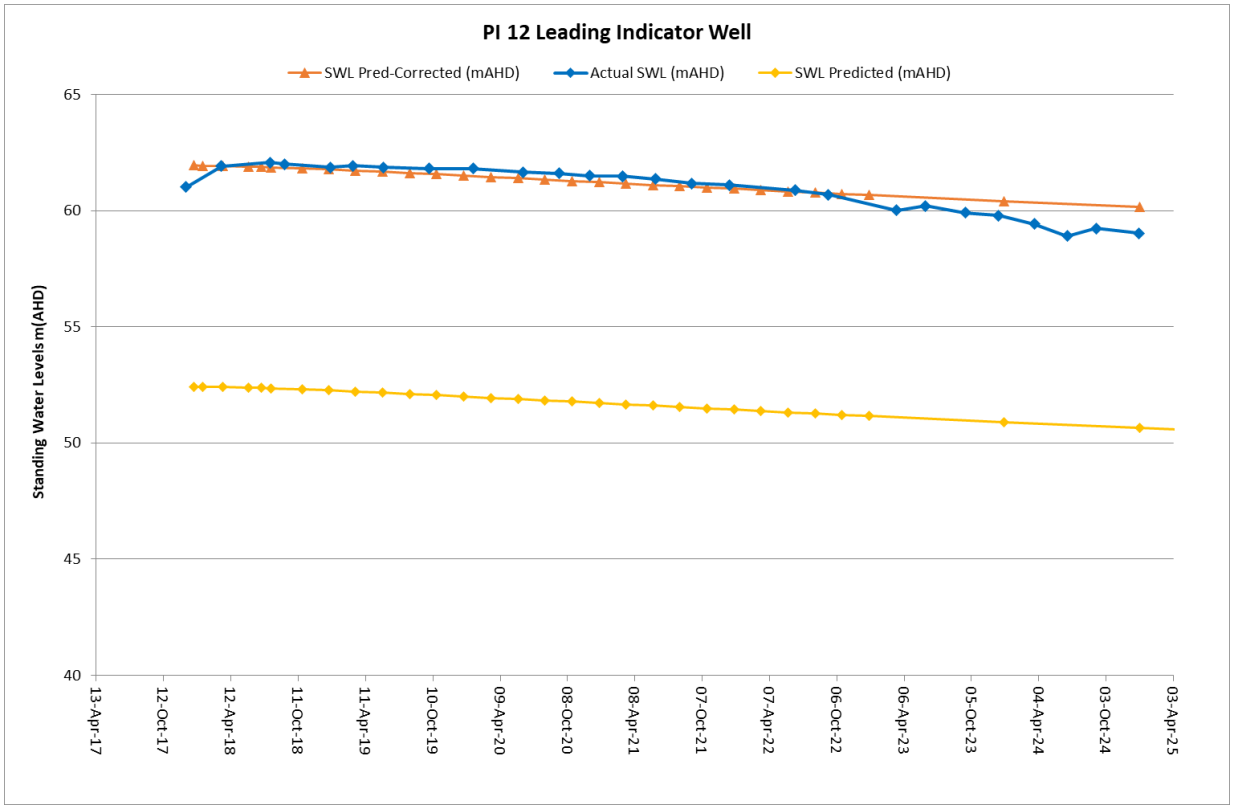


Figure 21: Standing water level for Leading Indicator Well PI12

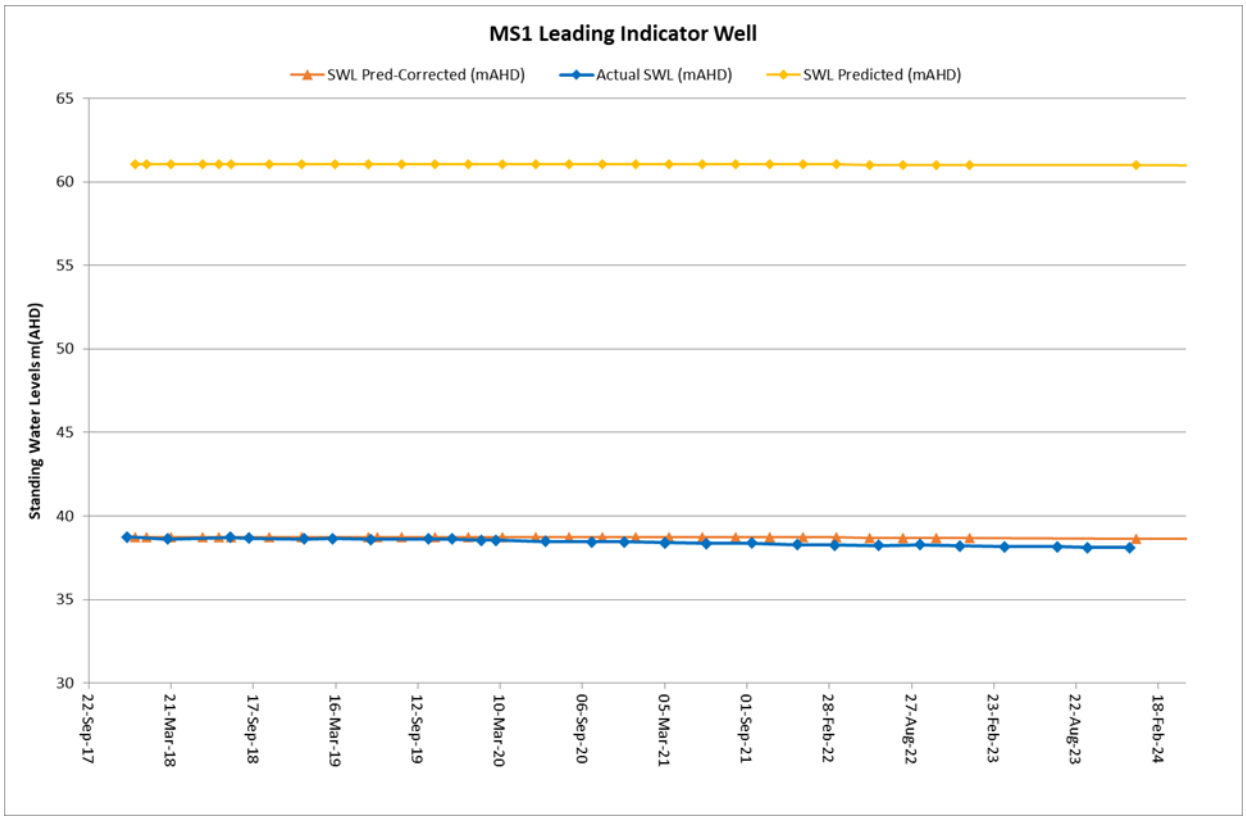


Figure 22: Standing water levels for Leading Indicator Well MS1

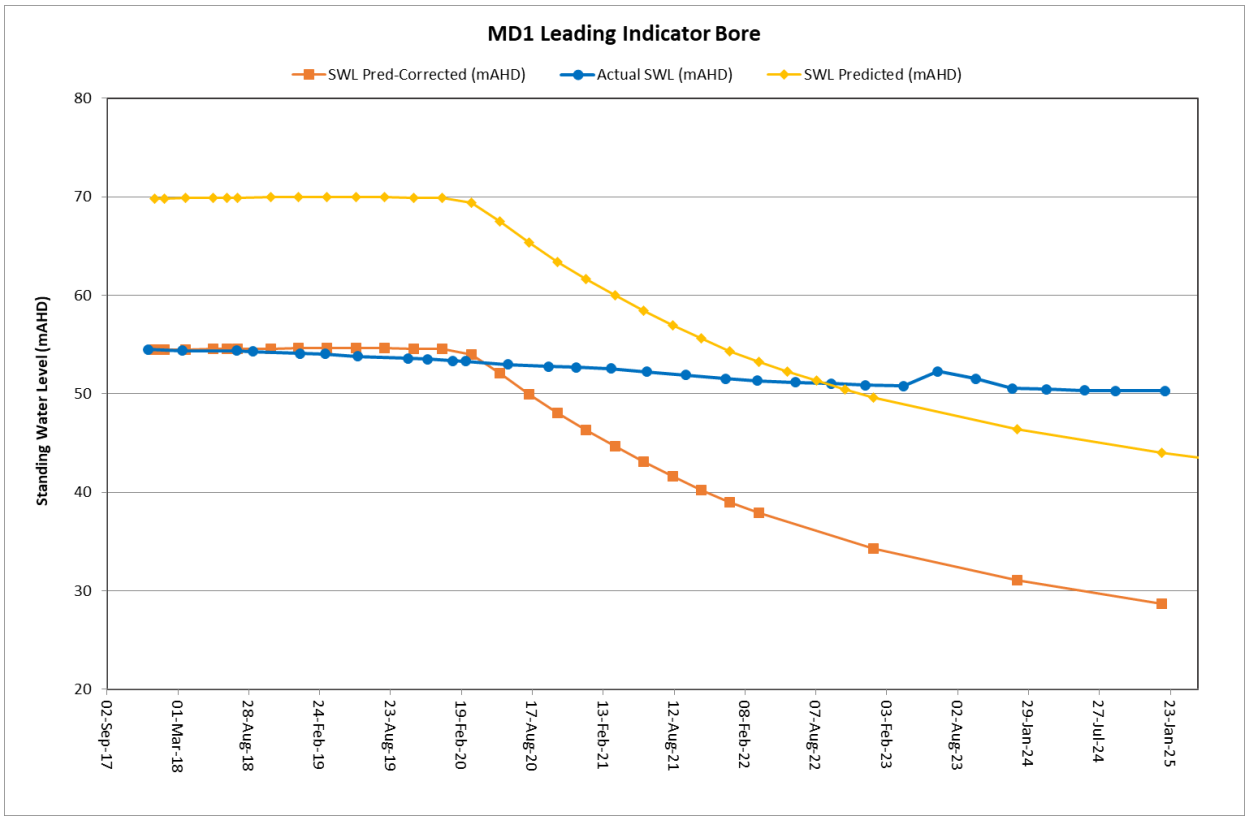


Figure 23: Standing water levels Leading Indicator Well MD1

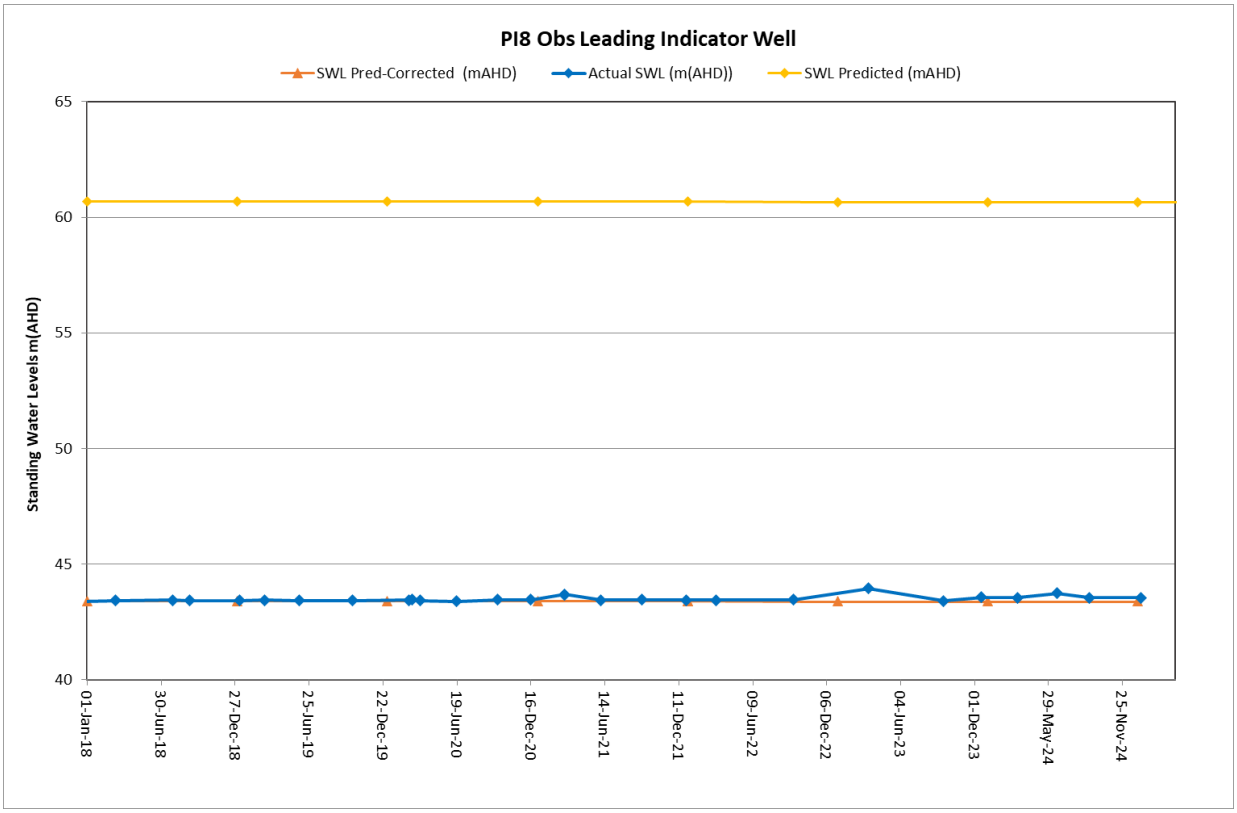


Figure 24: Standing water levels for Leading Indicator Well PI8-Obs

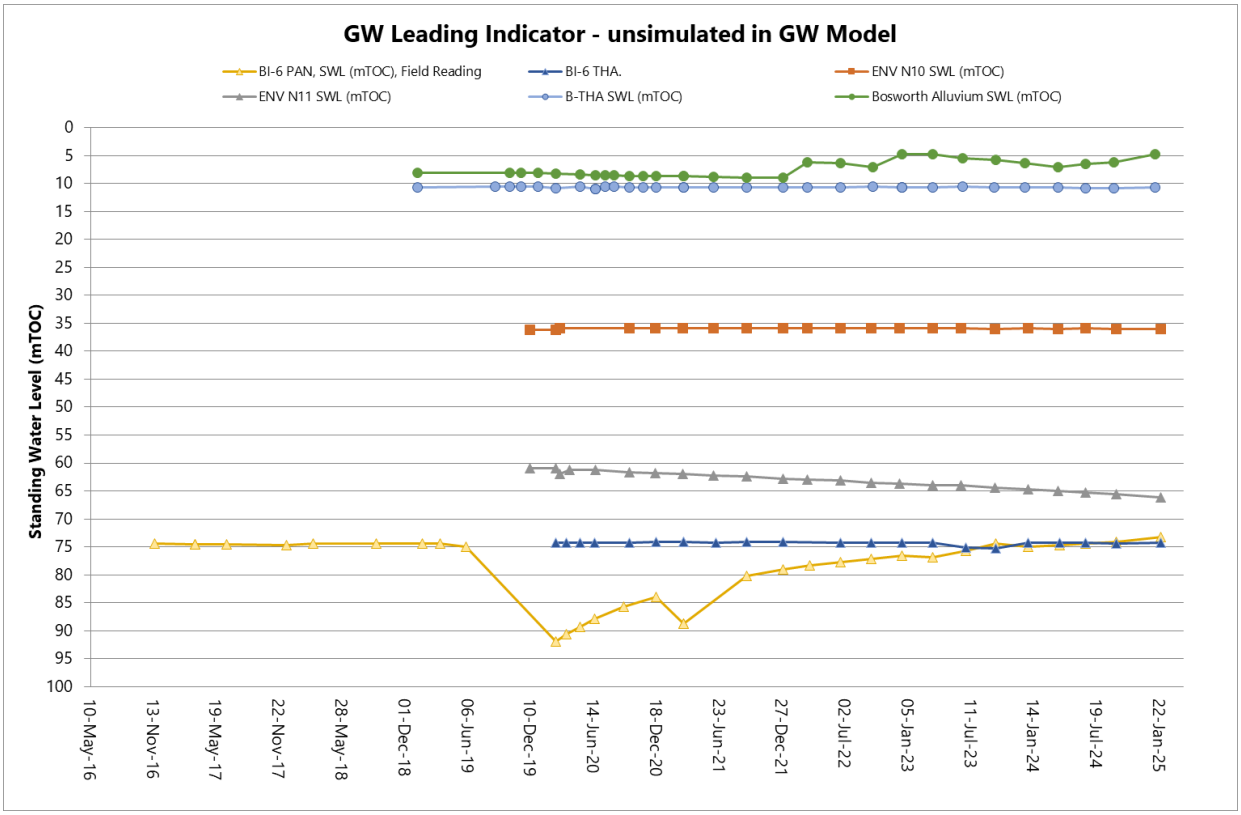


Figure 25: Standing water levels Leading Indicator Well – Unsimulated

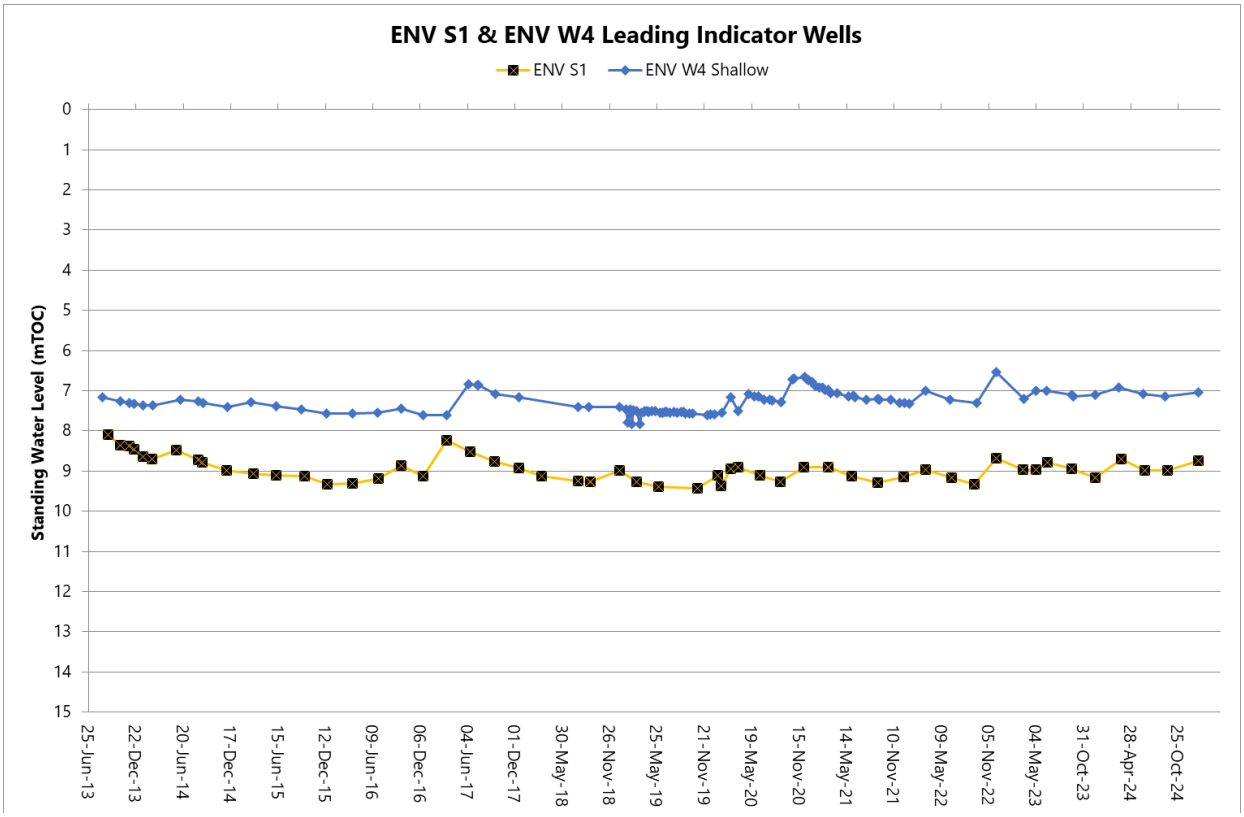


**Figure 26: Standing water levels for Leading Indicator Wells ENV S1 & ENV W4**

### 3.2.3 Abstraction volume

The Leading Indicator below relates to groundwater abstraction monitoring to monitor groundwater drawdown.

| ID | Outcome Measurement Criteria | Result |
|---|---|---|
| Leading Indicator – GW4 | Quarterly analysis of groundwater abstraction volumes from flow meter records at groundwater production wells demonstrate that trends do not exceed the predicted water demand (12.9 ML/d) and show that no more than average of 7 ML/d was abstracted from the Northern Wellfield | Abstraction volumes did not exceed predicted water demand or abstraction limits. |

Production bores in the Radiation Wellfield (RP3, RP4, RP5, RP6 & RP7), Northern Wellfield (NT-2P, NT-4P THA, NT-4P PFA, NT-5P, NT-8P, NT-10P, NT-11, NT12, NT13, NT-17P, N01) and miscellaneous production bores (WAT-3 & WAT-17) were used for groundwater abstraction during the reporting period.

The groundwater abstraction volume for the reporting period in the Radial Wellfield was 4.12 ML/day; the abstraction volume for the same reporting period in the Northern Wellfield was 5.17 ML/day (Table 13).

**Table 13: Carrapateena groundwater abstraction volumes for 2024**

| Source | PEPR (ML/day) | 2024 Groundwater Abstraction Volume (ML/day) |
|---|---|---|
| Radial Wellfield | **7.5** | **4.12** |
| Northern Wellfield | 7 | 5.17 |
| Miscellaneous Production Bores | - | - |
| TOTAL | 12.9 | 9.29* |

*Excludes mine dewatering volumes and **WAR Bores

# 4 References

EGi, 2024. Expansion Project Tailings Geochemical Update 2024

Simpson. SL., Batley GB and Chariton AA. 2013. Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines. CSIRO Land and Water Science Report 08/07. CSIRO Land and Water.

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# Appendix D

# 2024 Carrapateena Flora and Fauna Survey

# Carrapateena Operations

# Flora and Fauna Survey 2024

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LATHWIDA ENVIRONMENTAL

March 2025

Revision 0

## Document status

| Revision | Doc Type | Reviewed By | Approved By | Date Issued |
|---|---|---|---|---|
| A | Draft for internal review | NJB | ZMB | 06/02/2025 |
| B | Draft for client review | RF | ZMB | 10/02/2025 |
| 0 | Final | ZMB | ZMB | 11/03/2025 |

## Project details

| | |
|---|---|
| **Client** | BHP – Carrapateena |
| **Project** | BHP Carrapateena Ecology Support |
| **Project Number** | LE24009 |
| **Report Subject** | Flora and Fauna Survey 2024 |
| **Project Manager** | Zeta Bull |
| **Project Director** | Nick Bull |
| **Authors** | Zeta Bull, Sonia Croft |
| **File Reference** | LE24009 Carra Ecology Report_Rev 0 |

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## Disclaimer

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The sole purpose of this report and the associated services performed by Lathwida is to document the 2024 Ecological Assessment for the survey area. This document and associated data will support the development of primary approval documentation required for the Carrapateena Mine site in South Australia. The report is based on the results of an annual flora and fauna survey for BHP. The scope of services, as described in this report, was developed with BHP.

In preparing this report, Lathwida has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Lathwida has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Lathwida collected and reviewed data and information available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Lathwida has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

## Note on currency

Where possible, information contained in this Document is up to date as at March 2025. This was not possible for supporting appendices, and information based on those appendices, which were prepared by third parties (as discussed in the second paragraph in the Disclaimer above) prior to the Document being finalised.

## Copyright

## Executive summary

Carrapateena is a copper-gold mining operation located in South Australia approximately 160 km north of the regional centre of Port Augusta. BHP (previously OZ Minerals) have an approved Program for Environment Protection and Rehabilitation (PEPR) for the Carrapateena Mineral Lease (ML 6471), and associated Miscellaneous Purposes (MPLs) 149, 152, 153, 154 and 156, which satisfies section 70B of the Mining Act 1971 (SA) (Mining Act) (BHP 2024). Under the Mining Act Part 10A, a compliant program must be in force before carrying out operations as defined in the PEPR.

BHP engaged Lathwida Environmental (Lathwida) to conduct the annual flora and fauna survey to demonstrate approval conditions and outcomes as per the PEPR ML 6471 and associated MPLs. The relevant approval conditions focus on flora and fauna survey to monitor the following: plant diversity and abundance, plant health, evidence of new weed species that are declared under legislation, increases in abundance of existing (non-declared) weed species and evidence of pathogens or feral animals as a result of the mine operation or mine related activities. In addition, approval conditions require BHP to report records of fauna species with a National Conservation Rating (e.g. relevant species to Carrapateena listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)); Plains Mouse (*Pseudomys australis*), Night Parrot (*Pezoporus occidentalis*) and Thick-billed Grasswren (*Amytornis modestus indulkanna*). The PEPR outlines specific Outcome Measurement Criteria (OMC) which BHP are required to report against.

This report provides the outcomes of the spring 2024 survey, which builds upon the previous ecological compliance monitoring surveys undertaken since the commencement of construction in autumn 2018. The majority of surveys were conducted in spring (from September 2018), however an autumn survey was also conducted in 2023, given the change in rainfall in the preceding years. The intention of the 2023 autumn survey was to detect a different suite of flora and fauna and to provide an additional opportunity to capture the EPBC listed Plains Mouse. In 2024, Carrapateena rainfall was below average and fluctuated, with only two larger events in March (over 20 mm) and July (40mm), hence a spring survey was conducted rather than autumn.

Flora survey methods undertaken here are generally consistent with methods that have been used at the Carrapateena for baseline studies undertaken prior to construction (2012-2017), with minor modifications to align data collection with the outcomes and mine approval conditions. Flora methods include Jessup transects, Rangeland Assessment Methodology (RAM), canopy cover assessments and weed transects. These methods provide a combination of data that informs current native and exotic (weed) plant diversity and abundance, whilst canopy cover data provides an indication of tree health (and stress) within a creekline downstream of the Tailings Dam. Results are compared to baseline survey data where applicable data is available. Landscape Functional Analysis (LFA) was conducted at four sites (two established 2020, two established in 2022) that have begun rehabilitation. LFA uses field assessment of physical, chemical and biological processes to determine the degree to which the land system is self-sustaining, and in particular, assesses the capture or loss of resources from the system. The results of the spring 2024 LFA were compared with 2019 - 2023 results and baseline data from corresponding representative 'analogue' sites. One site no longer requires monitoring (Tjungu), one only requires one method of monitoring given the plant density is high, and one site should be rehabilitated again, given shallow ripping is very slow to

rehabilitate and one transect has been compromised. In future additional LFA sites and new analogue sites could be established immediately adjacent the LFA Sites, once infrastructure locations are final, and the rehabilitation is evident.

Fauna survey methods followed a modified version of the biological survey methods (as per Owens 2000), with a focus on pitfall trapping to address the lease area condition relating to small mammal and reptile diversity, including the EPBC listed as Vulnerable Plains Mouse (*Pseudomys australis*). A single trap line was installed at eight established fauna sites, and bird surveys were undertaken at 20 sites, aligning with vegetation survey sites. One un-baited camera trap was also installed at each trap line site, and Song Meters were deployed at 10 sites to record bird calls and at three sites to record microbat calls. Opportunistic observation / capture of all vertebrate species across the site was also recorded to provide information about overall species diversity at Carrapateena, which is comparable with previous surveys.

Despite below average rainfall for the year prior to the survey, an above average winter rainfall event in July and reduced grazing impacts has resulted in an abundance of short-lived flora species and sustained the four main long-lived flora species at Carrapateena and high numbers of reptiles which have less reliance on sustained rainfall. However, lack of sustained rainfall earlier in the year, and suitable food resources (e.g. grass seeds), has likely influenced the overall fauna records at the site, i.e. lower rodent diversity and captures and continued lack of detection of EPBC listed Plains Mouse,

## ES1 Flora results

The conditions of the PEPR require native vegetation condition surveys that assess native plant species abundance and diversity. In 2024, total species diversity recorded across all flora sites (141 native species) was the equal highest recorded during compliance monitoring, due to a very high diversity of short-lived species being recorded. During construction monitoring, variation in total species diversity within the mining lease has largely been due to variation in diversity of short-lived species that germinate in response to rainfall events, such as the well above average rainfall received in July 2024. Grazing impact continued to be low in 2024, following widespread destocking across the mining lease, which also likely influenced short-lived species diversity and widespread increased abundance of palatable species (e.g. Bladder Saltbush, Bush Minuria and Plains Lantern Bush). The population abundance of the five most abundant and/or widespread long-lived perennials declined during 2018 to 2020, but have all increased since 2021 (Bladder Saltbush, Samphire, Sea-heath, Bush Minuria, Plains Lantern Bush). The declines and increases in long lived perennial species are attributed to yearly and long-term rainfall totals rather than mining impacts (e.g. the 50% increases in Plains Lantern Bush and Cunningham's Daisy abundance in 2022 and/or 2023 were particularly striking). Similar to 2023, in 2024 the mean total species diversity for impact sites and for control sites was not significantly different, were within the baseline range, and comparable with mean total species diversities recorded in 2018 (early compliance). Based on the above, mining activities are not considered to be impacting either short-lived or long-lived species diversity at the mineral lease. Hence, results suggest there are no impacts on native flora species diversity and abundance from mining activities, satisfying Schedule 6 Conditions of the PEPR and OMCs SWRF1, AQ2.

Impacts in Eliza Creek have the potential to occur as a result of reduced surface water flows, reduced groundwater flows and / or groundwater contamination attributed to tailings seepage from the Tailings Storage Facility (TSF), or flood water released through activation of the decant dam spillway in a 1 in 100-year 72 AEP rain event. Since 2018, there has been no distinct trend in species diversity for any of the Eliza Creek sites, with both small increases and decreases occurring yearly at each site. There are also no distinct differences in species diversity between sites. There is no clear pattern emerging in species diversity data relating to the time since the TSF establishment and the distance from the TSF. Ten of the most abundant long-lived woody perennials recorded at the Eliza Creek Jessup transects were separately analysed. All 10 species have shown yearly fluctuations, but no downward population trends at any of the Eliza Creek sites since 2018, with the exception of Dead Finish at Site 10. The slight downward trend of Dead Finish may be attributable to fluctuating numbers between surveys and difficulty in separating dense clusters of spiky plants into individuals. Regardless, the Eliza Creek Jessup transects have shown an increase in total perennial species abundance. Canopy cover assessments have also shown positive tree health for the sites downstream of the TSF. Western Myall trees have shown an increase in foliage and recruitment and River Red Gums have regained canopy losses, but there was still no recruitment of Red Gums recorded along transects. Lack of recruitment from River Red Gums along the transects (located furthest from the TSF) are likely reflective of lower than average rainfall. No impact from mining activities is considered evident (based on diversity, abundance and canopy cover assessments) at the formal Eliza Creek sites. The results of the formal monitoring sites results would suggest there are no impacts on Eliza Creek vegetation arising from the TSF and associated mining activities, satisfying Sixth Schedule Condition 2 of the PEPR and OMC SWRF1, TSF6. However, downstream of the TSF there has been a seepage incident at the Decant Dam, resulting in the death of Western Myall trees and understorey shrubs upstream of Site 17. This is currently considered non-compliant until the extent of impact is finalised, and Significant Environmental Benefit (SEB) offset is accounted for. A follow up survey in spring 2024 has been undertaken to finalise the SEB offset requirement under the Native Vegetation Act 1991 (refer Separate memo).

Weed species were surveyed at existing flora sites; at designated weed transects, and at opportune locations throughout the lease area, including the camps and dams. Most weeds recorded were annual herbs or grasses. Most annual weed records were from dams or drainage lines, areas naturally susceptible to weed invasion, and from the dune habitats, and their presence is unrelated to mining activities. There were no new weeds recorded in 2024 and no overall increase in abundance or extent of weeds declared under legislation. Although not declared, Wards Weed was recorded along the Western Access Road for the first time, however was previously recorded along the SAR (2021). This introduction may be due to mine related activities. It is recommended that this small population be located in winter when it is actively growing and eradicated.

Ongoing control of Tobacco Bush at Dawson Dam and South Eliza Dam is recommended. Fluctuations in density reflect seasonal rainfall patterns rather than mining impacts. No new species of declared weeds were recorded during spring 2024, indicating compliance with the Schedule 6 Condition 6, Schedule 2 Condition 28, and OMC WP1 and WP2.

No EPBC listed or NPW Act listed flora species were recorded during the 2024 survey.

## ES2 LFA results

The current status and trends at four rehabilitation sites (Aerodrome laydown, Ventia laydown, Midway Quarry and Tjungu) were again measured by Landscape Function analysis (LFA), using the Established Method and Point Centre Quarter (PCQ) method for all sites. The LFA and PCQ show a positive trend in the number and area of plants per hectare (ha) at all four rehabilitation sites. Plant colonisation across sites is currently dominated by short-lived perennial species (*Sclerolaena* spp.) although several longer-lived perennials were also recorded and some distant from the transects. The short-lived species are an important colonising component of the naturally occurring vegetation in the stony tableland habitat, and all plants improve soil stability and function. As plants (patches) establish and increase in size, the potential for resource capture and nutrient cycling improves leading to ongoing increased potential for recruitment of native species. Developed patches also provide cover and habitat opportunities for native fauna species and reduce soil loss and erosion.

Although LFA monitoring is in its early stages, there are evident differences between application of different rehabilitation techniques which may be affecting recruitment. These include deeper contour ripping and application of rocky surface strew at the Aerodrome, Midway Quarry and Tjungu sites compared with shallow contour ripping at the Ventia site. The addition of hand seeding has also likely accelerated establishment of plants at the Tjungu site, although only a few species from the seed mix were recorded, regardless this site no longer requires monitoring. The absence of resource trapping patches (troughs) at the Ventia site is likely to substantially limit the speed with which the site rehabilitates, plus one transect was decommissioned in 2024 given it had been compromised by vehicle tracks. However, additional intervention or restoration activities of the remaining sites may further enhance site rehabilitation for all sites, including applying native woody debris (e.g. old Myall fence posts, fallen branches), planting local groundcovers and low shrubs, and providing supplementary watering during critical periods of plant establishment. Ongoing monitoring will assist in informing trends and the benefit of additional intervention such as deeper or repeat ripping and seeding.

Currently, LFA data is compared with data from a series of 'analogue sites' which were collected prior to construction at the site. Whilst this analogue data is considered broadly representative of the vegetation communities around the mine lease, and therefore a useful indicator of rehabilitation success, a more precise reference would be to establish LFA sites adjoining each rehabilitation site.

Overall, OMC LUP4 is considered to be in-progress / compliant.

## ES3 Fauna results

The 2024 spring fauna survey identified a total of 107 vertebrate species from the eight survey sites and opportunistically across the study area. Capture rates for small mammals and reptiles were within baseline and compliance ranges. Reptile and bird diversity, and total species diversity across the whole of Carrapateena was however within or above the range of diversity that has been recorded during baseline surveys, meaning construction and early operational activities do not appear to have resulted in a loss of abundance or diversity. Compared to recent years, increased reptile captures and the highest diversity recorded were most likely influenced by the warmer temperatures (e.g. a day of 36 and 40 degrees,

respectively), however there were also thunderstorms and extreme wind events. Bird diversity was within baseline and compliance range, with waterbird presence increased as a result of water present in dams and a temporary water source at South Eliza. Mammal captures were within baseline and compliance ranges, but diversity was slightly lower for rodents and no planigales were detected. However, these mammal types were generally captured in smaller numbers in previous surveys and respond to rainfall (or lack of). Higher total fauna capture rates were also likely associated with presence of short-lived flora species, a winter rainfall event and the warmer daily temperatures during the survey. The common species were captured in numbers within baseline ranges (e.g. Stripe-faced Dunnart, Fat-tailed Dunnart, Saltbush Ctenotus, Earless Dragons). Similar to the other compliance monitoring surveys, the reduced survey effort (reduced trap lines) compared with baseline surveys did not appear to influence capture rates per site. This trapping effort appears sufficient to capture information that is required for the mine conditions and PEPR outcomes, which focus on habitat quality and species presence or absence (diversity) rather than abundance, as well as comparison between control and impact sites. Diversity of species and families was comparable to baseline data, and birds and reptiles showed evidence of breeding (e.g. plumage, multi-sex groupings and presence of juveniles), suggesting that mining related construction activities are not negatively impacting fauna at Carrapateena. Small mammal capture numbers were again skewed towards Stripe-faced Dunnarts, aligning with baseline and compliance trends, with the exception of 2022 when Fat-tailed Dunnarts were captured in higher numbers. This may suggest conditions were more favourable for Stripe-faced Dunnarts compared to Fat-tailed Dunnarts at the time of the survey. In addition, microbats were surveyed using Song Meter acoustic device at three opportunistic sites and five species were detected, three of these had not been recorded since baseline.

The approval conditions of the PEPR (Schedule 2 Condition 28) require that any records of three EPBC Act listed as threatened species (Night Parrot *Pezoporus occidentalis*, Thick-billed Grasswren *Amytornis modestus*, and Plains Mouse *Pseudomys australis*) are documented and provided to the Biological Databases of South Australia (BDBSA), if they are recorded during ecological surveys at Carrapateena, or opportunistically during regular site activities. None of these EPBC listed threatened were detected during the 2024 survey. One EPBC listed as threatened and migratory was detected (Sharp-tailed Sandpiper) and one EPBC listed as migratory species (Common Sandpiper) was detected throughout the spring 2024 survey; both detected in small numbers at South Eliza Dam. Both species have previously been detected at Carrapateena at dams or effluent irrigation areas with run off.

During the spring 2024 survey, there were fauna species detected that had not previously recorded within the lease during baseline and compliance monitoring (Pelican, Red-necked Avocet, Rufous Songlark) and others that had not been detected since baseline (Southern Four-toed Slider, Australian Pratincole, Inland Forest Bat, Inland Free-tailed Bat and Lesser Long-eared Bat). Gould's Wattled Bat was also detected, considered as likely present in 2023, but calls could only be verified to Genus level that year. Carrapateena occurs within or on the edge of the known range of these species and there are historic BDBSA records for these species within the broader region (i.e. > 50km from the study area).

Less invasive fauna detection methods such as Song Meters and cameras have again proved useful to complement bird and fauna survey effort, particularly in the arid zone, where local climate can affect species presence during a survey.

Overall, OMC WP1, WP2, EPBC1, EPBC2, EPBC3 are considered to be compliant.

## Table of contents

## List of tables

## List of figures

## List of plates

## List of appendices

# 1 Introduction

## 1.1 Operation background

Carrapateena is a copper-gold mine, now owned and operated by BHP Group Limited (BHP), and which located in South Australia on the eastern margin of the Gawler Craton, approximately 160 km north of the regional centre of Port Augusta (Figure 1.1). Construction on Carrapateena was completed by OZ Minerals in late 2019 – early 2020, and is now in a steady state of operation. The Carrapateena operation is an underground copper gold mine using a sub-level cave mining method. Onsite there is the Tjati and materials handling declines, process plant, ancillary infrastructure, Tailings Storage Facility (TSF), Tjungu village and Aerodrome. An exploration village that was temporary is also likely to be retained and updated given expansions that are in progress. OZ Minerals was purchased by BHP in 2023 and all former OZ Minerals assets are now part of BHP.

BHP have an approved Program for Environment Protection and Rehabilitation (PEPR) for the Carrapateena Mineral Lease (ML 6471), which satisfies section 70B of the Mining Act 1971 (SA) (Mining Act). Under Part 10A of the Mining Act, a compliance program must be in force before carrying out operations as defined in the PEPR. OZ Minerals was granted ML 6471 on 3 January 2018. The PEPR was updated in June 2024. In addition to the ML, the Carrapateena PEPR also includes the following Miscellaneous Purposes Licence (MPLs) for infrastructure associated with the mine:

- Airstrip, Workers' Accommodation Village, Access Road and Ancillary Infrastructure (MPL 149), granted 5 July 2017
- Western Infrastructure Corridor (MPL 152), granted 3 January 2018
- Eastern Radial Wellfield (MPL 153), granted 3 January 2018
- Southern Access Road and Radial Wellfield (MPL 154), granted 3 January 2018
- Northern Wellfield (MPL 156), granted 11 December 2018.

Jacobs were previously engaged to conduct construction and operational ecological monitoring surveys in autumn and spring of 2018, spring 2019, spring 2020, spring 2021, spring 2022, and autumn 2023 in order to meet approval conditions outlined in the PEPR ML 6471. This report represents the findings from the eighth compliance monitoring survey; undertaken in spring 2024 by Lathwida Environmental (Lathwida). The approval conditions focus on:

- Surveying native plant species to ensure there is no decline in diversity and abundance as a result of mining activities,
- Monitoring of plant health to demonstrate there are no detrimental impacts on plants as a result of mining activities (e.g. including impacts from raised dust levels, contaminants and/or declines in surface water flow),
- Monitoring to demonstrate that no new weed species declared under legislation have been introduced to Carrapateena, and no increase in abundance of existing (non-declared) weed species, pathogens or feral animals has occurred as a result of mining activities,

- Surveying common native fauna to ensure there is no loss in diversity or abundance, as a result of as a result of mining activities (e.g. from direct impacts, impacts to habitat, weeds and pests),
- Surveying native fauna species to ensure there is no decline in diversity and abundance of NPW Act or EPBC Act listed fauna as a result of mining activities, and
- Reporting of any records of EPBC Act listed fauna species, including migratory species, with specific objectives for several EPBC listed species (discussed below).


**Figure 1.1: Project Location**
**Carrapateena Flora and Fauna Survey**

LATHWIDA

### 1.1.1 Relevant conditions of approval

As stated in the initial compliance monitoring report, which occurred during construction (Carrapateena Ecology autumn 2018 survey, Jacobs 2018a), the approval conditions of the PEPR for ML 6471 and associated MPLs define a number of conditions relating to fauna and flora values that occur within the lease areas, which are summarised in Table 1.1 below. The PEPR, updated in 2024, also outlines the monitoring program including Outcome Measurement Criteria (OMC), Leading Indicators and Strategies to demonstrate compliance with the defined and agreed Outcomes, which are summarised in Table 1.2.

**Table 1.1: Mineral Lease 6471 and associated MPLs fauna and flora conditions relevant to annual monitoring**

| Schedule and Conditions Reference no. | Condition Environmental Outcome / OMC ID |
|---|---|
| Schedule 2<br>Condition 28.2 to 28.4 (ML 6741, MPL 152 to 154) | To ensure the protection of Matters of National Environmental Significance, the Tenement Holder must:<br>28.1 (refer Schedule 6)<br>28.2. Provide data from any future sightings and records of the Thick-billed Grasswren to the Biological Databases of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions;<br>28.3. Provide data from any future sightings and records of the Night Parrot to the Night Parrot Recovery Team; and<br>28.4. Provide data from any future sightings and records of the Plains Mouse to the BDBSA to enable effective monitoring and record keeping, as per the Recovery Plan Actions.<br>OMC ID EPBC1, EPBC2, EPBC3 |
| Schedule 6<br>Condition 6 and 28.1 (ML 6471)<br>Condition 3 (MPL 156)<br>Condition 6 (MPL 152 to 154)<br>Conditon10 (MPL149) | The Tenement holder must during construction and operation ensure no introduction of new species of Weeds declared or listed under relevant legislation, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species in the Land as a result of mining operations or mining related activities.<br>28.1. Develop, implement and maintain appropriate management actions to ensure the control of feral animal populations, including cats and foxes.<br>OMC ID WP1, WP2 |
| Schedule 6<br>Condition 17 (ML 6471) | The Tenement Holder must during construction, operation and post Completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities.<br>OMC SWRF1, TSF6 |
| Schedule 6 Condition 7, 6, 4 (MPL 6471, MPL 149, 152 to 154, 156) | The Tenement Holder must during construction and operation ensure no impacts to agricultural productivity for third-party land users on or off the Land as a result of mining-related activities other than those agreed between the Tenement Holder and the affected user or determined by an appropriate court as evidenced in its order(s) (and the Tenement Holder must provide the Director of Mines (or other authorised officer) with a copy of the order(s), which shall be placed on the Mining Register).<br>OMC LUP4 |
| Schedule 6 Condition 14 (ML 6471) | The Tenement Holder must during construction, operation and post Completion ensure no adverse change to the air quality environment as a result of particulate emissions and/or dust generated by mining operations or mining related activities.<br>OMC AQ2 |

**Table 1.2: Outcomes, Outcome Measurement Criteria (OMC) / Leading Indicator / Strategies**

| Outcome Measurement Criteria (OMC) Code | Relevant Environmental Outcomes | OMC / Leading Indicator / Strategy | Achievement Values |
|---|---|---|---|
| SWRF1 | The Tenement Holder must during construction, operation and post Completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities. | Annual surveys undertaken by an independent and suitably qualified expert demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependent ecosystems at Eliza Creek monitoring attributed to reduced surface water flows caused by mining operations when compared to baseline conditions | No adverse impact on the diversity and abundance of native vegetation and water dependant ecosystems attributed to reduced surface water flows caused by mining operations when compared to baseline conditions (Appendix C5 of PEPR - Ecological Baseline BHP 2024) unless a significant environmental benefit has been approved in accordance with the relevant legislation Linked to Native Vegetation Outcome (Schedule 6 Condition 11) |
| TSF6 | | Annual surveys undertaken by an independent and suitably qualified expert demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependent ecosystems at Eliza Creek monitoring sites attributed to tailings seepage when compared to baseline conditions (Appendix C5 Ecological Baseline of PEPR BHP 2024) and surveys for new sites undertaken prior to commencement Stage 1 Tailings commissioning) | No adverse impact on the diversity and abundance of native vegetation and water dependant ecosystems attributed to tailings seepage when compared to baseline conditions (Appendix C5 of PEPR - Ecological Baseline BHP 2024) unless a significant environmental benefit has been approved in accordance with the relevant legislation.<br>Linked to Native Vegetation Outcome<br>(Schedule 6 Condition 11). |
| WP1 | The tenement holder must during construction and operation ensure no introduction of new species of weeds declared or listed under relevant legislation, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species in the Land as a result of mining activities mining operations or mining-related activities. | Annual flora and fauna surveys undertaken by suitably qualified ecologists at flora, fauna and weeds monitoring locations demonstrates no introduction of new species of weeds declared or listed under relevant legislation, plant pathogens or pests (including feral animals) as a result of mining related activities when compared to previously recorded weed species and introduced fauna | No introduction of:<br>• new species of weeds declared or listed under relevant legislation<br>• plant pathogens, pests (including feral animals)<br>when compared to previously recorded weed species and introduced fauna. |
| WP2 | | Annual flora and fauna surveys undertaken by independent and suitably qualified ecologists at flora, fauna and weed monitoring locations demonstrates no increase in the abundance of existing weeds or pest species in the land compared to previous survey records as a result of mining related activities | No increase in the abundance of existing weeds or pest species in the land compared to previous survey records. |

| Outcome Measurement Criteria (OMC) Code | Relevant Environmental Outcomes | OMC / Leading Indicator / Strategy | Achievement Values |
|---|---|---|---|
| AQ2 | The Tenement Holder must during construction, operation and post Completion ensure no adverse change to the air quality environment as a result of particulate emissions and/or dust generated by mining operations or mining-related activities. | Annual surveys undertaken by a suitably qualified and experienced expert demonstrates no adverse impact on the diversity and abundance of native vegetation at monitoring sites (Figure 2.1) directly attributed to dust deposition from mining operations or mining related activities when compared to baseline native vegetation conditions | No adverse impact on the diversity and abundance of native vegetation at monitoring sites directly attributed to dust deposition from mining operations or mining related activities when compared to baseline native vegetation conditions (Appendix C5 Ecological Baseline of BHP 2024) |
| EPBC1 | Provide data from any future sightings and records of the Thick-billed Grasswren to the Biological Databases of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions. | Future records of the Thick-billed Grasswren are to be provided to the BDBSA to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites or opportunistic sighting (Figure 2.1, Figure 2.2, Figure 2.3) | Records of the Thick-billed Grasswren provided to the BDBSA if observed.<br>Linked to MNES Condition (Schedule 2 Condition 28.2). |
| EPBC2 | Provide data from any future sightings and records of the Plains Mouse to the BDBSA to enable effective monitoring and record keeping, as per the Recovery Plan Actions | Future records of the Plains Mouse are to be provided to the BDBSA to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites or opportunistic sighting (Figure 2.1, Figure 2.2, Figure 2.3) | Records of the Plains Mouse, provided to the BDBSA if observed.<br>Linked to MNES Condition (Schedule 2 Condition 28.4). |
| EPBC3 | Provide data from any future sightings and records of the Night Parrot to the Night Parrot Recovery Team | Future records of the Night Parrot are provided to the Night Parrot Recovery Team to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites or opportunistic sighting (Figure 2.1, Figure 2.2, Figure 2.3) | Records of the Night Parrot provided to the Night Parrot Recovery Team if observed.<br>Linked to MNES Condition (Schedule 2 Condition 28.3) |
| LUP4 | The Tenement Holder must ensure that the Land is progressively and finally rehabilitated to support the future land use. | Rehabilitation trials shall be undertaken at infrastructure locations no longer required Figure 2.6 and ongoing (annual) assessment at LFA monitoring sites are assessed annually demonstrating development of trends and annual improvement of rehabilitation through LFA methodology. Should the data indicate rehabilitation not trending towards sustainability root-cause investigations will be undertaken and rectification methods be identified and implemented | Rehabilitation has achieved, or is likely to achieve, a landscape function equivalent to that of adjacent analogue LFA sites |

Note WP3 includes monthly weed inspections, this is not part of the scope of this report.

## 1.2 History of monitoring at Carrapateena

The history of baseline ecological monitoring at Carrapateena was summarised in the Carrapateena Ecology autumn 2018 survey report (Jacobs 2018a), which represented the first of the compliance monitoring reports following commencement of construction. Briefly, baseline flora and fauna surveys were undertaken by EBS Ecology within and surrounding the Carrapateena Mineral Lease (ML 6471), biannually between autumn 2012 and spring 2016 / 2017 (references provided in Jacobs 2018). The surveys covered a range of seasonal and yearly climatic conditions and therefore collectively provide a robust baseline data set describing the fauna and flora values present at the site, against which impacts from the Carrapateena construction and operation can be compared.

A summary of baseline ecological monitoring (2012 to 2017, EBS Ecology 2017b) is provided in previous monitoring reports (Jacobs 2018a, 2018b; 2019, 2020, 2021, 2022, 2023d). The autumn and spring 2018, and spring 2019 to 2023 surveys (conducted by Jacobs) are considered to represent the commencement of, and ongoing construction and operational compliance monitoring associated with the mining operation approved under ML 6471. It is noted that whilst baseline surveys were conducted in 2017, some raw data (primarily floristic data) was not available for comparison against the compliance monitoring data.

## 1.3 Climate at Carrapateena

The nearest weather station to Carrapateena Mine that provides detailed temperature and rainfall data is the Woomera Aerodrome (station number 16001, Commonwealth of Australia Bureau of Meteorology (BoM) 2023a), approximately 70 km to west of the operational area. Long term climatic statistics are available for this site (1949 to current) providing an insight into the region's climatic trends. The mine is located in an arid environment, with a hot, dry climate, and average rainfall of approximately 180 mm per year (BoM 2024a). Long-term mean monthly rainfall shows no distinct seasonal variation, whereas mean monthly temperature maximums vary from the mid to low 30s in the summer months to below 20 degrees Celsius in the winter months (Figure 1.2).

In the 12 months preceding the spring 2024 survey, the Woomera region recorded below average yearly rainfall, despite July and December receiving around 14 mm and 40 mm more rain than mean long term totals respectively (Figure 1.3, Figure 1.4, and Figure 1.5). This shortfall can be explained by six months of the year receiving at least 10 mm rain less than the mean monthly long-term totals (Figure 1.3). All remaining months during this period received within 5 mm of the mean monthly long-term totals. Further detail about specific trends in rainfall at Carrapateena are discussed in Section 3.1.

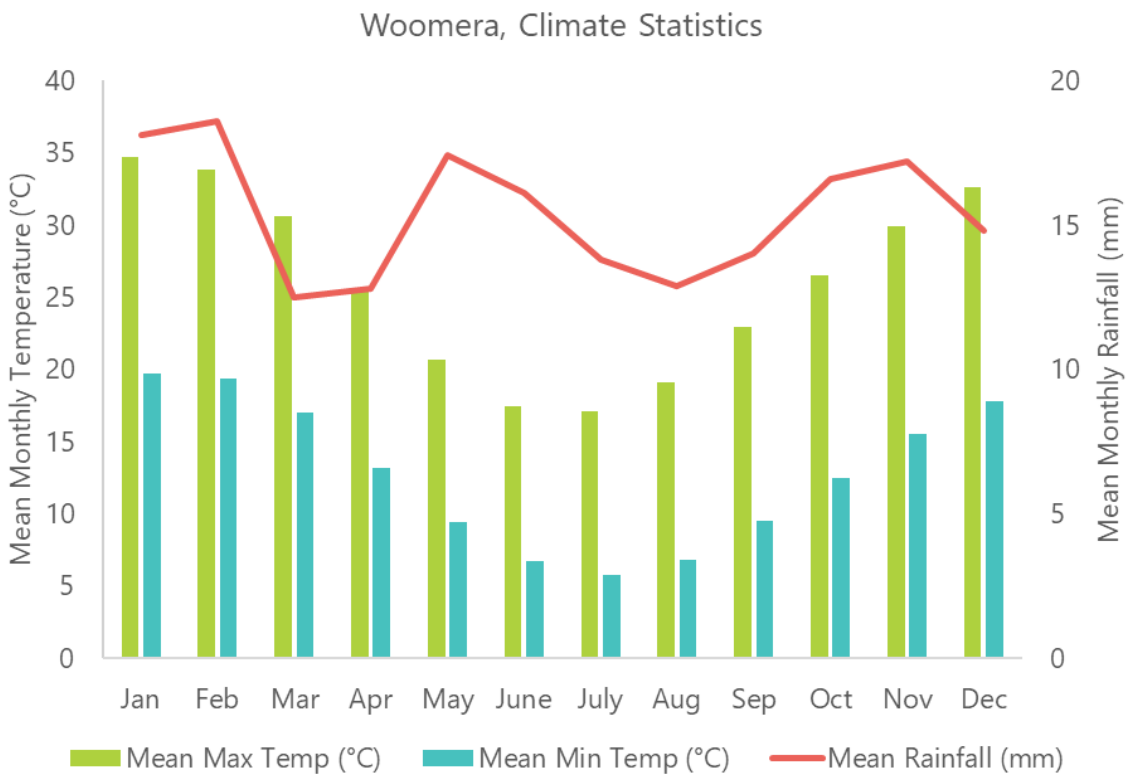



**Figure 1.2: Long-term climate averages (1949-2024) for regional weather station nearest to Carrapateena, Woomera Aerodrome**

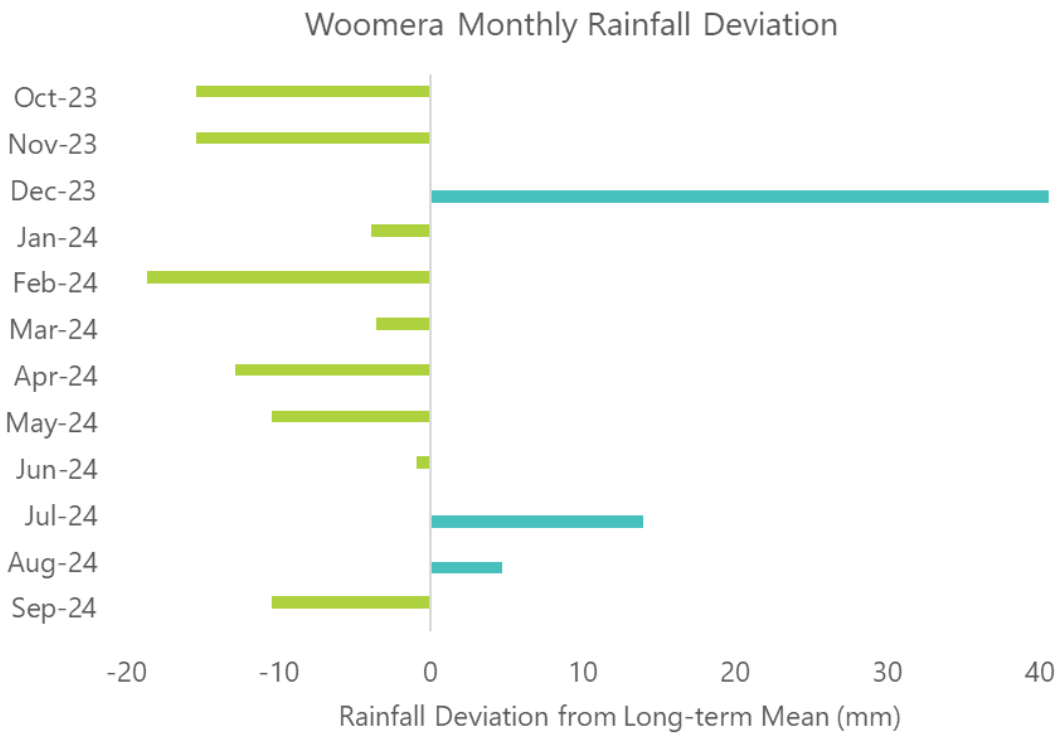



**Figure 1.3: Rainfall deviations between year preceding survey and long-term averages (1949-2024) for regional weather station nearest to site, Woomera Aerodrome**

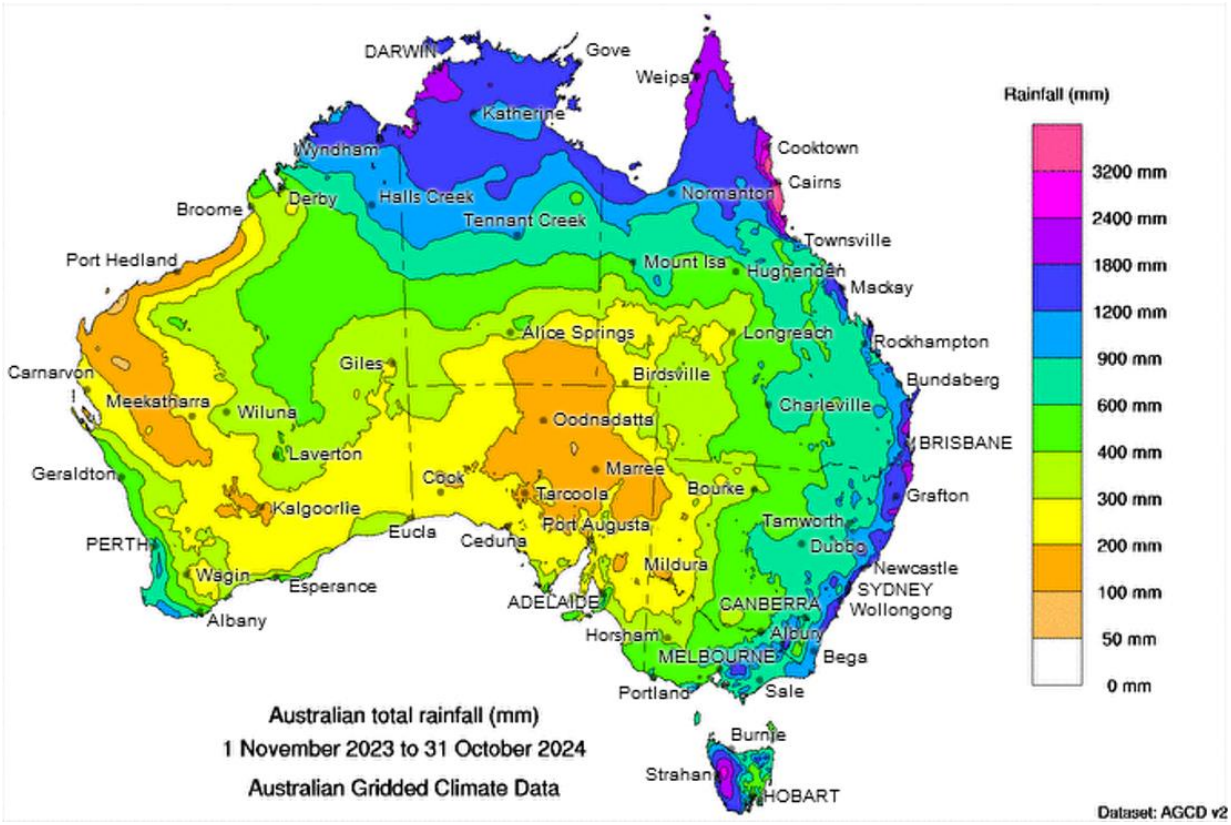



**Figure 1.4: Total rainfall across Australia, 12 months preceding the spring 2024 survey (BoM 2024b)**

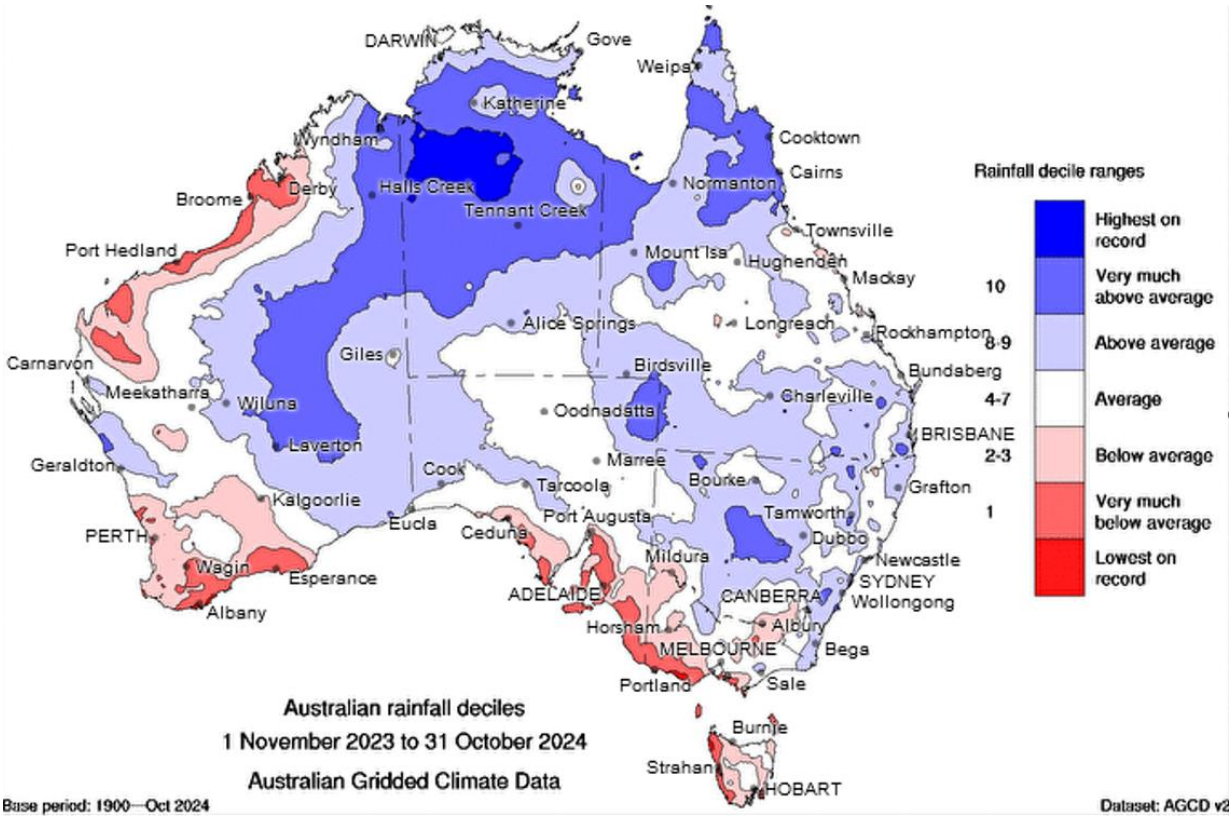



**Figure 1.5: Rainfall deciles across Australia, 12 months preceding the spring 2024 survey (BoM 2024b)**

# 2 Methods

## 2.1 Survey details

Lathwida undertook the spring flora and fauna surveys at Carrapateena between 14 and 23 October 2024. The survey team included the following suitably qualified personnel:

- Principal Ecologist Dr Zeta Bull undertook trap installation, morning and afternoon trap checks, bird survey, mammal and reptile identification lead, flora survey assistant, trap removal.
- Senior Associate Ecologist Greg Smith undertook trap installation, morning and afternoon trap checks, mammal and reptile identification, bird survey, flora survey, trap removal and Song Meter deployment and analysis. Greg specifically surveyed 'men only' cultural sites;
- Senior Ecologist Dr Sonia Croft undertook trap installation, morning and afternoon trap checks, flora surveys, bird survey, trap removal;
- Undergraduate Ecologist Andy Delvaux provided survey assistance and undertook trap installation, assisted with morning and afternoon trap checks, assisted with flora survey, mammal and reptile identification, bird survey and trap removal. Andy assisted with survey of the 'men only' cultural sites.

BHP Environmental personnel Josh Allen, Nicholas Kruger, Bob Starkey, Trent Anderson and Jennifer Kerr assisted with various logistics associated with the survey.

## 2.2 Permitting

Undertaking ecological research and handling/trapping of animals in South Australia can only legally be undertaken with relevant permits and licences in place. Relevant permits and licences were obtained prior to field survey commencement. All works were undertaken in accordance with permit and licence conditions; details as below.

- Permit to Undertake Scientific Research:
  - Permit # A27482-1, valid from 11/10/2024 to 10/10/2025
- Wildlife Ethics Committee Permit:
  - Application number Bull_26/2023 statewide fauna with semi-pitfalls, approval period 31/08/2023 to 01/09/2026
- Permit to Undertake Scientific Research for State-wide Vegetation Surveys:
  - Permit # U27347-2-16, valid 17/10/2024 to 16/10/2025
- Licence for 'teaching, research or experimentation involving animals':
  - Licence # 414, expires 25/8/2025

- Licence to 'possess and administer Prescription Drug[1]:
  - Licence # 2023-87672, expires 12/09/2026.

## 2.3 Spring 2024 Sites

The objective of the survey monitoring program is to demonstrate compliance against the conditions of the Mineral Lease and the approved outcomes during the mine construction, operations and rehabilitation. Table 2.1 below includes a summary of previous monitoring sites against the compliance survey sites and an explanation for any changes. Table 2.2 provides a summary of specific spring 2024 survey site details. Refer spring 2019 report (Jacobs 2020a) for further details. The locations of the spring 2024 survey sites are provided on Figure 2.1 for flora and canopy cover, Figure 2.2 for fauna sites, Figure 2.3 for weed transects, and Figure 2.6 for LFA, as part of the operational monitoring.

[1] A condition of Scientific Research Permits is that 'best practice' for biological survey work is undertaken, including vouchering of specimens of interest for the South Australian Museum (SAM). This condition is included on permits as a means of maximising value obtained from survey work across the State, to enable taxonomic specialists the chance to verify field identification, and to encourage survey records to be included in the Biological Database of South Australia for broader knowledge. As such, the project team liaised with the SAM prior to undertaking the survey to ascertain whether the Museum had particular interest in the region being surveyed. In this case, the curator of mammals and curator of reptiles requested voucher specimens and liver tissue samples be collected for target species. Pentobarbitone sodium is used to euthanize specimens, however, was not required on this survey as no animals were euthanized.

**Table 2.1: Sites surveyed in spring 2024, compared with baseline survey sites**

| Baseline Survey Sites (2012-2017) | Compliance sites | Construction / Operational (Compliance) Monitoring Survey Sites (spring 2024) |
|---|---|---|
| **Flora** | | |
| Jessup transects (x 16 sites)<br>(Flora Site 1 to Flora Site 16) | Jessup sites (x 18) | Jessup sites (as per baseline Flora Site 1 to Flora Site 16), plus additional Jessup sites at Eliza Creek Flora Sites 17 to 20.<br>*Note in spring 2019, Site 8 and 14 were permanently removed from the program given proximity to stock impact areas, interfering with assessment of mining impacts. Refer Jacobs Spring 2019 for additional detail (Jacobs 2020a).<br>**Jessup sites not undertaken at site 21, 22 sand dune habitat as per Section 2.4 |
| Flora sites (x 16 sites)<br>(Flora Site 1 to 16) | Rangeland (x 20) | Flora Site 1 to 16), Eliza Creek sites (Sites 17 to 20) and dune habitat sites (Sites 21 and 22), excludes Site 8 and 14.<br>Baseline and Compliance surveys recorded all plant species and cover/abundance within a 1 ha area.<br>For Compliance surveys Rangeland Assessment Method (RAM) (NVC 2024) was also undertaken (assessing grazing impact and life stages present for long-lived plant species). |
| Flora cover sites (x 33 sites)<br>(CFL01 to CFL33) | NA | Baseline surveys only, not continued. Survey sites covered 10 m x 5 m area, deemed too small to capture meaningful change in this habitat type. |
| Canopy cover (x 11 transects). 7 Eliza Creek transects, 4 Yeltacowie Creek transects (CCC01 to CCC11) | 8 sites (Eliza Creek) | Baseline Yeltacowie Creek and Eliza Creek canopy cover sites (CCC01 to CCC11, EBS 2017) were not assessed as per 2018-2023.<br>Eliza Creek canopy cover transects (sites17AB, 18AB, 19AB and 20AB), were surveyed in spring (2018 to 2022, 2024) and in autumn (2018, 2019, 2023). |
| Weed Monitoring (x 4 transects)<br>(CWM01 to CWM04) | 10 weed transects | Baseline weed transects (CWM01 to CWM04), CWM06, CWM07 (established in 2018) and CWM05 (established in 2022).<br>Northern Wellfield MPL 156, transects NWM01, NWM02 and NWM03 were assessed.<br>Opportunistic observations of declared weed species or species listed under legislation are also recorded (e.g. dams, villages and effluent irrigation areas, spill areas). |
| **Fauna** | | |
| Reptiles and mammals (x 8 sites)<br>Fauna Sites 1 – 6, 15, 16) | 8 sites | Semi-permanent pitfall trap line sites as per baseline surveys (Fauna Site 1 to 6, Fauna Site 15 to 16).<br>As per 2018 to 2023, only one pitfall line was opened at each site and only 6 pits per line. No Elliott traps were deployed as per baseline (2015-2017), and compliance / operation (2018 to 2023). This methodology will be continually reviewed based on an analysis of compliance monitoring trapping data for small rodents (e.g. Plains Mouse).<br>Camera traps have also been used (1 per line) since 2021. |
| Bats | NA | As per 2018 to 2023. Common microbat audible to humans (Dennis Mathews, pers. com.) assessed during spotlighting. No bats likely to be present at the site have a conservation rating.<br>In 2024 Song Meters were deployed to detect birds and microbats at Site 7, 10 and South Eliza Dam. |
| Bird Sites (x 16 sites - Fauna Site 1 – 16), opportunistic surveys at water points | 20-22 sites, opportunistic at water points / irrigation areas | Bird surveys at 14 of the baseline sites (e.g. Fauna Site 1 to 6, 15 and 16, Flora site 7, 9, 10, 11,12,13) and 6 compliance sites (17,18,19, 20, 21, 22). Opportunistic surveys were also undertaken at water points (e.g. farm dams), camps to capture diversity across the site as per baseline surveys. Survey of water points also enables opportunistic observations of seasonal of migratory shorebirds.<br>Song meters were deployed to detect bird species by call at all fauna sites (except site 3 adjacent admin), South Eliza Dam, Eliza Creek Site 10, and Flora site 7 (Bosworth Creek). The dam was full of water, the creeks were dry. |
| **Landscape Functional Analysis (LFA)** | | |
| Landscape Functional Analysis (CEF01 to CEF07) | 4 sites, each with 2 transects | Four Landscape Functional Analysis sites (LFAAL1, LFAVOL2, LFAQUA3, LFATJU4), each with two transects labelled A and B (e.g. LFAAL1A, LFAAL1B) were assessed.<br>In October 2024, Site LFAVOL2 Transect A was discontinued, due to 50% of the transect being graded and used as a temporary laydown area for widening of the adjoining road. No vegetation was present on the remainder of the transect. |

Refer to Jacobs Spring 2019 report for additional detail (Jacobs 2020a).

**Table 2.2: Summary of survey sites, codes and coordinates**

| Survey Techniques at Site | Site Code | Start / End | Easting | Northing |
|---|---|---|---|---|
| Weed Transect | CWM01 | Start | 737108 | 6517520 |
| | | End | 736871 | 6516550 |
| | CWM02 | Start | 737842 | 6530179 |
| | | End | 738177 | 6529435 |
| | CWM03 | Start | 733610 | 6535627 |
| | | End | 732611 | 6535266 |
| | CWM04 | Start | 735912 | 6540184 |
| | | End | 736548 | 6540963 |
| | CWM05 | Start | 700638 | 6518508 |
| | | End | 701466 | 6519078 |
| | CWM06 | Start | 717686 | 6529628 |
| | | End | 718673 | 6529505 |
| | CWM07 | Start | 743694 | 6539567 |
| | | End | 743410 | 6540518 |
| | NWM01 | Start | 726014 | 6554920 |
| | | End | 726937 | 6554923 |
| | NWM02 | Start | 726955 | 6569623 |
| | | End | 725963 | 6569751 |
| | NWM03 | Start | 720606 | 6580675 |
| | | End | 720551 | 6581674 |
| RAM, Jessup, Fauna Trapping, Birds | Flora / Fauna 1 | Start | 731707 | 6550590 |
| | Flora / Fauna 2 | Start | 734223 | 6545185 |
| | Flora / Fauna 3 | Start | 736001 | 6540156 |
| | Flora / Fauna 4 | Start | 736251 | 6534615 |
| | Flora / Fauna 5 | Start | 729131 | 6532955 |
| | Flora / Fauna 6 | Start | 739690 | 6531181 |
| | Flora / Fauna 15 | Start | 737123 | 6538106 |
| | Flora / Fauna 16 | Start | 732472 | 6535805 |
| RAM, Jessup, Birds | Flora / Fauna 7 | Start | 732755 | 6548730 |
| | Flora / Fauna 9 | Start | 746788 | 6544253 |
| | Flora / Fauna 10 | Start | 740538 | 6541973 |
| | Flora / Fauna 11 | Start | 734655 | 6536360 |
| | Flora / Fauna 12 | Start | 740402 | 6532837 |
| | Flora / Fauna 13 | Start | 745093 | 6528963 |
| RAM, Jessup, Birds, Canopy Cover | Flora / Fauna 17, CC17A | Start | 739269 | 6536920 |
| | Flora / Fauna 18, CC18A | Start | 739350 | 6537556 |
| | Flora / Fauna 19, CC19A | Start | 739621 | 6539504 |
| | Flora / Fauna 20, CC20A | Start | 739950 | 6541083 |
| Canopy Cover | CC17B | Start | 739265 | 6536929 |
| | CC18B | Start | 739345 | 6537556 |
| | CC19B | Start | 739676 | 6539434 |
| | CC20B | Start | 739959 | 6541060 |
| RAM, Birds | Flora / Fauna 21 | Start[1] | 722657 | 6531233 |
| | Flora / Fauna 22 | Start[1] | 718006 | 6529448 |
| Landscape Function Analysis | LFA Site 1 Aerodrome Laydown (Aerodrome) | Start | 733020 | 6534295 |
| | | End | 733063 | 6534316 |
| | | Start | 733052 | 6534277 |
| | | End | 733068 | 6534319 |
| | LFA Site 2 Ventia (Office) Laydown (Ventia)[2] | Start | 736103 | 6540338 |
| | | End | 736103 | 6540391 |
| | LFA Site 3 Midway Quarry Laydown (Midway Quarry) | Start | 729264 | 6533139 |
| | | End | 729291 | 6533097 |
| | | Start | 729307 | 6533163 |
| | | End | 729335 | 6533123 |
| | LFA Site 4 Tjungu to WAR | Start | 734595 | 6536191 |
| | | End | 734631 | 6536219 |
| | | Start | 734631 | 6536219 |
| | | End | 734673 | 6536252 |

[1]Refer Jacobs (2019) for further detail; [2]Transect A Start Easting 736070 Northing 6540392, End Easting 736069 Northing 6540392 discontinued in 2024 due to transect being 50% graded and used as temporary laydown area for widening of the adjoining road. The remainder of the transect contained no plants.

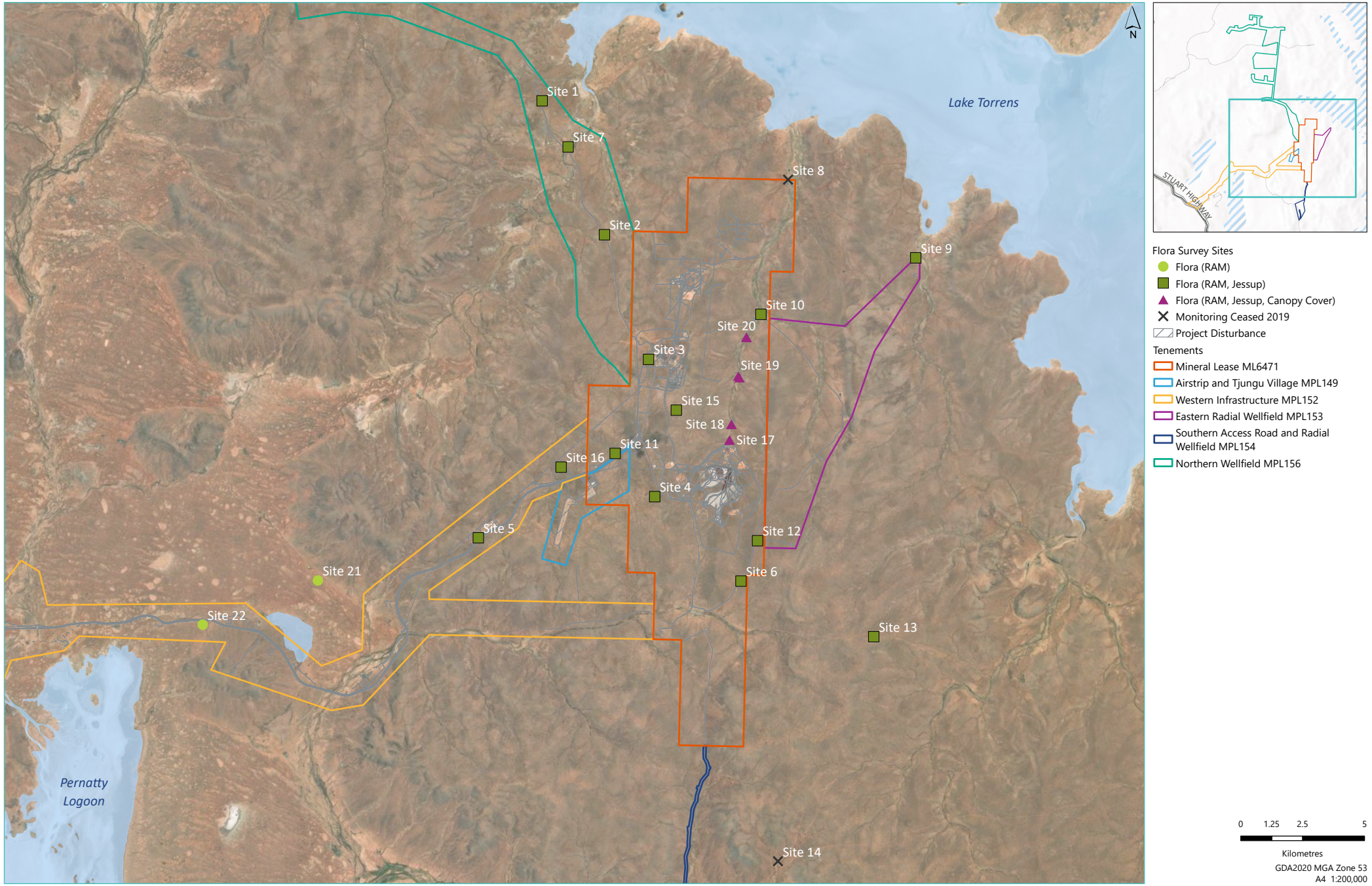



**Figure 2.1: Location of Flora Sites**
**Carrapateena Flora and Fauna Survey**

LATHWIDA

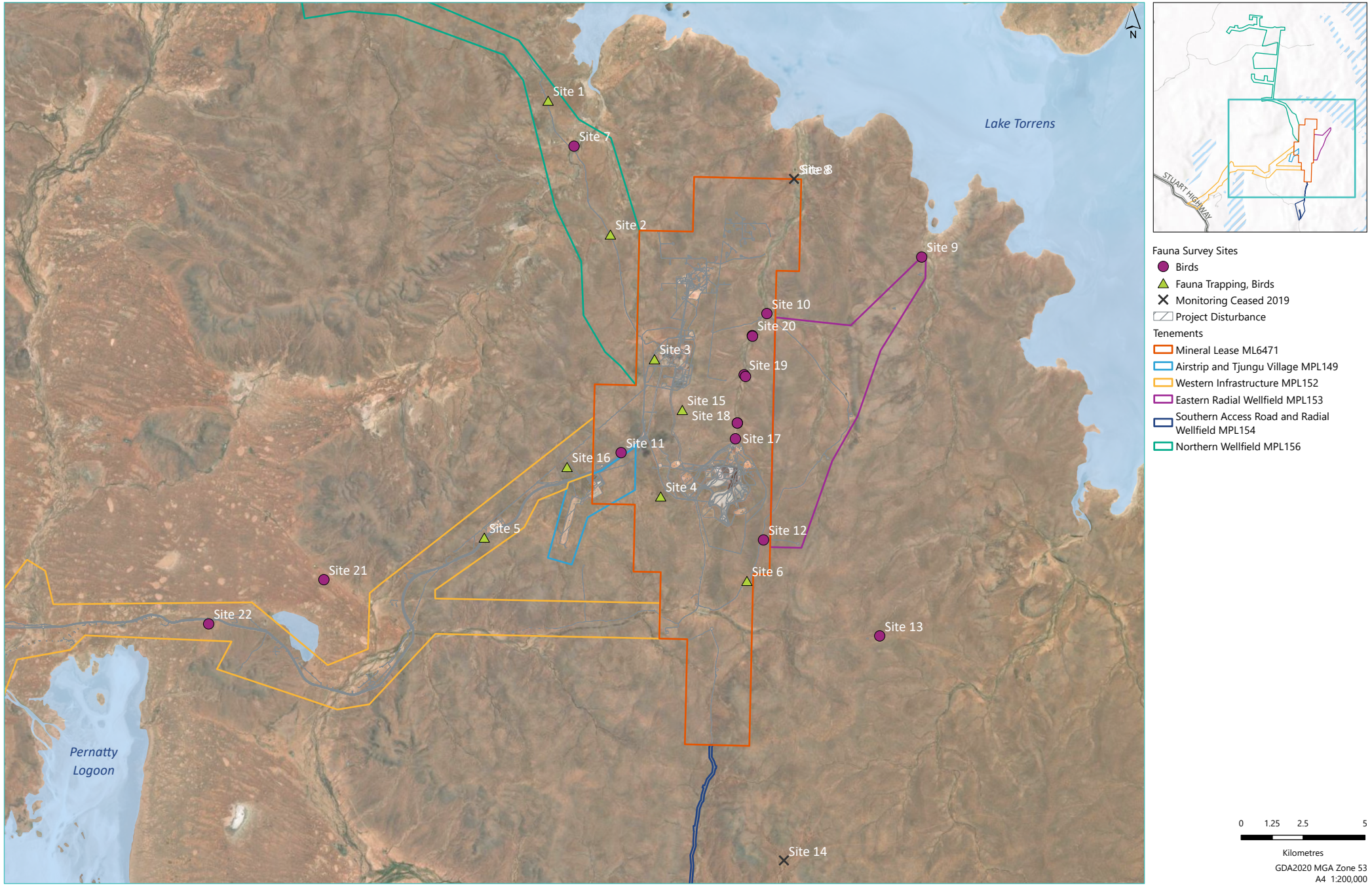
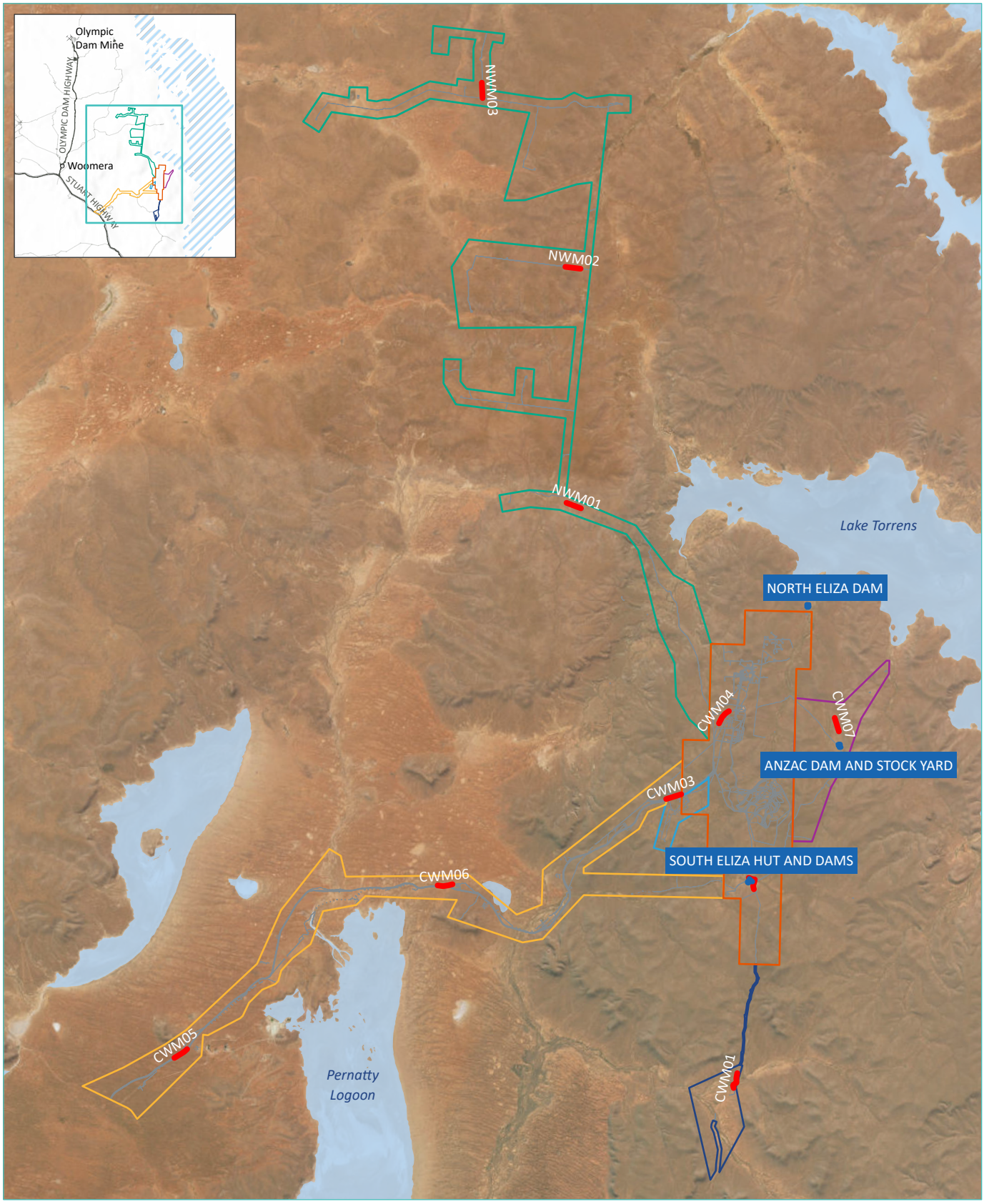



**Figure 2.2: Location of Fauna Sites**
**Carrapateena Flora and Fauna Survey**

LATHWIDA




Weed Transect
Dam Locations
Project Disturbance

Tenements

Mineral Lease ML6471
Airstrip and Tjungu Village MPL149
Western Infrastructure MPL152
Eastern Radial Wellfield MPL153
Southern Access Road and Radial Wellfield MPL154
Northern Wellfield MPL156

N

0 2.5 5 10

Kilometres

GDA2020 MGA Zone 53
A4 1:350,000

**Figure 2.3: Location of Weed transects**
**Carrapateena Flora and Fauna Survey**

LATHWIDA

### 2.3.1 Nomenclature

Survey site naming conventions remain as per previous spring surveys (Jacobs 2019a, 2020a, 2021, 2022, 2023a). It is noted that throughout this report, a simplified version of site names is often used e.g. Site 1, whereas CAR001 is the code used for data permit (refer Section 2.7) and the Carrapateena database.

### 2.3.2 Designation of control sites and impact sites

Survey sites are assigned to be either a control site (no detectable impact from mining considered likely) or an impact site (impacts on flora and/or fauna from mining activities considered possible). All sites on Eliza Creek, downstream of the tailings dam, were considered to be possible impact sites, due to potential changes in groundwater and / or surface water impacting vegetation, and the analysis of potential impacts here will be a comparison of results over time, and with distance from the Tailings Storage Facility (TSF) embankment.

For other sites, impacts on flora and / or fauna were considered to be most likely due to increased dust, noise and / or increased vehicle presence, and for sites near the airstrip, also aerial collision of birds with aircraft. For non-Eliza Creek sites, there were considered to be potential impacts from mining activities if the site was < 2 km from infrastructure. Distances > 2 km were considered unlikely to be impacted by possible raised dust (e.g. based on air quality modelling), noise and / or increased vehicle presence, and as such, sites located > 2 km from infrastructure (including roads) were designated as control sites for future comparison.

The initial designation in 2018 assumed the Western Access Road (WAR) would be a major thoroughfare, complete at the time of the 2022 and 2023 surveys, the Midway Quarry adjacent site 5 and the WAR (but is being progressively rehabilitated) and site 22 (sand dune site) is also adjacent the WAR. Site 6 located 1.5 km off the Southern Access Road (1.5 km from South Eliza Dam), but 2.4 km from the south-eastern edge of the TSF has been swapped to a control site in 2024 due to the Southern Access Road no longer being widely used, and being hydrogeologically distant and over 2 km from the TSF. Compliance monitoring to date has shown that sites 1.5 km from roads have not been impacted by mining activities and no change in flora of fauna is expected due to the lower vehicle activity on the SAR. Similarly, Site 4 is < 300 m from the Southern Access Road and former gatehouse, but also remains 1.5 km from the TSF. Again, compliance monitoring to date has demonstrated no impact from mining activities on flora and fauna at this site and no changes are anticipated in future, due to reduced vehicle use of the SAR. Hence this site has also been swapped to a control site.

A site summary, including distance from infrastructure and designation as control or impact, is provided in Table 2.3 below. Control sites were Sites 1, 2, 7, 9, 13 and 21, from 2012 to 2023, but also included Site 4 and 6 in 2024, given the reduction in potential impact, as a result of the reduced use of the SAR. Impact sites for the 2024 survey were sites 3, 5, 10, 11, 12, 15, 16, 17,18, 19, 20 and 22 (Site 4 and 6 were swapped to Control in 2024). Site locations relevant to infrastructure, including roads are provided in Figure 2.4 and Figure 2.5 below. It is noted that degree of impact varies and all sites are close to roads or tracks, but some have lower levels of traffic (e.g. Site 12). Regardless data is assessed for trends and if trends emerge further analysis is undertaken where necessary.

Rehabilitation sites (LFA sites) were assessed in 2024 as at the Aerodrome Laydown (LFA Site 1 / Aerodrome), Ventia Laydown (LFA Site 2 / Ventia), Midway Quarry Laydown (LFA Site 3 / Midway Quarry) and Tjungu to WAR Laydown (LFA Site 4 / Tjungu), with two transects at each site, noting only one transect was assessed at the Ventia site in 2024 (refer Table 2.3, Figure 2.6 and Section 2.5 for further information).

Weeds have been recorded at standard flora sites, designated weed transects, targeted sites (dams and villages), and opportunistically. Details of weed transect relative locations and habitat are provided in Table 2.4.

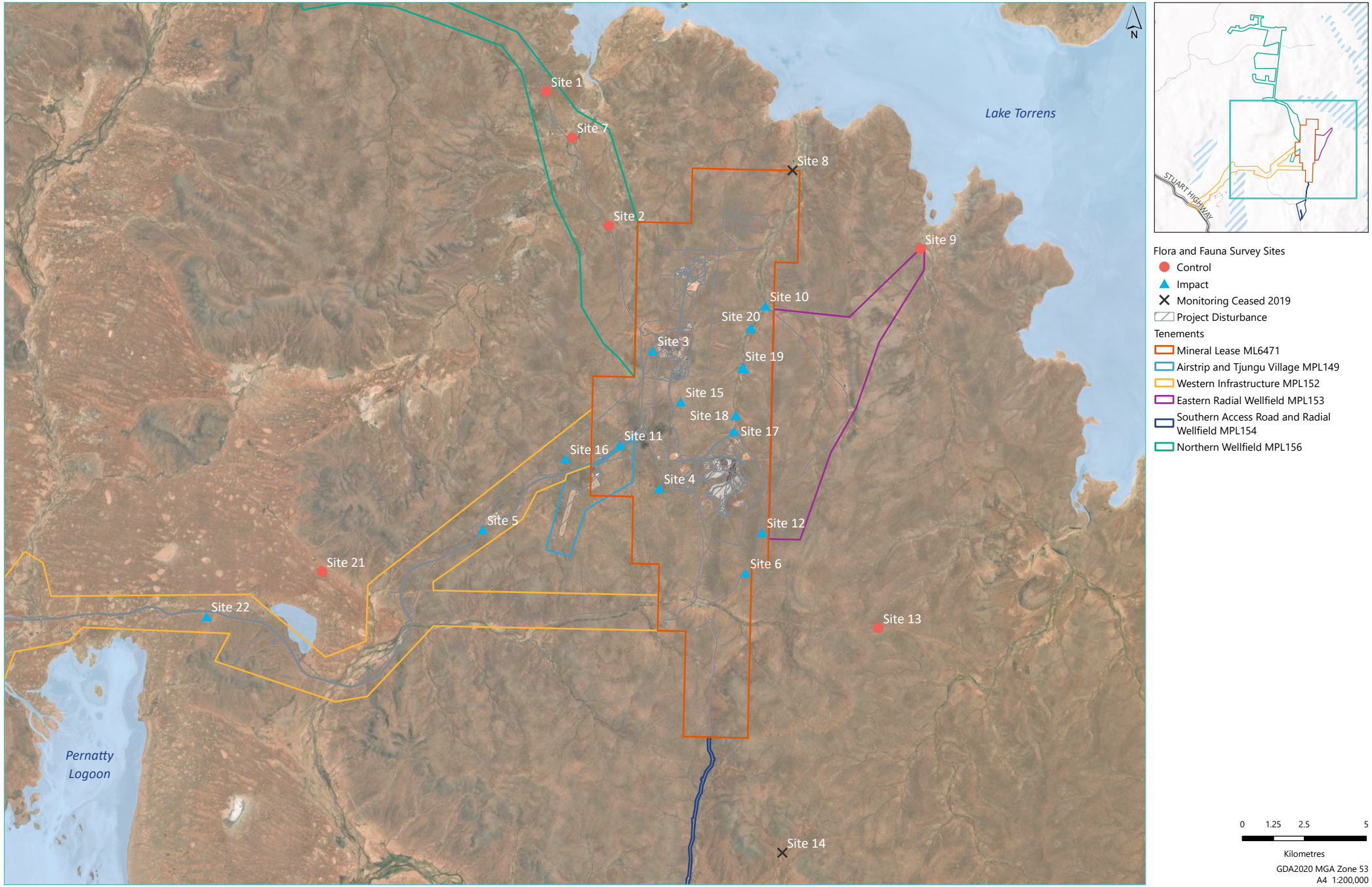



**Figure 2.4: Carrapateena Control and Impact Sites (Baseline to 2023 Original Treatment)**
**Carrapateena Flora and Fauna Survey**

LATHWIDA

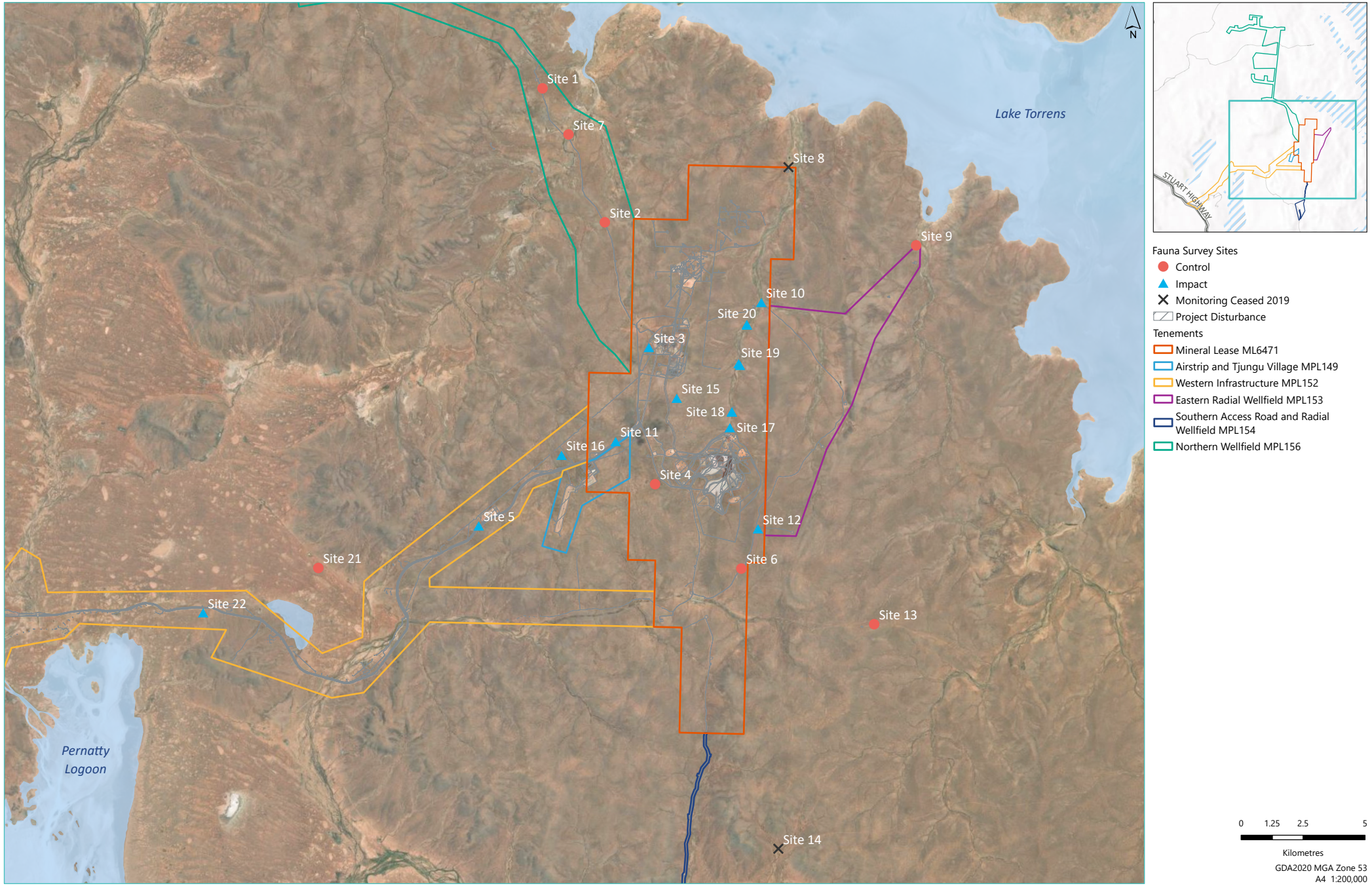



**Figure 2.5: Carrapateena Control and Impact Sites (2024 Updated Treatment)**
**Carrapateena Flora and Fauna Survey**

LATHWIDA

**Table 2.3: Summary of survey sites, and designation as control or impact**

| Site | Vegetation Association | Landform | Distance from Infrastructure | Site Type |
|---|---|---|---|---|
| Flora / Fauna Site 1 (CAR001) | Bladder Saltbush (*Atriplex vesicaria*) Low Open Shrubland | Stony Tableland with shallow drains | 7 km from Drill pad, and outside lease area, adjacent northern wellfield road (Khamzin) | Control |
| Flora / Fauna Site 2 (CAR002) | Bladder Saltbush Low Very Open Shrubland | Stony Tableland | Approximately 2 km west of Drill Pad, adjacent northern wellfield road (Khamzin). Depending on future traffic volume these sites may need to be considered impact in the future. | Control |
| Flora / Fauna Site 3 (CAR003) | Bladder Saltbush / Samphire (*Tecticornia medullosa*) Low Open Shrubland | | Southern Access Road, adjoining western edge of Processing Plant and approximately 2 km SW of Expo Village. | Impact |
| Flora / Fauna Site 4 (CAR004) | Bladder Saltbush +/– Samphire Low Open Shrubland | | Approximately 1.5 km west of tailings dam. Approximately 300 m from Southern Access Road. With the completion of the WAR, the SAR now receives very little vehicle use. Further it is hydrogeologically disconnected from the TSF. Hence, in 2024, Site 4 was changed from being an Impact site to a Control site. | Control |
| Flora / Fauna Site 5 (CAR005) | | | Western Access Road. Site begins about 40 m from WAR. Site is at least 3.5 km from airstrip | Impact |
| Flora / Fauna Site 6 (CAR006) | Bladder Saltbush Low Open Shrubland | | 1.5 km east of South Eliza Dam / SAR.<br>2.4 km from south-eastern edge of tailings dam.<br>With the completion of the WAR the SAR now receives very little vehicle use. Further it is hydrogeologically disconnected from the TSF. Hence, in 2024, Site 6 was changed from being an Impact site to a control site. | Control |
| Flora / Bird Site 7 (CAR007) | | | 100 m west of Hilson Creek and 3 km south of Lake Torrens. 5 km north-west of Drill Pad | Control |
| Flora / Bird Site 9 (CAR009) | Western Myall (*Acacia papyrocarpa**) Tall Open Shrubland on minor drainage line over Bladder Saltbush Low Open Shrubland | Minor drainage line (150m west of junction with Tadpole Creek) / adjoining stony plain. Approximately 1.5 km from Lake Torrens. | 12 km north-east of tailings dam. 600 m from Radial Pipeline. | Control |
| Flora / Bird Site 10 (CAR010) | Northern River Red Gum (*Eucalyptus camaldulensis* ssp. *arida*) Low Open Woodland | Eliza Creek, junction with major tributary. 8 km south of Lake Torrens. | Approximately 5.5 km downstream of tailings dam | Impact |
| Flora /, Bird Site 11 (CAR011) | Bladder Saltbush Low Open Shrubland fringed by Western Myall | Stony Tableland and Minor Drainage Line | Approximately 1.5 km from Southern Access Road junction.<br>200 m west of lay down area, and 40 m from Western Access Road. 2 km northeast of Tjungu Accommodation Village. | Impact |
| Flora /, Bird Site 12 (CAR012) | Bladder Saltbush) Low Open Shrubland | Stony Tableland | Approximately 0.8 km east of the Tailing Dam's mid-eastern boundary | Impact |
| Flora / Bird Site 13 (CAR013) | Bladder Saltbush +/- Samphire Low Open Shrubland | | Adjoining minor vehicle track, approximately 15 km SE of mining village.<br>Approximately 6 km SE of Tailings Dam and 6 km from Radial Pipeline. | Control |
| Flora / Fauna Site 15 (CAR015) | Bladder Saltbush Low Open Shrubland | | Approximately 1.5 – 2 km south of processing plant and 650 m from Explosives Magazine. | Impact |
| Flora /, Fauna Site 16 (CAR016) | | | Approximately 1 km north west of Tjungu Accommodation Village and airstrip and 500 m north of Western Access Road. | Impact |
| Flora / Bird Site 17 (CAR017) | Western Myall Low Open Woodland) | Major Drainage Line / Eliza Creek | 230 m north of the Tailings Storage Facility Decant Dam Embankment | Impact |
| Flora / Bird Site 18 (CAR018) | | | 870 m north of the Tailings Storage Facility Decant Dam Embankment | Impact |
| Flora / Bird Site 19 (CAR019) | Northern River Red Gum* Low Open Woodland | | 3 km north of northern bank of tailings dam on Eliza Creek. 730 m from Injection Well. | Impact |
| Flora / Bird Site 20 (CAR020) | | | 5 km north of northern bank of tailings dam on Eliza Creek and 470 m from Injection Pipeline. | Impact |
| Flora / Bird Site 21 (CAR021) | Umbrella Bush (*Acacia ligulata*) Tall Shrubland | Sand Dune | >2 km from WAR | Control[1] |
| Flora / Bird Site 22 (CAR022) | Umbrella Bush shrubland over Sandhill Cane-grass (*Zygochloa paradoxa*) Hummock Grassland | | 150 m from Western Access Road | Impact |

| Site | Vegetation Association | Landform | Distance from Infrastructure | Site Type |
|---|---|---|---|---|
| LFA Aerodrome Laydown (LFAAL1A-B) | Formerly Bladder Saltbush Low Open shrubland | Stony Plain | 10 m from airport road, 100 m from airport | Impact |
| LFA Ventia Laydown (LFAVOL2A-B) | Formerly Bladder Saltbush / Samphire Low Open Shrubland | Stony Tableland | 5 m from road, 100 m from processing plant | Impact |
| LFA Midway Quarry Laydown (LFAQUA3A-B) | | | Western Access Road (40 m in), west of Mid-way Quarry | Impact |
| LFA Tjungu to WAR Laydown (LFATJU4A-B) | Formerly Bladder Saltbush (Low Open Shrubland | | Western Access Road, approximately 1.5 km from Southern Access Road junction. | Impact |

*Refer Appendix B for explanation of taxonomy; [1]Refer Jacobs (2019) for additional detail about change of site location

**Table 2.4: Weed Transects location and habitat**

| Transect | Road | Habitat |
|---|---|---|
| CWM01 | Southern Access Road (SAR) | Gibber stony tableland is dominant, but the transect also includes creeks and culverts |
| CWM02 | | |
| CWM03 | Western Access Road (WAR) | Gibber stony tableland |
| CWM04 | Access Road west of Administration and Processing area | Gibber stony tableland, includes "Ventia" LFA site |
| CWM05 | Western end of WAR | Mulga (*Acacia aneura*) woodland on sandy loam |
| CWM06 | WAR | Gibber stony tableland, dunes and minor creek |
| CWM07 | Minor road, north-east of Anzac Dam | Gibber stony tableland |
| NWM01 | Northern Wellfields Road | |
| NWM02 | | |
| NWM03 | | Drainage Line |

## 2.4 Techniques to address OMC

Table 2.5 summarises the survey techniques used in spring 2024 to assess each OMC. More detailed descriptions of each method (Jessup, RAM, Photopoints, Canopy Cover, Weeds) are provided in the 2018 -2022 reports (Jacobs 2018a, 2019a, 2019b, 2020a, 2021a, 2022a, 2023a).

At each Flora site where a RAM (NVC 2024) was undertaken, it was within a 1 ha area. For the stony tableland sites (1 – 7, 9, 11–13, 15 and 16) this was a survey of 100 m x 100 m plot, 50 m either side of the line joining the start and end of the Jessup transect. For the Eliza Creek sites (Flora Site 10, Flora sites 17 – 20) the one-hectare survey was confined to vegetation considered to be under the influence of the creek landform and water regime.

As per spring 2019 – 2023 surveys, Jessup surveys were not undertaken at Site 21 and 22 (sand dunes), given the sand dune sites were not marked in the field (due to potential heritage values). The RAM survey area at Sites 21 and 22 is an area centred on the site coordinate, with a 55 m radius (namely a circular area of approximately 1 ha).

As per 2021 to 2023 reporting, Canopy Cover results include data from spring 2018 onwards, given alterations in transect alignment from initial establishment in autumn 2018. For Canopy Cover sites, densitometer results are provided for individual transects at each site, as well as mean data results for the two transects at a site. Canopy Cover intactness is calculated as the extent of the individual tree's live canopy at the time of the survey compared to the potential extent of the canopy for a fully healthy tree.

Weed transect refinements were required at some locations in spring 2024. Due to realignments and substantial widening of the WAR since the initial weed transects were established, survey point locations along the transect have varied. In 2024, new coordinates were recorded for the start, 250 m, 500 m, 750 m and end (1000 m) locations. The distances (250 m, 500 m, 750 m and 1000 m) represent the distance in a straight line from the start of the transect and not necessarily the distance along the road (some transects have bends/curves). For the SAR and WAR roads, two photographs are taken on both sides of the road, photo bearings being parallel with the road (i.e. four photos at each survey location). The area surveyed is a semicircle on either side of the road with a radius of 50 m beginning from the carriageway (the surveyed area includes the road shoulder/verge). For weed transects on the Northern Wellfield Road and narrow tracks (CWM04 and CWMO7), the area surveyed is a circle with a 50 m radius from centre of road.

**Table 2.5: Survey techniques used in spring 2024 to address Outcome Measurement Criteria**

| OMC Code | Outcome Measurement Criteria (OMC) | Technique / data collection strategy to determine if obligations are being met |
|---|---|---|
| SWRF1 | Annual surveys undertaken by an independent and suitably qualified expert demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependent ecosystems at Eliza Creek monitoring (Figure 9.2, Figure 9.3 of the PEPR) attributed to reduced surface water flows caused by mining operations when compared to baseline conditions (Appendix C6 Ecological Baseline and surveys for new sites undertaken prior to commencement Stage 1 Tailings commissioning). | RAM survey x five sites on Eliza Creek (0.23 km, 0.87 km, 3 km, 5 km and 5.5 km) at increasing distance (downstream) from the northern bank the TSF dam. Results assist with distinguishing grazing impacts from other causes of defoliation / plant damage, provides inventory of species present and detection of any loss of diversity. Abundance data allows detection of changes in native and introduced species, with repeat monitoring.<br>Jessup (DENR 2011) and Canopy Cover transects at the same location as RAM sites. One Jessup transects at each of the five sites. Provides information on population structure of long-lived perennials, including recruitment.<br>Eight canopy Cover sites (2 parallel transects at each of the five sites) to assess possible impacts on tree health due to potential higher watertable, reduced surface water flows and / or tailings seepage. Comparing the total number of GRS densitometer foliage records along a transect over time provides an indication of changes in total canopy volume. Canopy data recorded from 100 points at each location. One transect representing instream habitat and one representing bank habitat.<br>In summary, Jessup, Rangeland Assessment and Canopy Cover Assessment provides detailed information on plant species diversity, abundance and health at each site: vegetation structural layers, population data for woody perennials (number of adults and number of juveniles), and grazing impacts on woody perennials, plus notes on existing disturbance agents at each site. |
| TSF6 | Annual surveys undertaken by an independent and suitably qualified expert demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependent ecosystems at Eliza Creek monitoring sites (Figure 9.2, Figure 9.3 of the PEPR) attributed to tailings seepage when compared to baseline conditions (Appendix C6 Ecological Baseline and surveys for new sites undertaken prior to commencement Stage 1 Tailings commissioning). | |
| WP1 | Annual flora and fauna surveys undertaken by suitably qualified and experienced ecologists at flora (including weeds) and fauna monitoring locations (Figure 9.2, Figure 9.3 and 9.4 of the PEPR) demonstrates no introduction of new species of weeds declared or listed under relevant legislation, plant pathogens or pests (including feral animals) as a result of mining related activities when compared to previously recorded weed species and introduced fauna.<br>Annual flora and fauna surveys undertaken by independent and suitably qualified ecologists at flora (including weeds) and fauna monitoring locations (Figure 9.2, Figure 9.3 and 9.4 of the PEPR) demonstrates no increase in the abundance of existing weeds or pest species in the land compared to previous survey records as a result of mining related activities | The four Weed Transects surveyed during baseline from 2013 to 2016 re-surveyed (CMW01-CMW04). Namely, for each weed transect, the abundance and cover of all weeds recorded at 5 locations (250 m intervals, 50 m radius) along a 1000 m transect).<br>Additional weed transects established along the WAR (CMW05, CWM06) and near Anzac Dam (CWM07) to monitor potential impacts along the WAR and the eastern wellfield.<br>Additional weed transects established along Northern Wellfields Road to monitor potential impacts from dust due to mine vehicle traffic (NWM01, NWM02 and NWM03).<br>Opportunistic records of all weed species made whilst moving around the whole mine site in general. Weed location, habitat, and weed population size and extent recorded. In addition, active searches of areas with a high potential for weed establishment also undertaken (e.g. dams, spill areas, and effluent irrigation areas adjacent the Exploration Village and the Tjungu Village). |
| WP2 | | |
| AQ2 | Annual surveys undertaken by a suitably qualified and experienced expert demonstrates no adverse impact on the diversity and abundance of native vegetation at monitoring sites (Figure 9.3 Flora of the PEPR) directly attributed to dust deposition from mining operations or mining related activities when compared to baseline native vegetation conditions (Appendix C5 Ecological Baseline of the PEPR). | Jessup Transects x 14 sites, RAM x 14 sites with the addition of collecting species cover and abundance information using both the Crown Separation Ratio scale.<br>Jessup and RAM at the same location. Undertaken at the existing 14 of the 16 baseline flora site locations to enable comparison. Additional sites along the WAR within dune habitat that was not covered by the existing baseline data (namely, sites 21 and 22, RAM only). |
| EPBC1 | Future records of Thick-billed Grasswren are to be provided to the Biological Database of South Australia BDSA to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites ((Figure 9.2, Figure 9.3 and 9.4 of the PEPR)) | Bird surveys conducted at 14 of the 16 baseline bird monitoring sites, as well as at the 4 Eliza Creek flora sites and the 2 WAR dune sites. Opportunistic records of Thick-billed Grasswren to be recorded.<br>All records of Thick-billed Grasswren will be forwarded to Department for Environment and Water (DEW) as part of the Permit reporting requirements, which will then be uploaded into the BDBSA. |
| EPBC2 | Future records of Plains Mouse are to be provided to the Biological Database of South Australia BDSA to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites (Figure 9.2, Figure 9.3 and 9.4 of the PEPR) | Fauna surveys conducted at each of the eight baseline sites as per autumn 2017. Pitfall traps and un-baited cameras used to detect any Plains Mouse captures in spring 2024, aligning with the later years of the baseline surveys. |
| EPBC3 | Future records of Night Parrot are provided to the Night Parrot Recovery Team to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites (Figure 9.2, Figure 9.3 and 9.4 of the PEPR) | Bird surveys are undertaken as part of annual survey.<br>(none detected to date during compliance monitoring). |
| LUP4 | Rehabilitation trials shall be undertaken at infrastructure locations no longer required and ongoing assessment at LFA monitoring at sites (Figure 9.3; CEF1-7 of the PEPR) are assessed annually demonstrating development of trends and annual improvement of rehabilitation through LFA methodology. Should the data indicate rehabilitation not trending towards sustainability root-cause investigations will be undertaken and rectification methods be identified and implemented | Following site rehabilitation, LFA is being undertaken within rehabilitation zones, and comparable data from these sites is being compared with baseline data, and future more relevant control sites will be established.<br>Four LFA sites established. |

Refer Appendix C for additional detail about species classification and long-lived and short-lived, flora taxonomy and identification.

## 2.5 Landscape function

### 2.5.1 LFA sites

To meet the requirements of Outcome Measurement Criteria (OMC) LUP4 in the PEPR (Table 1.2), Landscape Function Analysis (LFA) monitoring was conducted at four sites in October 2024. LFA measures various processes that contribute to the formation of self-sustaining ecosystems and can be used to monitor revegetation post-impact (Tongway & Hindley 2005). The data collected during the October 2024 survey represents the sixth year of data collection for the two sites established in 2019 and third year for the two sites established in 2022.

Initially, two rehabilitation areas were selected by BHP for LFA assessment prior to the 2019 survey: a laydown area adjacent to the operational Carrapateena airport (referred to as the Aerodrome Site in this report) and a second laydown area adjacent to the Carrapateena Mine Processing Plant (referred to as the Ventia Site in this report). Prior to the Spring 2019 survey, the rehabilitation sites were contour ripped to create troughs ('patches') for nutrients and water to accumulate and facilitate regeneration and revegetation; Aerodrome – June 2018, Ventia Laydown August-September 2019. The objective of subsequent LFA surveys (2019 to present) was to measure the success of returning the sites to sustainable pre-impact levels of landscape function. The two sites established in spring 2022 are both on the WAR, one adjacent the Midway Quarry that was used for WAR construction and one near the Tjungu Village (opposite Flora Site 11).

The Midway Quarry site is situated west of the WAR on a northwest facing gentle slope with two transects (3A and 3B) installed in a northwest facing direction (perpendicular to the WAR) with Site 3A slightly southwest of and parallel to transect 3B. The Tjungu village site is situated on the south-eastern side of the WAR on a north-east facing moderate slope which extends down to a minor drainage line. Both sites were deeply ripped prior to the 2022 survey. The Tjungu site was hand seeded three months prior to the September 2022 survey, whilst the Midway Quarry site was not seeded, trialling natural recruitment / regeneration. The surface at both sites comprises large flat broken rock in deeply ripped contours, more irregular at the Midway Quarry site.

For the initial surveys of all sites, the LFA Bank and Trough assessment method was undertaken for the new sites as they comprised only non-vegetated rip lines (refer Jacobs 2023h). By the second or third survey, the ripped troughs had levelled out and sufficient vegetation had established to convert to the Established method, whereby patches comprised plants and inter-patches comprised soil/rocks. The rehabilitation of the four areas has been monitored using two complementary methods: the LFA, following the established method, supplemented by the Point-centred Quarter (PCQ) method during the early phase of colonisation and succession (Tongway and Hindley 2005). Jacobs (2023h) provides a summary of the methodologies applied and reasoning for the change. Table 2.6 provides a summary of where the different approaches have been applied to date. For LFA transect coordinates and location refer Table 2.2 above and Figure 2.6.

Section 2.5.2 and 2.5.3 below provides a summary of the methodologies applied and reasoning for the change. Table 2.6 provides a summary of where the different approaches have been applied to date.

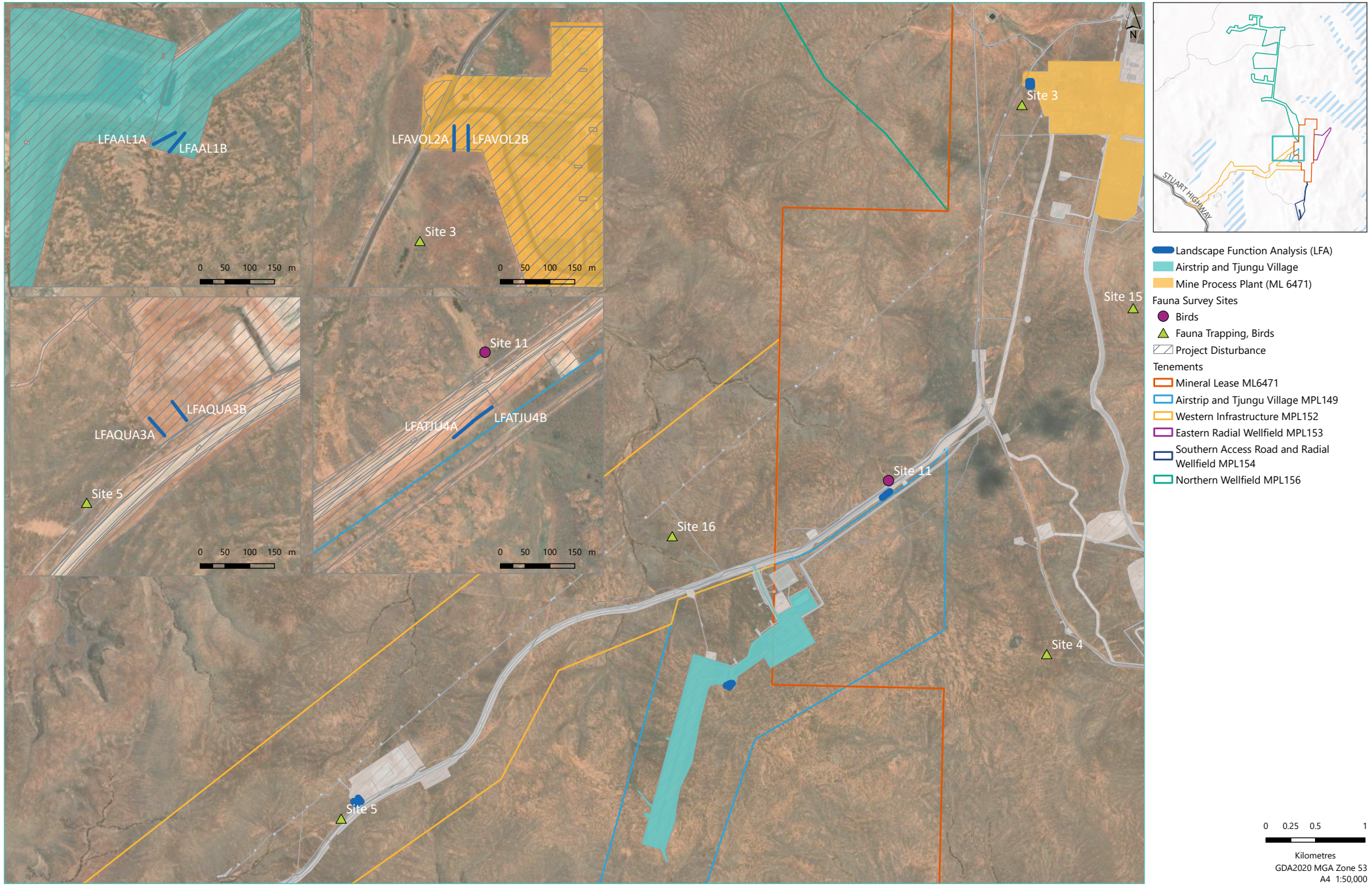



**Figure 2.6: LFA Sites, Aerodrome Laydown (LFAAL), Ventia Laydown (LFAVOL), Midway Quarry (LFAQUA), Tjungu (LFATJU)**
**Carrapateena Flora and Fauna Survey**

LATHWIDA

### 2.5.2 The LFA established method

The methodology used during compliance monitoring for the LFA 'Established Method' is as described in Department for Manufacturing, Innovation, Trade, Resources and Energy (DMITRE) (2013). At each site, two fixed transects have been established, 50 m in length (Table 2.2). Directly beneath the transect line, the zones that occur are classified as a patch (represented by a plant/s with overlapping canopies or other resource-accumulator such as litter or logs), or interpatch (e.g. rocky surface, or bare ground). All short-lived and long-lived perennial species have been included as patches. Short-lived perennials, particularly *Sclerolaena* species, comprise a large proportion of the groundcover in the LFA site natural habitat.

### 2.5.3 Supplementary vegetation sampling using the Point-centred Quarter (PCQ) Method

Rehabilitation in semi-arid Australia is expected to be slow. In the early phase, plants may colonise in low abundance, or a clumped pattern, making it difficult to representatively sample using a fixed transect (Tongway and Hindley 2004). To supplement the LFA Established Method, the PCQ Method was used.

The fixed transects were dived into regular intervals: 10 m, 20 m, 30 m, 40 m and 50 m. At each point, the nearest long-lived perennial or biennial plant up to 10 m away was located within each of four quadrants. No data was recorded for a quarter where there were no perennial or biennial plants within 10 m of the sample point that had not already been sampled for a prior quadrant (Tongway and Hindley 2005).

For each transect the mean distance between plants, and plant density per 100 $m^2$ were derived from the PCQ data. It is anticipated that the mean distance between plants would decrease (as more plants become established), while the plant density would increase. A summary of the different methods of data collection that have been applied for LFA at the Carrapateena site is presented below in Table 2.6.

**Table 2.6: Summary of methods used to date for Landscape Function Analysis at Carrapateena**

| Survey | Sites | LFA Bank & Trough Method | LFA Established Method | LFA Soil Surface Assessment (SSA) | Point-centred Quarter (PCQ) method |
|---|---|---|---|---|---|
| 2013 /2014 Baseline (EBS) | 6 analogue sites | Nil | All 6 sites | X | Nil |
| September 2019 (Jacobs) (newly ripped soil) | 2 sites with 2 transects each | 1A, 1B, 2A, 2B | | 1A, 1B, 2A, 2B | Nil |
| September 2020 survey (Jacobs) | | 2A | 1A, 1B, 2B | 1A, 1B, 2A, 2B | 1A, 1B, 2A, 2B |
| September 2021 (Jacobs) | | Nil | 1A, 1B, 2A, 2B | 1A, 1B, 2A, 2B | 1A, 1B, 2A, 2B |
| September 2022 (Jacobs) | 4 sites with 2 transects each | 3A, 3B, 4A, 4B | 1A, 1B, 2A, 2B | 1A, 1B, 2A, 2B | 1A, 1B, 2A, 2B |
| May 2023 (Jacobs) | | Nil | 1A, 1B, 2A, 2B<br>3A, 3B, 4A, 4B | 1A, 1B, 2A, 2B<br>3A, 3B, 4A, 4B | 1A, 1B, 2A, 2B<br>3A, 3B, 4A, 4B |
| October 2024 (Lathwida) | 3 sites with 2 transects each, 1 site with one transect | Nil | 1A, 1B, 2B, 3A, 3B, 4A, 4B | 1A, 1B, 2B, 3A, 3B, 4A, 4B | 1A, 1B, 2B, 3A, 3B, 4A, 4B |

## 2.6 Fauna survey method

### 2.6.1 Fauna trapping

As per 2018-2023 monitoring, fauna trapping was undertaken at eight sites, with groups of four sites monitored over two consecutive trapping periods. Each site was monitored for four days and four nights between 14 and 23 October 2024. Two sites were opened on 14 October, and two sites were opened on the 15 October which were closed on 18 and 19 October respectively, and a second round of sites was opened on 18 October and closed on 22 October. All equipment and flagging tape was removed from each site at the end of each survey, except for semi-permanent pits which remained in-situ with lids re-established, and screwed in with 'hex' screws to prevent animals entering the pits post monitoring. Trench lines for drift fencing between pit traps were backfilled.

The configuration at each site was as follows:

- A single pitfall line was opened from one of four semi-permanent baseline pit lines that are established at the eight fauna site (i.e. Sites 1-6, 15, 16), noting Site 5 only has three semi-permanent pit lines remaining, one being removed in 2019 due to a number pits with decreased integrity / holes in bases.
- Six pitfall traps were opened at each site, as required by the SA Vertebrate Survey Guidelines (Owens 2000).
- Each drift fence line, was approximately 80 m x 0.3 m, dug into the ground approximately 5-10 cm depth. Lines running across semi-permanent pitfall traps, 10 m apart (fence extending approximately 5 m either side of the first and last pitfall trap).
- The semi-permanent pitfall traps were 240 mm diameter (standard PVC 225 / 250 mm pipe - internal diameter 240mm) and 600 mm deep with a mesh base to allow water drainage were used to target small to medium sized mammals and reptiles.
- Two funnel trap pairs were placed evenly along each line.
- Two camera traps were established facing each trap line at open locations, with minimal vegetation to avoid accidental triggers (as per 2021).
- No Elliott traps, cage traps, HARP traps or ANABAT recorders were used.
- One Song Meter was established at a suitable location away from the trapping line, with the exception of Site 3 which is immediately adjacent the noisy processing plant. A Song Meter was established at Dawson Dam which is 0.5 km from Site 3.
- Refer spring 2019 report (Jacobs 2020a) for additional details.

### 2.6.2 Bird/bat detection

As per previous monitoring (2018 to 2023), bird surveys were undertaken at least once at each of the 20 survey sites (Flora sites 1 to 7, 9 to 13, 15 to 16, plus sites 17, 18, 19, 20, 21 and 22), for 30 minutes at each site within 2 hours of dawn. If weather conditions or timing were not considered optimal, repeat surveys were undertaken. Bird data was also collected opportunistically during multiple visits to the fauna trapping sites and when driving between sites, during flora surveys, at four dams, camps and at the two effluent irrigation areas.

In addition, in 2024 Song Meters were deployed at all fauna trapping sites, one dam and one creek site, in order to detect additional species that were not detected during the day or nocturnal / crepuscular species. Song meters were deployed for a minimum of 24 hours at each site. Desktop analysis was undertaken post field to determine whether any additional species were present. Such analysis involves ecologists reviewing images and calls of bird calls and bat calls and verifying species against recognised images.

Six Autonomous Recording Units (ARUs), of the Song Meter Mini Bat model (Wildlife Acoustics, 2022), were fitted with an acoustic stub microphone to enable recording of vocal bird species in the audible frequency range. They were deployed within areas of habitat considered suitable for detection of birds approximately 100-200m from fauna trapping lines. ARUs were configured to record in the acoustic mode: for one hour either side of both sunset and sunrise. In this configuration, for every 24 hours of deployment, each ARU captured 14 hours of acoustic recordings (birds) and 4 hour of ultrasonic records (bats).

Each ARU was affixed to a stake or other stable object using cable ties. All cable ties were clipped short to avoid the potential for whistling interference in high winds. This model of ARU is synchronised with the GPS reading from the user's smartphone to correctly set sunrise and sunset times. The location of each deployment was also marked using a GPS unit (IPAD).

#### 2.6.2.1 Acoustic analysis

ARUs recorded all data to Secure Digital (SD) cards. The data was then transferred to a laptop computer and backed-up to internal servers. All bird recordings were processed using Kaleidoscope Software for visual and acoustic assessment. Analyses for these deployments followed the procedure of analysing recordings for the presence of any fauna species by first detection using a combination of listening through in real time and high-speed visual spectrogram scanning. All audible taxa were noted in the order in which they appear in recordings. A total of 434 hours of recording were collected from 10 sites between 18-22 October 2024.

Bat data that was analysed included at total of 539 WAV format bat detector sound files from three recording sites over 8 recording nights (nights of 16 – 21 October 2024); Site 7, Site 10 (Eliza Creek) and South Eliza Dam).

The ultrasonic recordings provided were recorded in WAV sound format from Wildlife Acoustics Song Meter Mini Bat bat detectors. All sound files were inspected in Anabat Insight version 2.1.3 software and Adobe Audition version 23.1 (Specialised Zoological 2025, provided in Appendix F).

Species identifications were made based on measurements of characteristic frequency and observation of pulse shape, and with reference to information in Armstrong et al. (2021b, cited in Specialised Zoological 2025). Nomenclature follows Jackson and Groves (2015, cited in Specialised Zoological 2025). Distribution information for all bat species considered here was checked against the BatMap resource hosted by the Australasian Bat Society, Inc (https://www.ausbats.org.au/batmap.html) (Milne et al. 2023, cited in Specialised Zoological 2025).

### 2.6.3 Active reptile, track and scat search

Given the warmer conditions of the spring 2024 survey and the high number of reptile captures at fauna trapping sites, active reptile searches were not undertaken. Additional reptile species were also detected as part of opportunistic observations throughout the survey, and via camera trapping.

### 2.6.4 Spotlighting

As per previous monitoring (2018 - 2023), nocturnal searches were conducted at a subset of sites that were easier to safely access at night (e.g. Site 10 - Eliza Creek). Survey involved spotlighting with head-torches (LED), active searching and listening for nocturnal vertebrate species including Night Parrot and a bat species that are audible to the human ear (e.g. White-striped Free-tail Bat). Searches were undertaken for a minimum of 30 minutes at Site 10 and 20 minutes at the next drainage line by 4 observers / spotters. Noting the Camera Traps (one per site), and Song Meters were also collecting nocturnal images / acoustic data for four / one trap nights (respectively) at each of the eight fauna sites (Sites 1-4, 15, 16) and Site 10 Eliza Creek.

### 2.6.5 Opportunistic observations

Opportunistic observations make up an important component of a fauna survey and constitute any observations made while travelling around the Operations area, targeted searches at likely locations for fauna (e.g. dams), or between the survey sites. Any animals identified opportunistically, either via direct observation or by evidence, were recorded on fauna and flora data sheets with location and any useful notes. These species were added to site species lists if identified at a survey site, or to a general survey species list if from the broader Operations area (if not attributed to a particular habitat type).

Location details for the key opportunistic observation locations are provided in Table 2.7 and on Figure 2.3.

**Table 2.7: Key opportunistic survey site locations at Carrapateena**

| Location | Easting | Northing |
|---|---|---|
| Exploration Camp | 737500 | 6541120 |
| Exploration Village Effluent Irrigation Area (EV EIA) | 733550 | 6535200 |
| Anzac Dam | 743880 | 6539300 |
| Tjungu Village EIA (TV EIA) | 733700 | 6535306 |
| Dawson Dam | 735690 | 6541028 |
| North Eliza Dam | 741682 | 6547790 |
| South Eliza Dam | 737960 | 6529976 |
| Yeltacowie Homestead | 724430 | 6530245 |

*MGA zone 53. GDA1994

### 2.6.6 Identification

It is noted that some species have undergone taxonomic revision since earlier reports; where possible the common name follows the nomenclature of the Biological Databases of Australia flora and fauna taxonomy (DEW

The following reference material and taxonomic keys were used for species identification and classification:

#### Reptiles and Amphibians

- A Complete Guide to Reptiles of Australia 2nd edition (Wilson and Swan 2008)
- Reptiles and Amphibians of Australia (Cogger 2014)
- Key to the Geckos of South Australia (Hutchinson and Williams 2024a)
- Key to the Skinks of South Australia (Hutchinson and Williams 2024b)
- Key to the Snakes of South Australia (Hutchinson and Williams 2024c)
- Key to the Dragons of South Australia (Hutchinson and Williams 2024d)
- Key to the Goannas of South Australia (Hutchinson and Williams 2024e)
- Checklist of the Reptile and Frogs of South Australia (Hutchinson and Williams 2024f).

#### Birds

- The Field Guide to the Birds of Australia, 9th edition (Pizzey et al. 2012)
- Field Guide to the Birds of Australia, 8th edition (Simpson and Day 2010)
- eGuide to Birds of Australia, application (Morcombe 2011-2019, Version 1.6.2)
- The Australian Bird Guide. (Menkhorst et al. 2019)
- Annotated List of the Birds of South Australia (Horton et al. 2020)

- The compact Australian Bird Guide (Davies et al. 2022).

### Mammals

- A Field Guide to the Mammals of Australia (Menkhorst and Knight 2004)
- Mammals of Australia (Strahan 1995)
- Tracks, Scats and Other Traces (Triggs 2004)
- Key to Dasyuridae of SA (Kemper and Stokes 2020)
- Key to Muridae of South Australia (Kemper and Stokes 2021)
- Australian Bats (Churchill 2008).

### Plants

- PlantNET - NSW FloraOnline (2024)
- Plants of Western New South Wales (Cunningham et al. 1992)
- Field guide to the plants of outback South Australia (Kutsche et al. 2023).
- South Australian Seed Conservation Centre (2024)
- The Australasian Virtual Herbarium (AVH) (2024)
- Atlas of Living Australia (ALA) (2024).

## 2.6.7 Vouchering

No vouchering of fauna species was required, as all species captured had been sufficiently vouchered previously.

Flora vouchering was undertaken as per permits (2.2).

## 2.6.8 Fauna survey limitations

The limitations associated with this fauna survey, consistent with most fauna surveys, are as follows:

- The results of the fauna surveys are only a 'snapshot' in time and cannot describe seasonal variation or migrations on their own.
- Scats could not always be correctly attributed to species, however where they could be confidently identified, they provide an accurate indication of the presence and habitat preferences of certain species (Triggs 2004).
- Detection of nocturnal species by spotlighting potentially does not detect all of the animals present and is affected by environmental factors (Wayne et al. 2005).
- Read & Moseby (2001) concluded that environmental factors affected the capture rates of small reptiles. Unfortunately, planning logistics for fauna surveys around specific environmental conditions is very difficult. Planning to survey when weather conditions are generally favourable (as was done here) allows the best chance of favourable conditions during a survey and species

identification. It is noted that daily conditions were considered favourable for reptiles during this survey.

- Conditions for birds were suitable as the survey was undertaken in mid spring, however there were extreme windy and above average warm days (e.g. two days 36-40 degrees). Bird detection was also enhanced at each individual site with Song Meter deployment, and opportunistic observations from across the broader Operation area (e.g. dams, tracks, camps, creeks). Given many Song Meter files were wind affected, each site was analysed for one 24-hour period and at least two mornings.
- Similar to recent surveys, for camera traps, facing the camera towards open areas, without vegetation, or roads in the field of view are noted to produce less false triggers.

# 3 Results

## 3.1 Climate during and preceding survey

### 3.1.1 Rainfall preceding survey

Average yearly rainfall totals for the region are approximately 180 mm (BOM 2024b). The mean monthly rainfall totals are relatively consistent over the year, with a slight decrease generally observed during the late autumn and late winter months. In the years 2021, 2022, and 2023, annual rainfall at Woomera weather station totalled 155 mm, 381.4 mm and 173.2 mm respectively; 2022 being well above the long-term annual mean rainfall.

In the 12 months preceding the survey (01 October 2023 to 30 September 2024), the Carrapateena weather station recorded 157 mm of rain, 15% below the regional yearly average, due to mostly below average rainfall totals between January and June. This annual rainfall deficit was reported despite the two months, December and July, recording almost 40% of the total rainfall for this period. For all but July, monthly rainfall totals at Carrapateena and Woomera differed by less than 10 mm.

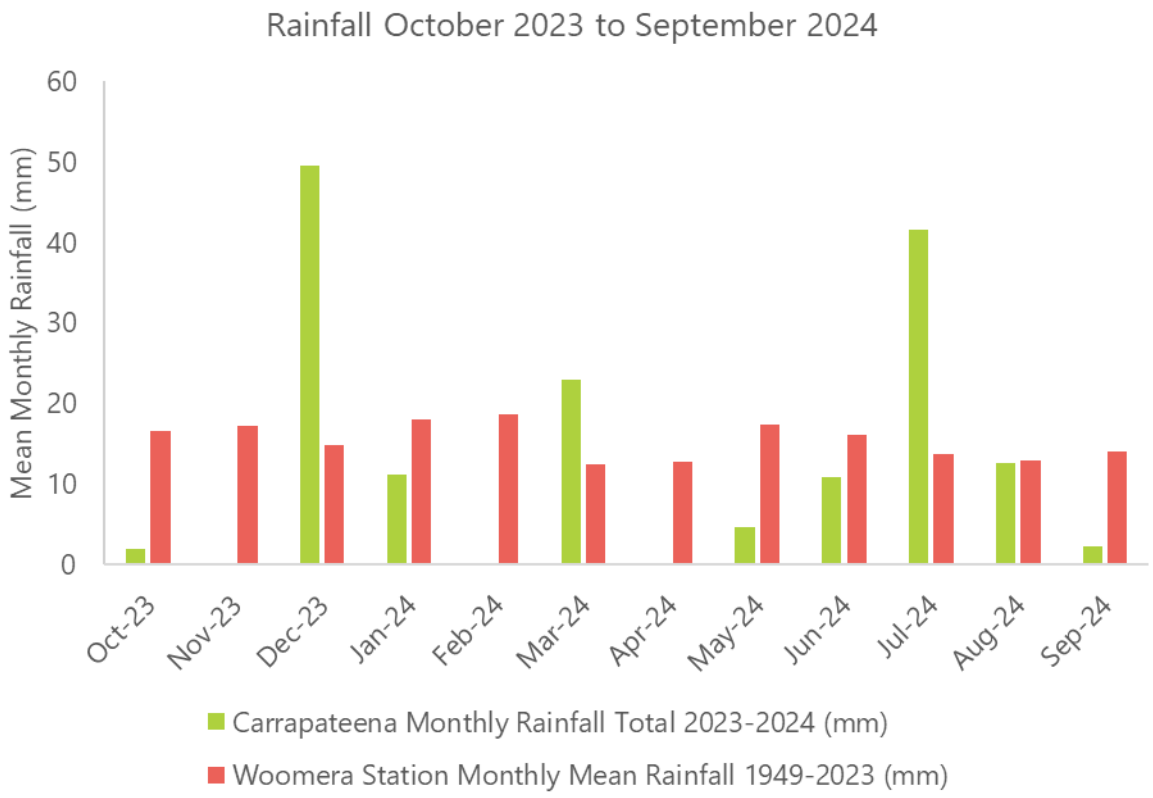



**Figure 3.1: Rainfall 12 months preceding the spring 2024 survey at Carrapateena (OZ unit – Vaisala WXT520) and regional long-term averages (1949-2024) at regional weather station nearest to site, Woomera Aerodrome**

### 3.1.2 Weather during survey

The weather conditions during the survey are summarised in Table 3.1 below, presenting data from the on-site weather station located near the Tailings Storage Facility (a Vaisala WXT520). Conditions (including overnight temperatures) were warm to hot, with the maximum daily temperatures ranging between 23.3°C to 40.5°C, and an average of 30.8°C for the survey period. These temperatures are higher than the average regional long-term maximum daily temperatures for October of 26.5°C (Woomera Aerodrome, BoM 2024a).

Minimum overnight temperatures were relatively mild and ranged from 11.2°C to 21.7°C, with an average of 17.6°C, notably higher than the long-term mean minimum temperature of 12.5°C for October (Woomera Aerodrome, BOM 2024a).

During the spring survey, average winds were light to moderate breezes each day, with average speeds ranging between 11.3 and 23.6 km/h. There was also a thunderstorm event, and strong winds on 17 October, with very few captures the following morning, as would be expected. These conditions are considered generally optimal for bird surveys and Song Meter deployment; excluding excessively windy periods. Overall conditions were considered generally suitable for fauna survey, and the warmer days likely increased reptile activity.

**Table 3.1: Field survey weather (Carrapateena All Weather Data Spring 2022)**

| Observation | 14-Oct | 15-Oct | 16-Oct | 17-Oct | 18-Oct | 19-Oct | 20-Oct | 21-Oct | 22-Oct | 23-Oct | 24 Oct |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Min temp (°C) | 20.89 | 21.66 | 20.77 | 20.17 | 15.21 | 11.24 | 15.24 | 20.56 | 19.68 | 15.59 | 12.35 |
| Max temp (°C) | 32.27 | 31.09 | 36.85 | 40.47 | 24.78 | 26.85 | 28.71 | 32.82 | 34.21 | 27.52 | 23.28 |
| Mean wind (km/h) | 15.20 | 17.00 | 21.40 | 22.00 | 23.60 | 17.70 | 14.00 | 11.30 | 15.90 | 18.90 | 21.00 |
| Rainfall total (mm) | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

## 3.2 Flora

### 3.2.1 Plant diversity

A general floristic description of each site is provided in the Carrapateena Ecology Survey – Autumn 2018 report (Jacobs 2018a). Representative photographs of each site during the spring 2024 survey are provided in Appendix A.

#### 3.2.1.1 Total species diversity: compliance monitoring period

In spring 2024, a cumulative total of 141 native flora taxa was recorded at the one-hectare RAM sites across the Carrapateena Operation area (Flora Sites 1-7, 9 – 13,15 – 22). This was the equal highest diversity recorded during the compliance monitoring period, that began in autumn 2018 (Table 3.2). During compliance monitoring, the total plant species diversity recorded at the flora sites has ranged from 111 species in spring 2018 to 141 species in both 2023 and 2024.

Since 2018, the variation in total species diversity has been almost entirely due to variations in short-lived species diversity (ranging from 52 to 83 species recorded), with long-lived perennial species diversity remaining within the narrow range of 58 – 62 species (Table 3.2). Pre-construction comparisons of total species diversity across the Carrapateena Operation area are not possible, as Sites 17 – 22 were established in 2018. A list of all species recorded in spring 2024, their frequency and their long-lived status is contained in Appendix B. A list of all species at each site, their abundance and grazing impact is contained in Appendix B2.

**Table 3.2: Total species diversity recorded at RAM sites during compliance monitoring period (construction and operation)**

| Life Span | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring | 2018 – 2024 range | 2018 – 2023 Mean, St Dev |
|---|---|---|---|---|---|---|---|---|---|---|
| Long-lived[2] | 58 | 59 | 61 | 59 | 62 | 60 | 58 | 60 | 58 – 62 | 60 (±1.4) |
| Short-lived | 58 | 52 | 75 | 80 | 57 | 74 | 83[1] | 81 | 52 – 83 | 70 (±12.4) |
| Totals | 116 | 111 | 136 | 139 | 119 | 134 | 141 | 141 | 111 – 141 | 130 (±12.3) |

[1] amended from 2023 report to remove duplicate records; [2] Long-lived woody perennials and long-lived grasses; rounded to nearest whole number

#### 3.2.1.2 Total species diversity at control/impact sites: baseline and compliance monitoring period comparison

Flora sites 1-7, 9-13 and 15-16 were surveyed in all years both during pre-construction (baseline) and during the construction/operational phase (compliance monitoring period). Hence these sites are suitable to compare species diversity during these phases. Species diversity at all individual sites in 2024 was within the baseline range for each site. In 2024, total native plant diversity at six sites was the highest recorded during compliance monitoring (Table 3.3). During both baseline and the compliance monitoring period, there has been a wide range in total plant diversity within all sites, however the remaining eight sites were still within the compliance monitoring range (Table 3.3). The following sections show that the range in total native plant diversity is largely due to variations in short-lived plant diversity.

In 2024, the mean total species diversity for control and impact sites was 28.3 and 28.6, respectively, and not significantly different (t test, t = 0.9). The 2024 mean diversities for impact and control sites were at the upper end of the range for compliance monitoring (Table 3.3).

For analyses up to 2023, the Baseline Control Mean was 29.1 and the Baseline Impact Mean was 26.6 (Figure 3.2). For analyses from 2024, when Sites 4 and 6 were changed to control sites, the Baseline Control Mean was 27.2 and the Baseline Impact Mean was 28.1 (Figure 3.3). This again demonstrates that the 2024 results were well within the baseline range.

**Table 3.3: Total native plant species diversity, baseline versus compliance monitoring period**

| Type | Baseline (2012-2016) and Compliance Total Diversity to (2018-2023) | | | | | | | | | | Updated Treatment Baseline and Compliance 2024 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RAM Site[1] | Baseline Min | Baseline Max | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | Type | RAM Site | Baseline Min | Baseline Max | 2024 Spring |
| Control | 1 | 18 | 40 | 24 | 17 | 23 | 18 | 25 | 27 | 31 | Control | 1 | 18 | 40 | 24 |
| | 2 | 9 | 35 | 14 | 15 | 21 | 21 | 14 | 19 | 21 | | 2 | 9 | 35 | 28 |
| | 7 | 20 | 46 | 30 | 24 | 30 | 17 | 32 | 33 | 25 | | 4 | 15 | 38 | 25 |
| | 9 | 21 | 42 | 21 | 18 | 30 | 34 | 31 | 34 | 40 | | 6 | 15 | 38 | 21 |
| | 13 | 10 | 34 | 14 | 22 | 30 | 20 | 18 | 19 | 27 | | 7 | 20 | 46 | 35 |
| | **Means** | **15.6** | **39.4** | **20.6** | **19.2** | **26.8** | **22.0** | **24.0** | **26.4** | **28.8** | | 9 | 21 | 42 | **41** |
| Impact | 3 | 16 | 41 | 23 | 22 | 29 | 21 | 17 | 25 | 34 | | 13 | 10 | 34 | 24 |
| | 4 | 15 | 38 | 14 | 25 | 19 | 17 | 23 | 25 | 26 | | **Means** | **15.4** | **39** | 28.3 |
| | 5 | 13 | 41 | 21 | 14 | 25 | 19 | 17 | 23 | 25 | Impact | 3 | 16 | 41 | 37 |
| | 6 | 15 | 38 | 15 | 28 | 23 | 16 | 18 | 21 | 24 | | 5 | 13 | 41 | 26 |
| | 10 | 26 | 56 | 22 | 15 | 28 | 23 | 16 | 18 | 21 | | 10 | 26 | 56 | 24 |
| | 11 | 18 | 49 | 32 | 25 | 37 | 28 | 26 | 31 | 37 | | 11 | 18 | 49 | 24 |
| | 12 | 9 | 32 | 17 | 14 | 29 | 22 | 16 | 25 | 30 | | 12 | 9 | 32 | 36 |
| | 15 | 10 | 36 | 18 | 16 | 31 | 23 | 16 | 19 | 21 | | 15 | 10 | 36 | 33 |
| | 16 | 10 | 36 | 17 | 16 | 27 | 15 | 17 | 16 | 24 | | 16 | 10 | 36 | 20 |
| | **Means** | **14.7** | **40.8** | **22.2** | **19.7** | **30.1** | **23.7** | **20.9** | **24.6** | **29.8** | | **Means** | **14.6** | **41.6** | **28.6** |

[1] Rangeland sites, as per previous reporting. Note: Comparable data for 2017 not available.

[2] In 2024, Sites 4 and Site 6 were transferred from impact to control sites due to the Southern Access Road no longer being in general use for mining activities, and there being no hydrogeological connection to the Tailings Storage Facility. The baseline mean (and min/max) values therefore change at 2024 as a result of these changes.

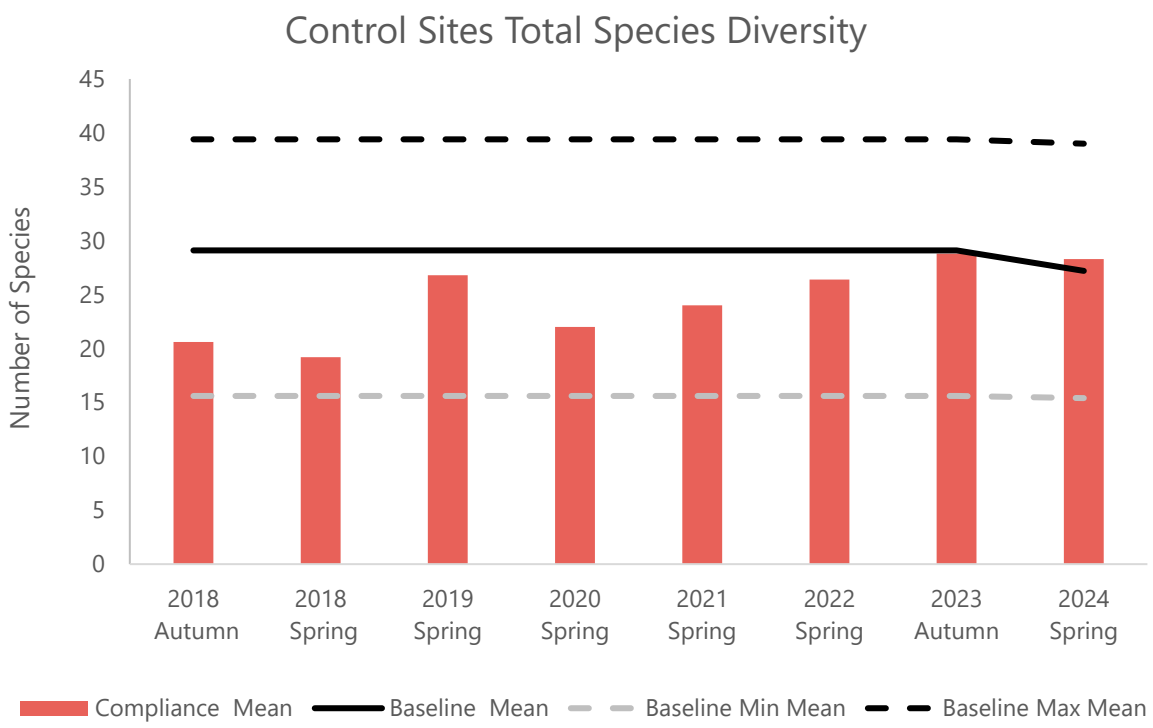



**Figure 3.2: Mean total flora species diversity (long-lived and short-lived species) at control sites during compliance monitoring (compared to baseline mean, min, max, changed in 2024)**

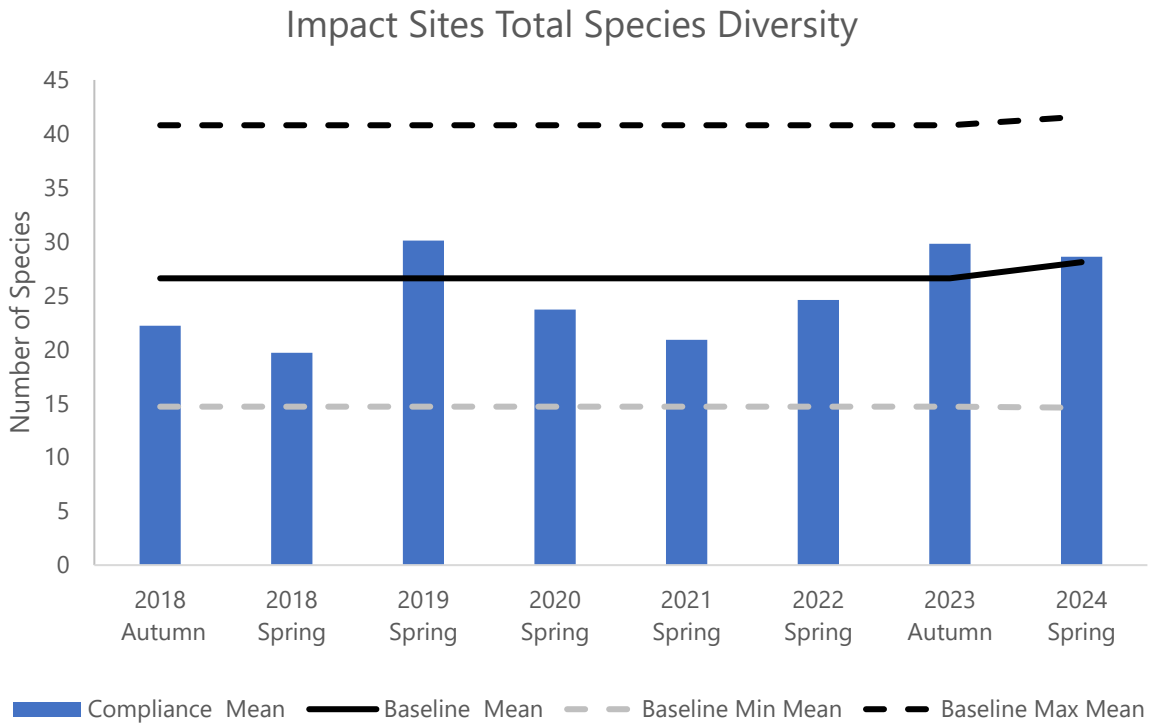



**Figure 3.3: Mean total flora species diversity (long-lived and short-lived species) at impact sites during compliance monitoring (compared to baseline mean, min, max, changed in 2024)**

#### 3.2.1.3 Long-lived species diversity: baseline and compliance monitoring period comparison

Table 3.4 and Figure 3.4 show the range in long-lived native species diversity at sites surveyed in common during baseline (autumn 2012 to 2016) and during the compliance monitoring period (autumn 2018 to spring 2024). Mean diversity of long-lived species during spring 2024 exceeded the baseline means for both control and impact sites. For analyses up to 2023, the Baseline Control Mean was 11.5 and Baseline Impact Mean was 9.7 (Figure 3.4). For analyses from 2024 (Site 4 and 6 as control Sites), the Baseline Control Mean was 9.9 and the Baseline Impact Mean was 10.9 (Figure 3.5). The 2024 mean diversity of long-lived plant species for control sites was the highest recorded during compliance monitoring to date (2018 – 2024) and was at the upper end of the range for impact sites.

Control and impact sites have recorded similar directional changes in perennial species diversity during compliance monitoring. Namely, both control and impact sites recorded increases in mean perennial diversity in 2018, 2019, 2021 and 2022, and a decrease in mean perennial species diversity in 2020.

At individual impact and control sites, perennial species diversity has been very consistent between surveys, for all sites except impact Site 12 and control Sites 1 and 2. The latter have fluctuated between survey periods but show no obvious trends. Variations at these sites occurred prior to 2022, and are thought likely to be due to variation between observers in interpreting survey boundaries, rather than actual changes in perennial diversity.

**Table 3.4: Long-lived perennial native species diversity, baseline versus compliance monitoring period**

| Type | Baseline (2012-2016) and Compliance Long-lived Diversity to (2018-2023) | | | | | | | | | | Updated Treatment Baseline and Compliance 2024 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RAM Site[1] | Baseline Min | Baseline Max | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | Type | RAM Site | Baseline Min | Baseline Max | 2024 Spring |
| Control | 1 | 10 | 14 | 12 | 10 | 13 | 7 | 15 | 12 | 11 | Control | 1 | 10 | 14 | 11 |
| | 2 | 4 | 8 | 4 | 7 | 9 | 6 | 3 | 7 | 7 | | 2 | 4 | 8 | 7 |
| | 7 | 11 | 19 | 16 | 17 | 20 | 10 | 16 | 19 | 11 | | 4 | 5 | 10 | 9 |
| | 9 | 13 | 21 | 15 | 14 | 19 | 16 | 18 | 16 | 19 | | 6 | 4 | 8 | 9 |
| | 13 | 4 | 8 | 4 | 6 | 6 | 6 | 6 | 8 | 8 | | 7 | 11 | 19 | 18 |
| | **Means** | **8.4** | **14** | **10.2** | **10.8** | **13.4** | **9** | **11.6** | **12.4** | **11.2** | | 9 | 13 | 21 | 19 |
| Impact | 3 | 5 | 10 | 9 | 10 | 10 | 7 | 8 | 9 | 10 | | 13 | 4 | 8 | 10 |
| | 4 | 5 | 10 | 7 | 7 | 8 | 7 | 7 | 8 | 7 | | **Means** | **7.3** | **12.6** | **11.9** |
| | 5 | 8 | 14 | 10 | 10 | 11 | 8 | 9 | 11 | 10 | Impact | 3 | 5 | 10 | 11 |
| | 6 | 4 | 8 | 7 | 6 | 7 | 7 | 6 | 6 | 6 | | 5 | 8 | 14 | 9 |
| | 10 | 17 | 29 | 22 | 26 | 26 | 21 | 27 | 25 | 24 | | 10 | 17 | 29 | 23 |
| | 11 | 11 | 16 | 18 | 16 | 17 | 14 | 15 | 17 | 19 | | 11 | 11 | 16 | 18 |
| | 12 | 3 | 7 | 4 | 8 | 8 | 6 | 4 | 10 | 9 | | 12 | 3 | 7 | 7 |
| | 15 | 6 | 10 | 6 | 7 | 8 | 10 | 7 | 7 | 6 | | 15 | 6 | 10 | 8 |
| | 16 | 6 | 10 | 6 | 7 | 7 | 5 | 5 | 7 | 9 | | 16 | 6 | 10 | 9 |
| | **Means** | **7.2** | **127** | **9.9** | **10.8** | **11.3** | **9.4** | **9.8** | **11.1** | **11.1** | | **Means** | **8** | **13.7** | **12.1** |

*In 2024, Sites 4 and 6 were transferred from impact to control sites due to the Southern Access Road no longer being in general use for mining activities, and there being no hydrogeological connection to the Tailings Storage Facility. The baseline mean (and min/max) values therefore change at 2024 as a result of these changes.

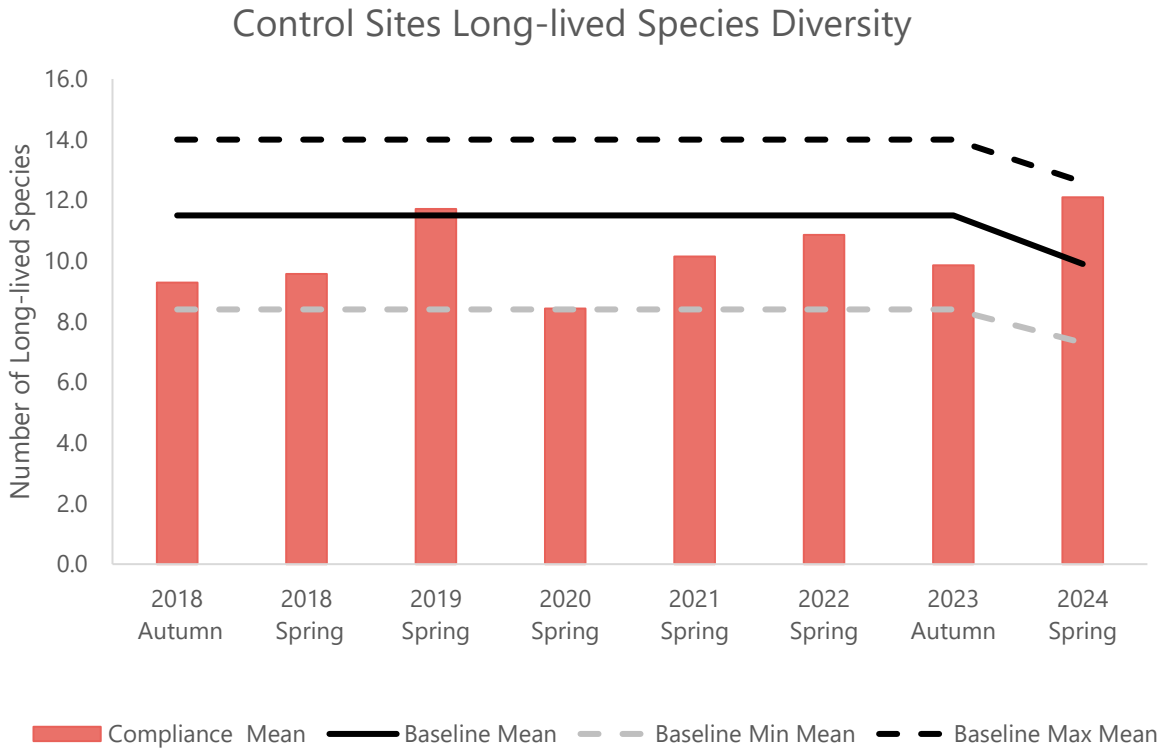



**Figure 3.4: Mean diversity of long-lived flora species at control sites during compliance monitoring (compared with baseline mean, min, max, changed in 2024)**

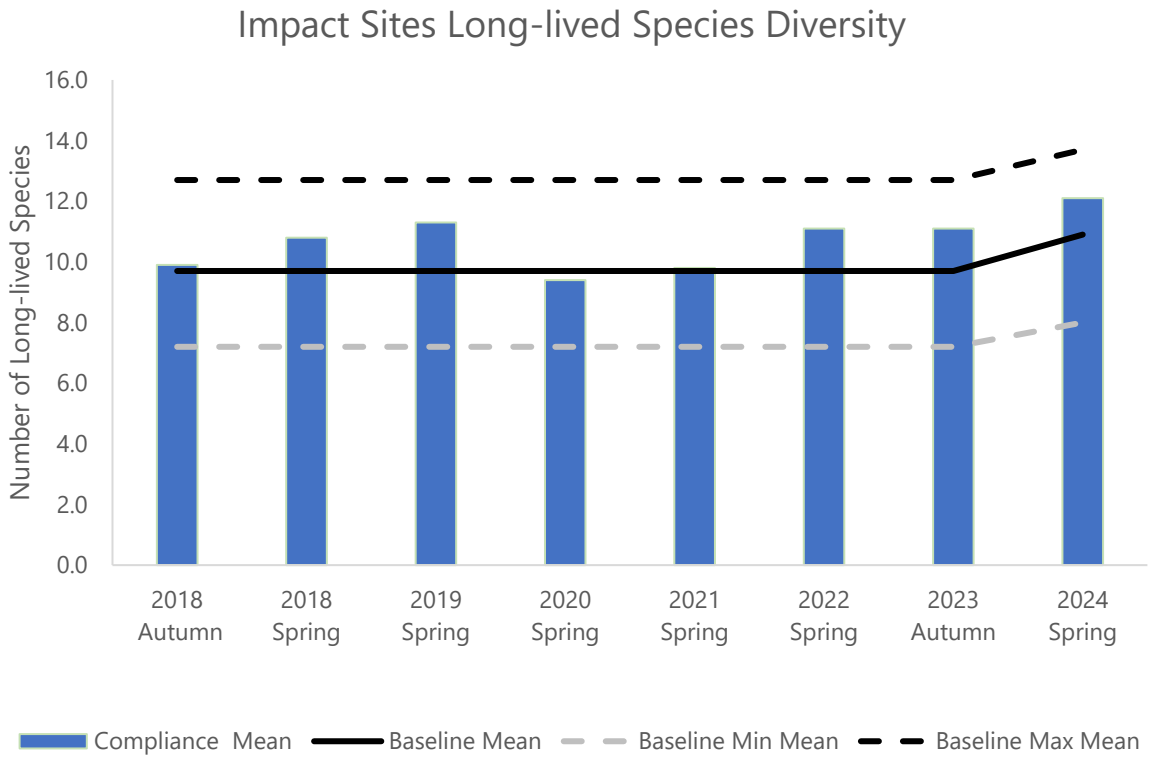



**Figure 3.5: Mean diversity of long-lived flora species at impact sites during compliance monitoring (compared with baseline mean, min, max, changed in 2024)**

#### 3.2.1.4 Short-lived species diversity: baseline and compliance monitoring period comparison

During compliance monitoring, the mean short-lived species diversity for both control and impact sites has fluctuated yearly, largely in response to fluctuations in rainfall patterns. In 2024, the mean short-lived species diversities for control sites (17.0 species) and for impact sites (16.3 species) were the second highest and third highest, respectively recorded during compliance monitoring, and at the upper end of the range for baseline monitoring. The tallies for all individual sites were also within the baseline ranges (Table 3.5). Three control sites and two impact sties recorded the highest short-lived species diversity tallies for the compliance/operational period. For analyses up to 2023 (Site 4 and 6 as Impact), the Baseline Control Mean was 16.4 and the Baseline Impact mean was 18.2 (Figure 3.6). For analyses in 2024 (Site 4 and 6 as Control) the Baseline Control Mean was 16.9 and Baseline Impact Mean was 18.2 (Figure 3.6). These results also well within the baselines ranges, regardless of site allocation to control of impact (for Site 4 and 6).

**Table 3.5: Total diversity of short-lived native species, baseline versus compliance monitoring period**

| Type | Baseline (2012-2016) and Compliance Short-lived Diversity to (2018-2023) | | | | | | | | | | Updated Treatment Baseline and Compliance 2024 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RAM Site[1] | Baseline Min | Baseline Max | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | Type | RAM Site | Baseline Min | Baseline Max | 2024 Spring |
| Control | 1 | 6 | 28 | 12 | 7 | 10 | 11 | 10 | 15 | 20 | Control | 1 | 6 | 28 | 13 |
| | 2 | 4 | 31 | 10 | 8 | 12 | 15 | 11 | 12 | 14 | | 2 | 4 | 31 | 21 |
| | 7 | 8 | 28 | 14 | 7 | 10 | 7 | 16 | 14 | 14 | | 4 | 8 | 29 | 17 |
| | 9 | 2 | 25 | 6 | 4 | 11 | 18 | 13 | 18 | 21 | | 6 | 11 | 24 | 15 |
| | 13 | 5 | 27 | 10 | 14 | 24 | 14 | 12 | 11 | 19 | | 7 | 8 | 28 | 17 |
| | **Means** | **5.0** | **27.8** | **10.4** | **8.0** | **13.4** | **13.0** | **12.4** | **14.0** | **17.6** | | **9** | **2** | **25** | **22** |
| Impact | 3 | 10 | 35 | 14 | 12 | 19 | 14 | 9 | 16 | 24 | | 13 | 5 | 27 | 14 |
| | 4 | 8 | 29 | 14 | 7 | 17 | 12 | 10 | 15 | 18 | | Means | 6.3 | 27.4 | 17.0 |
| | 5 | 4 | 32 | 12 | 10 | 14 | 12 | 9 | 10 | 16 | Impact | 3 | 10 | 35 | 26 |
| | 6 | 11 | 24 | 15 | 9 | 21 | 16 | 10 | 12 | 15 | | 5 | 4 | 32 | 15 |
| | 10 | 8 | 28 | 6 | 9 | 14 | 21 | 18 | 18 | 26 | | 10 | 8 | 28 | 13 |
| | 11 | 7 | 33 | 14 | 9 | 20 | 14 | 11 | 14 | 18 | | 11 | 7 | 33 | 15 |
| | 12 | 6 | 25 | 13 | 6 | 21 | 16 | 12 | 13 | 21 | | 12 | 6 | 25 | 13 |
| | 15 | 4 | 29 | 12 | 9 | 23 | 13 | 9 | 12 | 15 | | 15 | 4 | 29 | 17 |
| | 16 | 4 | 30 | 11 | 9 | 20 | 10 | 12 | 9 | 15 | | 16 | 4 | 30 | 15 |
| | **Means** | **6.9** | **29.4** | **12.3** | **8.9** | **18.8** | **14.2** | **11.1** | **13.2** | **18.7** | | **Means** | **6.1** | **30.3** | **16.3** |

*In 2024, Sites 4 and Site 6 were transferred from impact to control sites due to the Southern Access Road no longer being in general use for mining activities, and there being no hydrogeological connection to the Tailings Storage Facility. The baseline mean (and min/max) values therefore change at 2024 as a result of these changes.

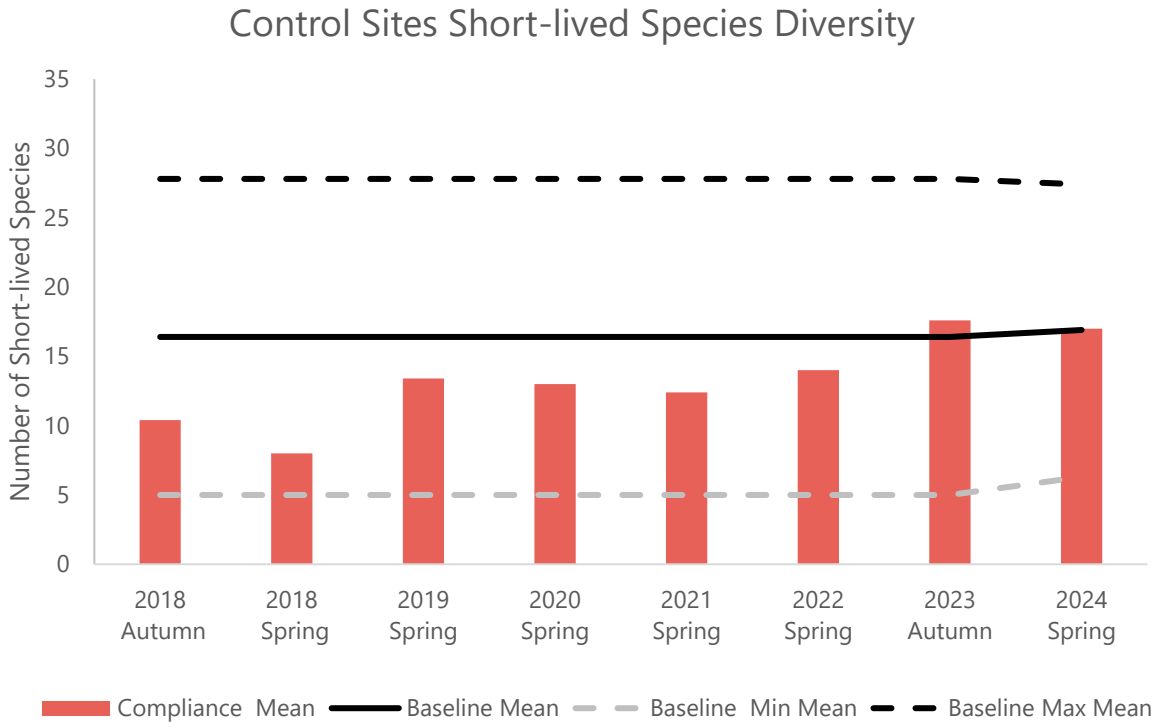



**Figure 3.6: Mean diversity of short-lived flora species at control sites during compliance monitoring (compared with baseline mean, min, max, changed in 2024)**

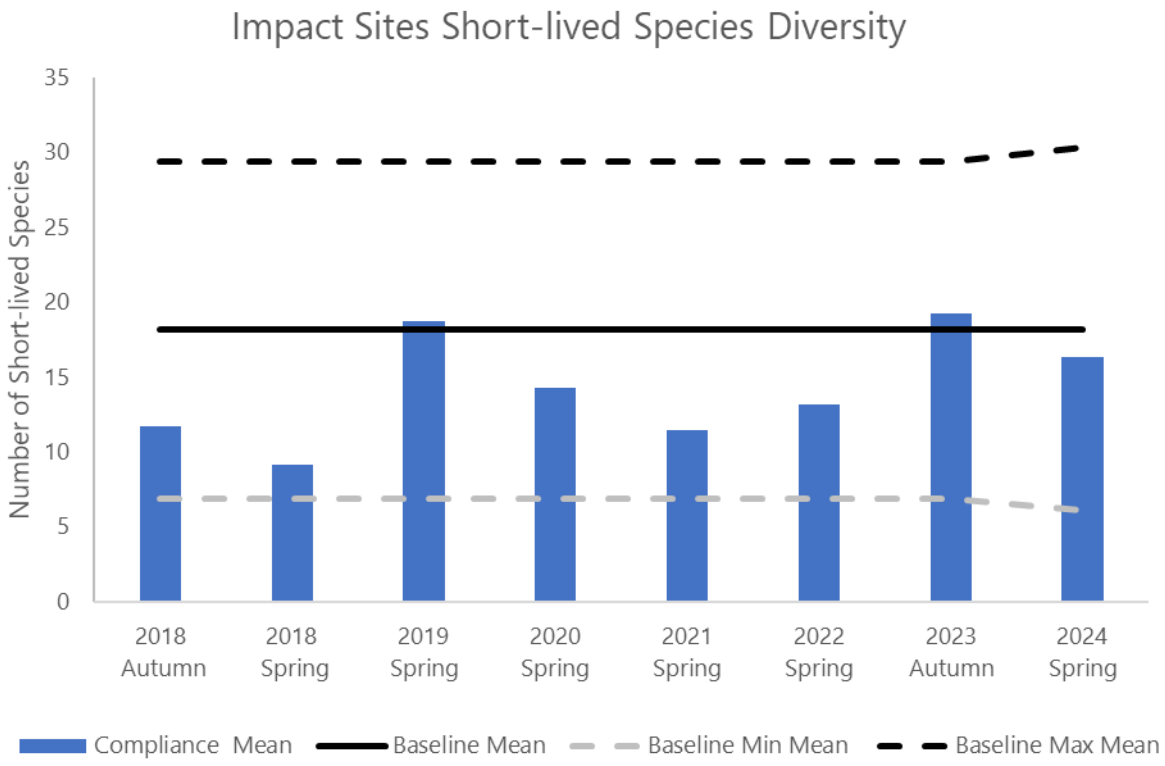



**Figure 3.7: Mean diversity of short-lived flora species at impact sites during compliance monitoring (compared with baseline mean, min, max, changed in 2024)**

#### 3.2.1.5 Comparison of long-lived species diversity by habitat type and site

Four distinct habitats were recognised at the Flora Rangeland sites: Eliza Creek (major drainage line) sites, sand dune sites, gibber sites with no drainage line, and gibber sites with a drainage line. Trends in perennial species diversity were compared between sites of similar habitat. This was done to:

1. Determine the magnitude of inherent variation between sites of similar habitats, regardless of potential impact from mining, and
2. Detect potential changes in plant diversity associated with a particular habitat, regardless of distance from mining infrastructure; namely to detect possible stressors (mining related or otherwise), impacting species diversity in specific habitats.

Potential increasing or decreasing trends for individual sites were also assessed. This was done to detect possible trends at a site level, that were otherwise being masked at a control group or impact group level.

***Long-lived species diversity at Eliza Creek sites***

The Eliza Creek Sites 17, 18, 19 and 20 were established in autumn 2018, specifically to monitor the potential impacts of the tailings dam embankment on downstream vegetation. In addition, flora Site 10, established in 2012, is located on Eliza Creek, approximately 5 km downstream from the Tailings Storage Facility (TSF) and is therefore also a potential impact site from the TSF. The TSF construction began in 2018 and TSF commenced operations during February 2020. As such, the 2018 and 2019 survey data represent the best 'baseline' data available for Eliza Creek survey sites 17-20, noting that natural spatial and temporal variations in species diversity are present and due to inter alia: slight habitat differences (width and depth of channel); seasonal and yearly rainfall variations; and slight variations in area surveyed at each site for each survey.

Since 2018, there has been no distinct trend in species diversity for any of the Eliza Creek sites, with mean diversity since 2020 (namely, TSF operational) being similar to 2018 and 2019 tallies (Table 3.6 and Figure 3.8). Mean species diversity for each site post construction has either been greater than construction (2018 and 2019) means or within 5% of construction mean diversities. In addition to similar baseline and operational mean diversities, the range in species diversity recorded at individual sites has also been similar for construction and operational phases (Table 3.6). Mean perennial diversity between sites during operational monitoring has also been very similar, varying from a mean of 22 species at Sites 17 and 18 to 24 species at Sites 19 and 10.

In summary there is no clear pattern emerging in species diversity data relating to the time since TSF establishment and the distance from the TSF (Sites 17 being the closest and Site 10 being the furthest away). Site 17 is approximately 200 m downstream from the TSF and as at October 2024 had experienced no species loss, or evident decline in populations of any species.

**Table 3.6: Long-lived perennial plant species diversity at Eliza Creek sites during compliance monitoring (all sites considered potential impact sites)**

| RAM Site[1] | Construction Long-lived Species Diversity | | | Operation Long-lived Species Diversity | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | 2018-2019 Mean | 2020 | 2021 | 2022 | 2023 | 2024 | 2020-2024 Range | 2020-2024 Mean |
| 17 | 19 | 24 | 21 | 18 | 20 | 27 | 24 | 22 | 18 - 27 | 22 |
| 18 | 22 | 25 | 23 | 21 | 20 | 23 | 21 | 24 | 20 - 24 | 22 |
| 19 | 16 | 19 | 18 | 23 | 24 | 25 | 24 | 23 | 23 - 25 | 24 |
| 20 | 21 | 26 | 24 | 20 | 21 | 23 | 25 | 25 | 20 - 25 | 23 |
| 10 | 22 | 26 | 25 | 21 | 27 | 25 | 24 | 23 | 21 - 27 | 24 |

[1] Flora sites (One hectare Rangeland) displayed by increasing distance from TSF, where flora Site 17 = CAR017, 18 = CAR018 and so on.

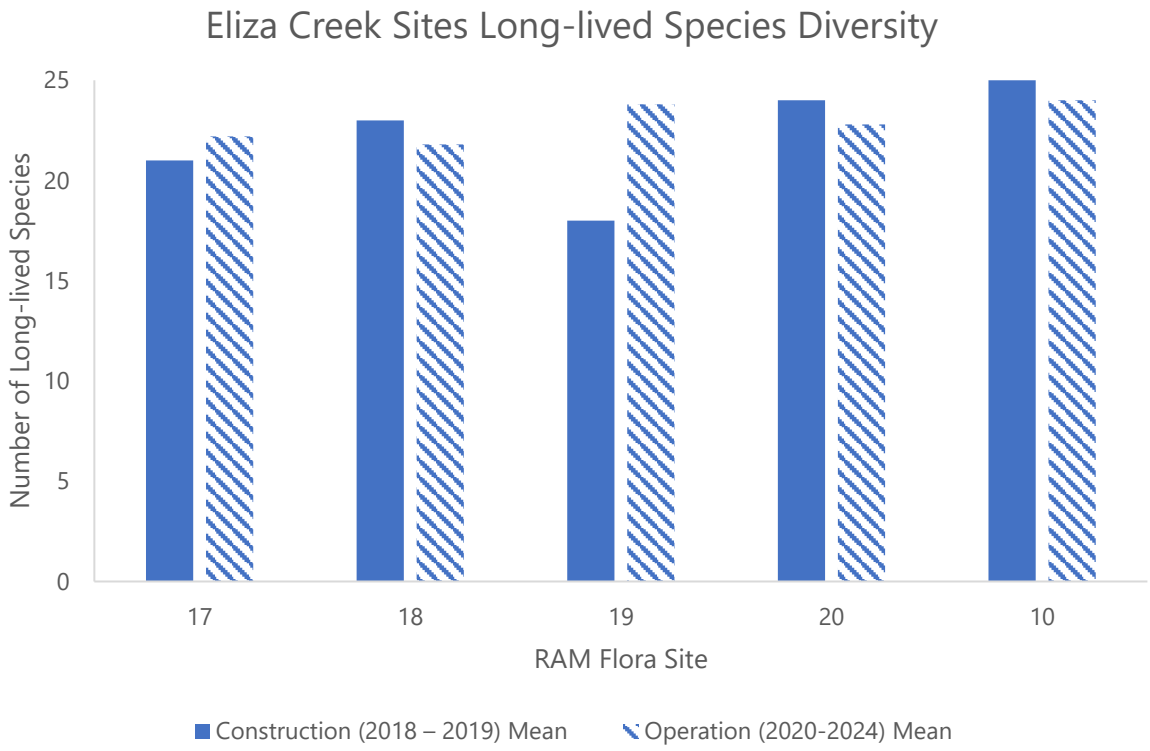



**Figure 3.8: Mean native long-lived species diversity at Eliza Creek Rangeland Flora Sites (TSF construction (2018 and 2019) and operation (2020 – 2024)**

### *Long-lived species diversity at sand dune habitat*

Flora Sites 21 and 22 were established in May 2018 on sand dunes, a previously un-monitored habitat within the Carrapateena Operation area, but the control Site 21 was relocated in spring 2018 given proximity to proposed infrastructure. For both sites, perennial species diversity has fluctuated yearly (Table 3.7) without any clear trend emerging in either long-term increases or declines.

The sand dune sites are not defined on the ground. A central point is designated by an easting and northing coordinate and the site is surveyed by walking within an area defined by a 55 m radius from the central coordinate (namely an area equivalent to a 10 000 $m^2$ RAM site). Several species are present as isolated individuals only. Due to the undulating nature of the dunes and the absence of on-ground survey markers, it is possible that some perennial species of low abundance, are present but not detected during some surveys.

**Table 3.7: Long-lived perennial plant species diversity at sand dune habitats during compliance monitoring**

| RAM Site | Site Type | Compliance Monitoring Long-lived Species Diversity | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 21 | Control | 10 | 8 | 7 | 9 | 8 | 12 | 11 |
| 22 | Impact | 7 | 8 | 10 | 5 | 5 | 7 | 9 |

### *Long-lived species diversity at gibber habitats with no drainage line*

Gibber habitat sites that contained no drainage line were control Sites 2, 4, 6 and 13, and Impact Sites 3, 5, 12,15 and 16. There has been no obvious trend in long-lived species diversity at any individual site (Table 3.8). Mean diversity at all sites during compliance monitoring has remained within the baseline range, and been similar to baseline diversity (Table 3.9).

Post-construction long-lived species diversity has fluctuated slightly at all sites with no consistent trend evident at any site, regardless of whether designated a control or potential impact site (based on distance from mining infrastructure). Of the gibber (non-drainage line) sites, site 3 recorded the highest perennial species diversity in both 2023 and 2024, noting that this site is closest to major mining infrastructure.

**Table 3.8: Long-lived perennial plant species diversity at gibber sites (with no drainage lines) during compliance monitoring**

| RAM Site | Compliance Monitoring Long-lived Species Diversity Totals | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 2 | 4 | 7 | 9 | 6 | 3 | 7 | 7 | 7 |
| 3 | 9 | 10 | 10 | 7 | 8 | 8 | 10 | 11 |
| 4 | 7 | 7 | 8 | 7 | 7 | 9 | 7 | 9 |
| 5 | 10 | 10 | 11 | 8 | 9 | 8 | 10 | 9 |
| 6 | 7 | 6 | 7 | 7 | 6 | 11 | 6 | 9 |
| 13 | 4 | 6 | 6 | 6 | 6 | 10 | 8 | 10 |

| RAM Site | Compliance Monitoring Long-lived Species Diversity Totals | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 12 | 4 | 8 | 8 | 6 | 4 | 6 | 9 | 7 |
| 15 | 6 | 7 | 8 | 10 | 7 | 7 | 6 | 8 |
| 16 | 6 | 7 | 7 | 5 | 5 | 7 | 9 | 9 |

*Sites 4 and 6 were changed from potential impact sites to control sites in 2024 due to operational changes around 2024.

**Table 3.9: Long-lived plant perennial plant species diversity at gibber sites (with no drainage lines), means and ranges**

| RAM Site | Baseline Diversity (2012-2016) | | | Compliance Diversity (2018-2024) | | |
|---|---|---|---|---|---|---|
| | Min | Max | Mean | Min | Max | Mean |
| 2 | 4 | 8 | 5.3 | 4 | 9 | 6.3 |
| 3 | 5 | 10 | 7.3 | 7 | 10 | 9.1 |
| 4 | 5 | 10 | 7.6 | 7 | 9 | 7.6 |
| 5 | 8 | 14 | 9.7 | 8 | 11 | 9.4 |
| 6 | 4 | 8 | 6.3 | 6 | 11 | 7.4 |
| 13 | 4 | 8 | 6.6 | 4 | 10 | 7.0 |
| 12 | 3 | 7 | 4.7 | 4 | 9 | 6.5 |
| 15 | 6 | 10 | 7.9 | 6 | 10 | 7.4 |
| 16 | 6 | 10 | 6.7 | 5 | 9 | 6.9 |

The baseline mean (and min/max) values change at 2024 in the graph below as a result of changes in allocation of control and impact sites due to operational changes around 2024. Site 4 and Site 6 were designated as impact sites up until 2023 due to the proximity of the Southern Access Road. With the SAR no longer widely used for mine-related activities, and the absence of hydrological connectivity to the TSF, these sites have been re-designated as control sites.

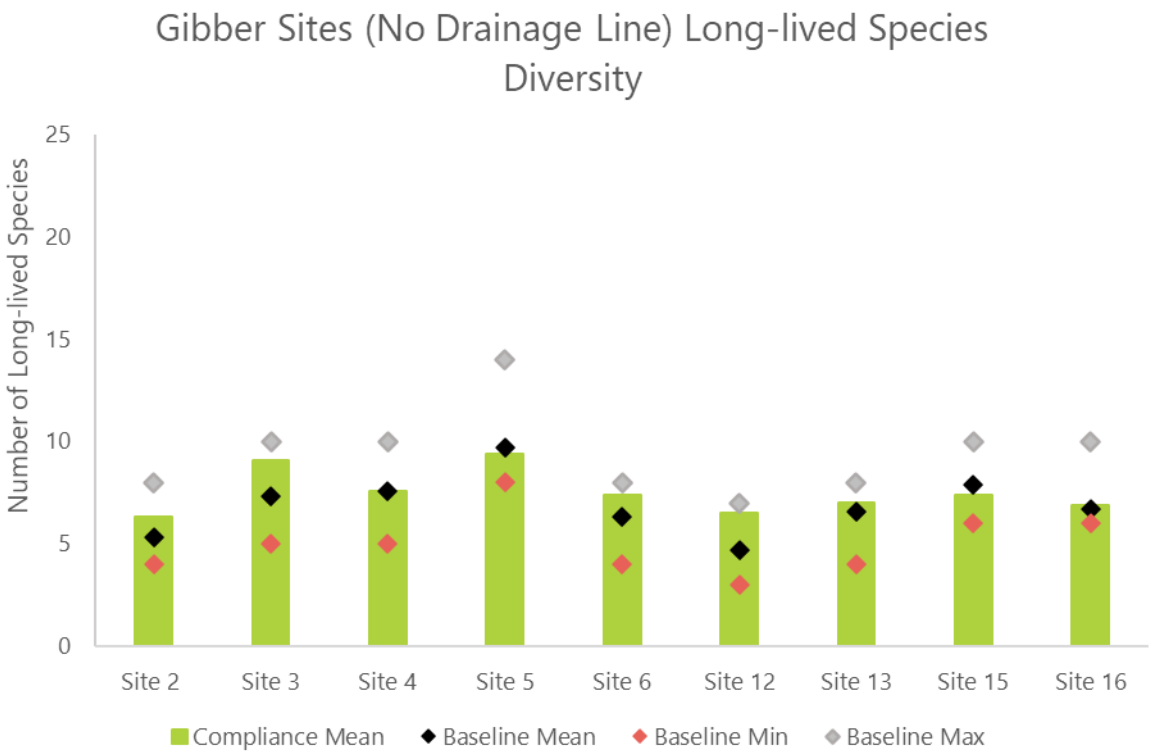



**Figure 3.9: Mean species diversity of long-lived species at gibber sites (no minor drainage line in site)**

*Sites 4 and 6 changed from potential impact sites to control sites in 2024, due to operational infrastructure changes.

### *Long-lived species diversity at gibber habitats that include a minor drainage Line*

Gibber sites that contained a drainage line were Control Sites 1, 7 and 9, and Impact Site 11. Since 2018, there has been no obvious trend in long-lived species diversity at these sites (Table 8). During both baseline and post-construction/ operational monitoring, diversity has fluctuated quite widely at Control Sites 1 and 7, and to a lesser extent at Sites 9 and 11, but overall has shown no clear trends at these sites (Table 3.10). Variations in long-lived species diversity at these sites is thought to be largely due to slight variations in area surveyed at each survey: the presence of multiple habitats decreasing the ability to replicate survey areas precisely. Mean diversity at all sites during compliance monitoring has remained within the baseline range (Table 3.11 and Figure 3.10).

**Table 3.10: Long-lived perennial plant species diversity at gibber sites with a minor drainage line during compliance monitoring**

| RAM Site | Compliance Monitoring Long-lived Species Diversity Totals | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 1 | 12 | 10 | 13 | 7 | 15 | 12 | 11 | 11 |
| 7 | 16 | 17 | 20 | 10 | 16 | 19 | 11 | 18 |
| 9 | 15 | 14 | 19 | 16 | 18 | 16 | 19 | 19 |
| 11 | 18 | 16 | 17 | 14 | 15 | 17 | 19 | 18 |

**Table 3.11: Long-lived perennial plant species diversity at gibber sites with a minor drainage line; baseline and compliance monitoring means and ranges**

| RAM Site | Baseline Diversity (2012-2016) | | | Compliance Diversity (2018-2024) | | |
|---|---|---|---|---|---|---|
| | Min | Max | Mean | Min | Max | Mean |
| 1 | 10 | 14 | 12.2 | 7 | 15 | 11.4 |
| 7 | 11 | 19 | 15.4 | 10 | 20 | 15.9 |
| 9 | 13 | 20 | 18.0 | 14 | 19 | 17.0 |
| 11 | 11 | 16 | 14.4 | 14 | 19 | 16.8 |

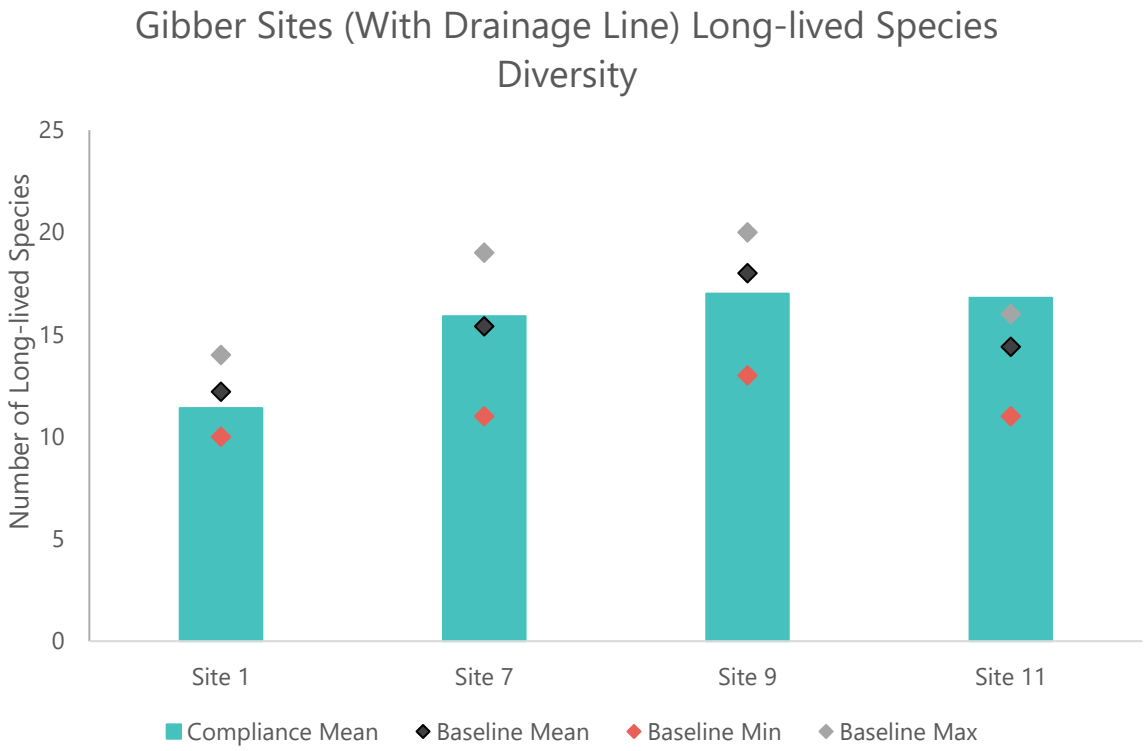



**Figure 3.10: Mean long-lived species diversity at gibber sites that include a minor drainage line**

### 3.2.2 Jessup transects – population structure of long-lived woody perennials

During compliance monitoring, Jessup transects were conducted at all 13 gibber habitat flora sites (Sites 1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 13, 15 and 16) and at the five Eliza Creek flora sites (Sites 10, 17, 18, 19, 20). Appendix D1 contains all species data recorded for Jessup transects in 2024. Baseline Jessup site data is available for comparison for the 13 gibber sites for 2013 to 2025 surveys (Sites 15 and 16 were not surveyed in 2012).

#### 3.2.2.1 Gibber habitat Jessup transects

Jessup data (Appendix D) shows the total number of adults and juveniles of long-lived woody perennials for the flora sites, recorded in spring 2024. Jessup transects conducted in gibber habitat during both the baseline and compliance periods were Sites 1 to 7, 9 to 13, 15 and 16.

For the gibber habitat Jessup sites three species have been chosen for a detailed comparison of baseline and compliance population levels: the two dominant species, *Atriplex vesicaria* and *Tecticornia* species, which are present at all gibber sites, and a third species, *Frankenia serpyllifolia*, which was also present at most sites.

- Bladder Saltbush (*Atriplex vesicaria*): Dominates the Jessup transects, scoring approximately eight times more individuals (adults and juveniles combined) than the next most abundant species.
- Samphire (*Tecticornia medullosa*): Widespread and abundant at most gibber sites, sometimes co-dominant with Bladder Saltbush.
- Sea-heath (*Frankenia serpyllifolia*): Chosen for analysis because it is widespread at gibber sites and the next most abundant species recorded in Jessup gibber sites, following Bladder Saltbush and Samphire species. Its relative unpalatability eliminates grazing impact as a cause of potential decline. Hence causes of potential changes in abundance can be narrowed down to climate and/or mining impact.

Further interrogation of the presence of these three species at control and impact sites, is provided below.

##### *Bladder Saltbush*

Bladder Saltbush is a long-lived woody perennial, and the dominant plant species at the gibber habitat Jessup transects (Sites 1 to 7, 9 to 13, 15 and 16). In this habitat due to the semi-saline soils, Bladder Saltbush is only moderately palatable.

During both baseline and compliance monitoring, the combined total population of Bladder Saltbush from all gibber sites has varied widely. Since compliance monitoring began in autumn 2018, the total number of adult and juvenile Bladder Saltbush from all gibber sites has ranged from 2,175 individuals in spring 2020 to 3,455 individuals in spring 2018. The total abundance recorded in 2024 was 3,146 individuals and near the upper end of the range recorded since 2018.

During compliance monitoring the greatest fluctuations in yearly population sizes occurred in control sites with large declines in 2020 and 2021, before steadily increasing in 2022, 2023 and 2024 (Figure 3.11). The fluctuations reflect changes in juvenile numbers, but also defoliation of shrubs during years of well below average rainfall. In 2024 the 374 juveniles recorded was the highest since construction monitoring began. At control sites, the mean number of Bladder Saltbush (adult and juvenile combined) in 2020, 2021, 2022 and 2023 were all below the baseline range but in 2024 had recovered to be once more just within the baseline range (Figure 3.12).

At impact sites the mean number of Bladder Saltbush plants has fluctuated less than at control sites, and during all compliance monitoring surveys remained within the baseline range for all but the 2020 survey (Figure 3.13).

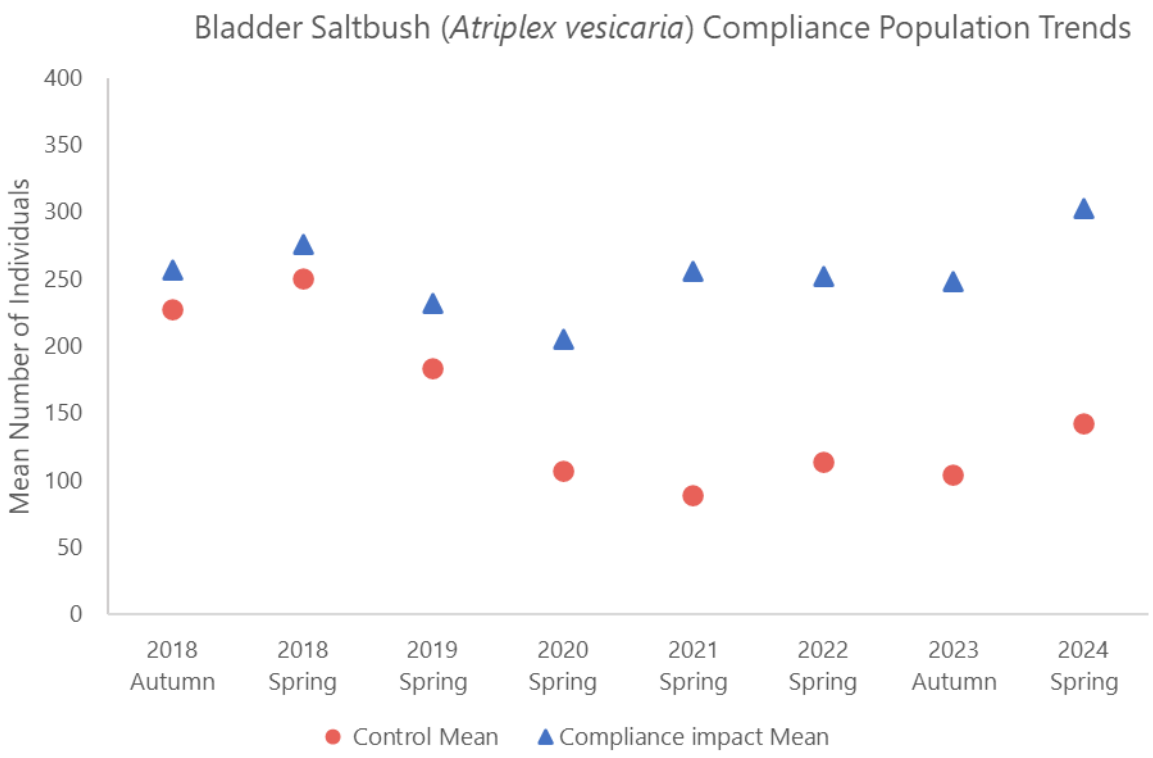



**Figure 3.11: Population trends in Bladder Saltbush during compliance monitoring at control and impact sites**

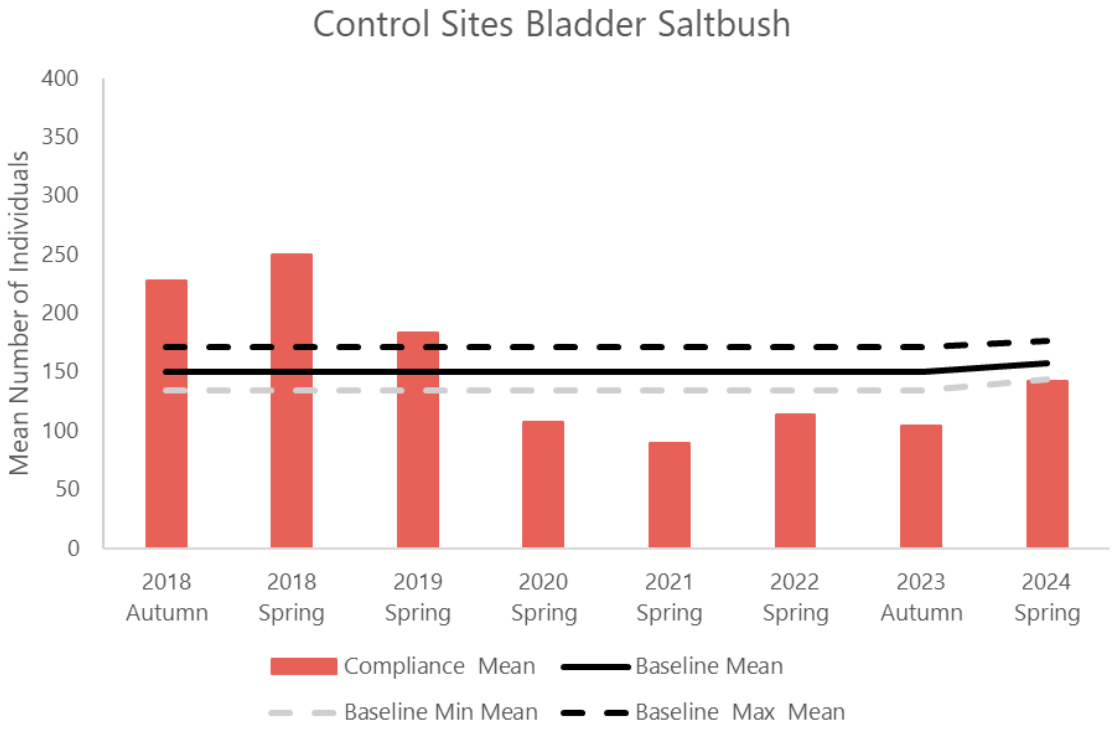



**Figure 3.12: Mean abundance of Bladder Saltbush (adults and juveniles combined) at Jessup control sites, baseline versus compliance monitoring.**

Note, baseline mean populations are for 2013 – 2015, given some sites not surveyed in 2012 and no data available for 2016 or 2017.

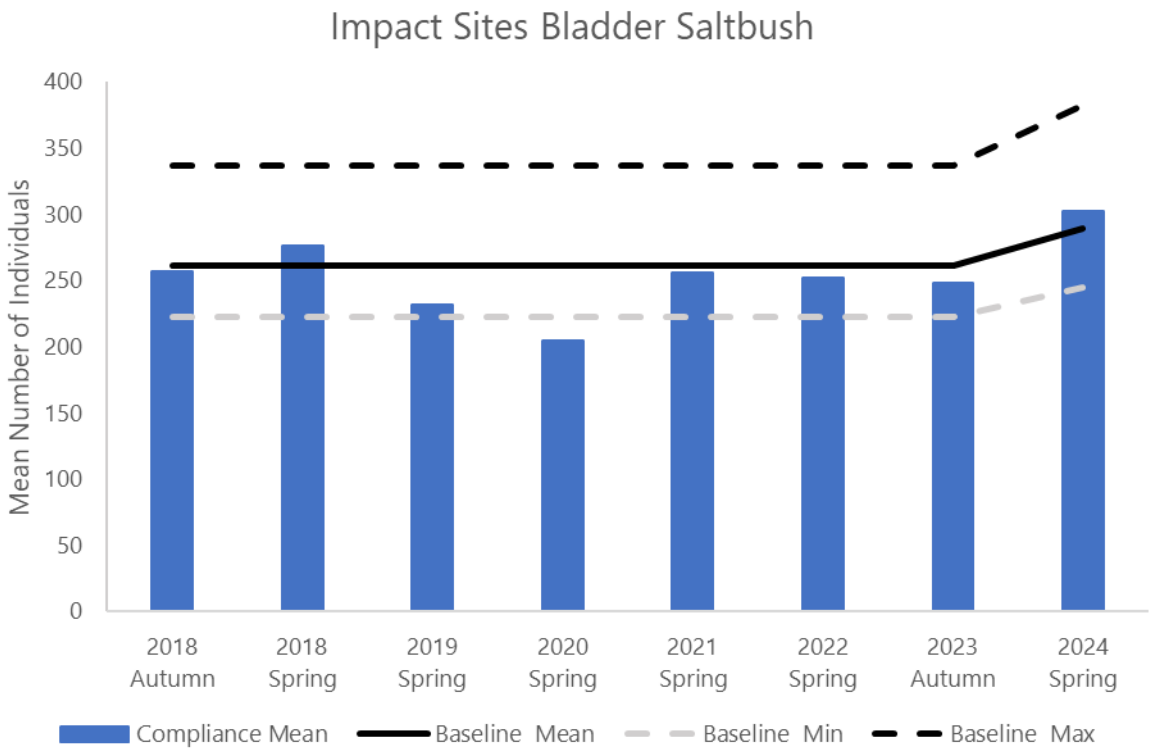



**Figure 3.13: Mean abundance of Bladder Saltbush (adults and juveniles combined) at Jessup impact sites, baseline (2013-2015) vs compliance monitoring (autumn 2018 to spring 2024).**

Note not all sites surveyed in 2012, and no data available for 2016 or 2017.

### *Samphire*

All Samphire species were analysed collectively. The most widespread Samphire species at the Jessup sites is *Tecticornia medullosa*, with *T. pergranulata* and *T. tenuis* being associated with floodout areas of drainage lines. Samphire species were present at all 13 gibber Jessup sites.

As with all the long-lived woody perennials analysed since 2018, the abundance of Samphire was lowest in 2020/2021 and then increased in 2022, 2023 and 2024 (Figure 3.14). The 2024 combined tally of 400 adult and juvenile Samphire species, from 13 Jessup transects were the highest recorded during the compliance / construction period. Since 2018, the mean number of Samphire individuals at control sites has been within, or exceeded, the baseline range except in 2021 (Figure 3.15). The mean number of Samphire at impact sites was slightly below the baseline range in 2020, 2021 and 2022. In 2023 and 2024, the mean number of individuals at impact sites returned to being within the baseline range (Figure 3.16). It is noted for both impact and control, some sites were not surveyed in 2012, and there was no data available for 2016 or 2017.

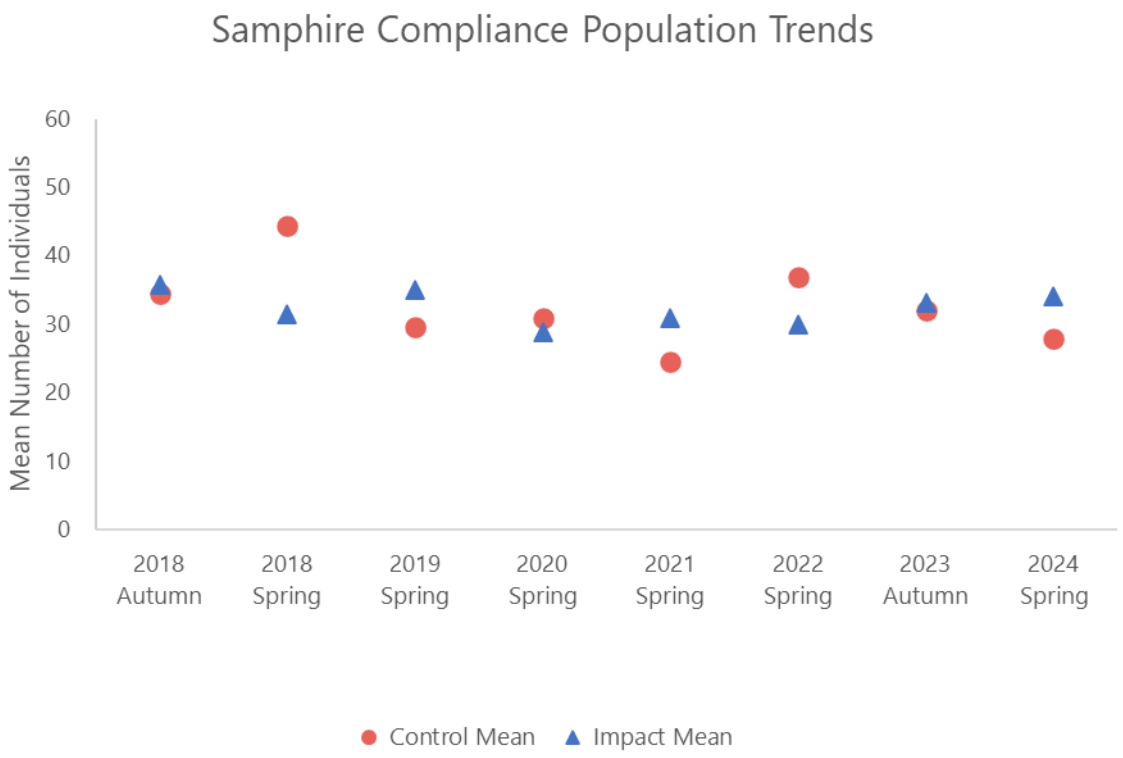



**Figure 3.14: Population trends in Samphire during compliance period, control and impact sites**

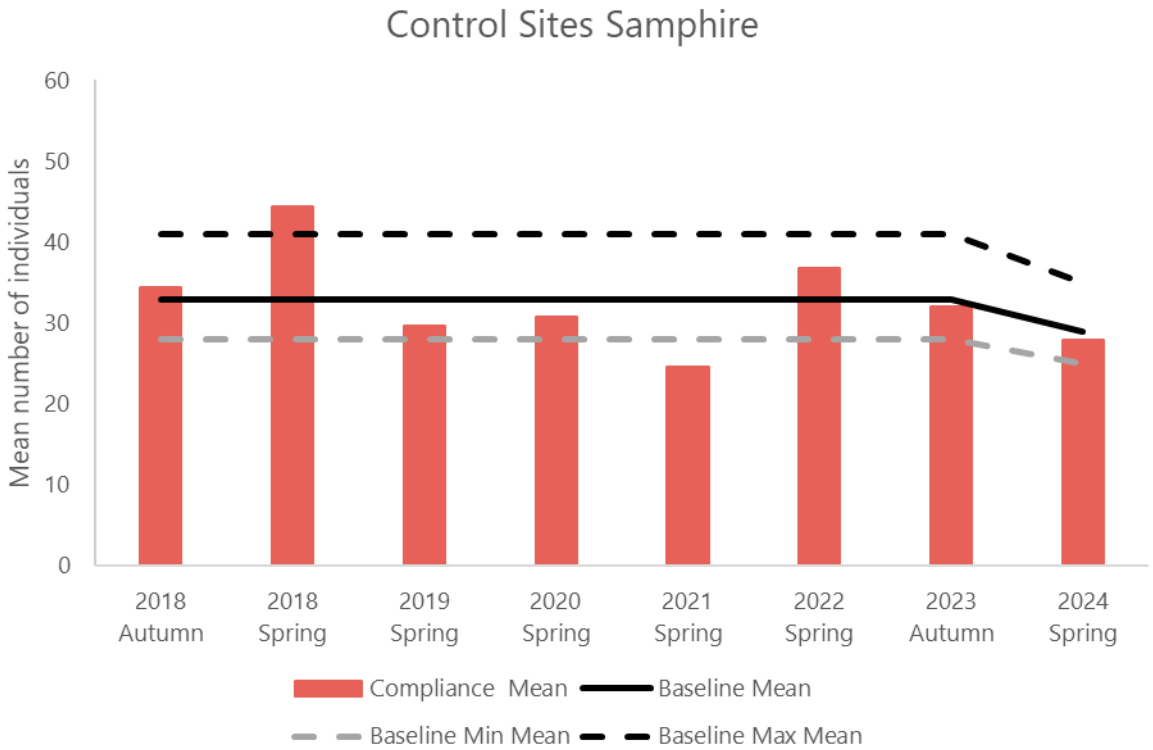



**Figure 3.15: Mean number of Samphire at Jessup control sites, baseline (2013-2015) vs compliance monitoring (autumn 2018 to spring 2024).**

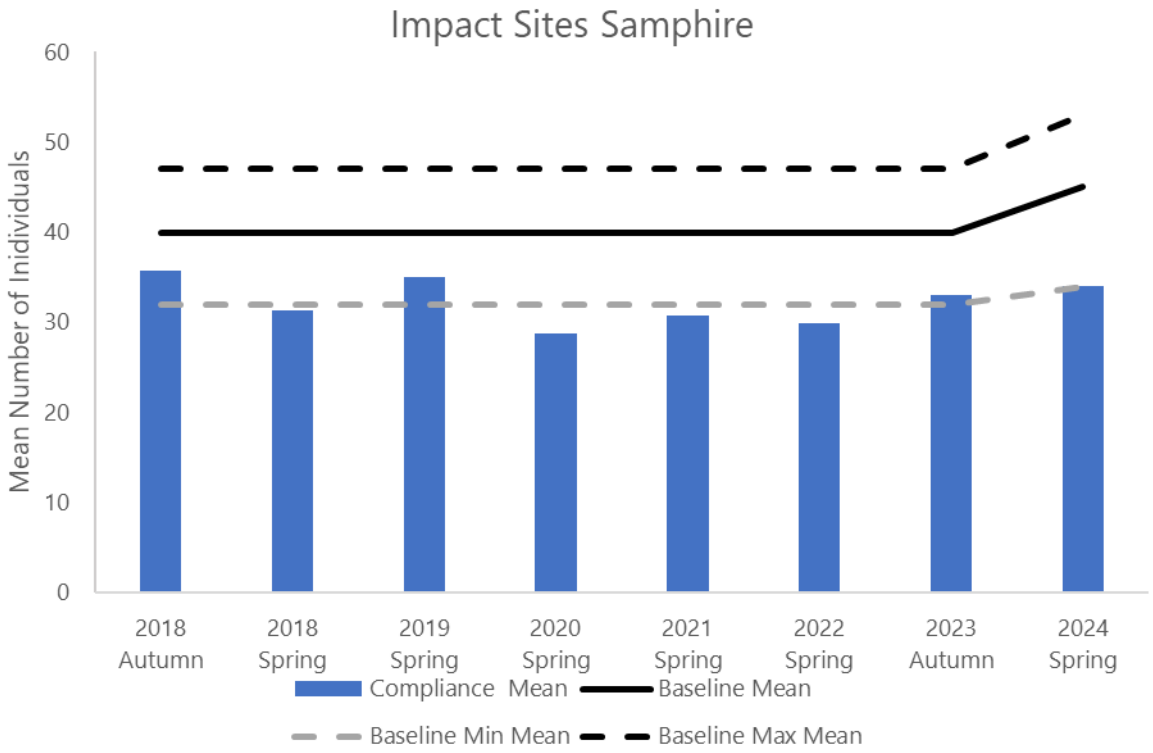



**Figure 3.16: Mean number of Samphire at Jessup impact sites, baseline (2013-2015) vs compliance monitoring (autumn 2018 to autumn 2024).**

***Sea-heath***

Sea-heath is also widespread in the gibber habitat, recorded from 12 of the 13 gibber Jesup sites. This species is tolerant of saline habitats and largely unpalatable. As with other long-lived woody perennials, abundance at Jessup transects has fluctuated during both baseline and compliance monitoring. The lowest Sea-heath totals for both control and impact sites were recorded in 2020 and 2021 (Figure 3.17). In 2024, 146 adults and 2 juveniles were recorded from 11 sites. This compares with 169 adults and no juveniles recorded from 10 Jessup transects in 2023 (Jacobs 2023h). In both 2023 and 2024, approximately 45% of all Sea-heath plants were recorded at Jessup transect Site 5. It is noted that Sites 4 and 6 changed from potential impact to control sites in 2024 due to infrastructure changes.

At control sites, the mean number of Sea-heath has been within, or exceeded, the baseline range for all survey periods except spring 2021 (Figure 3.18). At impact sites, the mean number of Sea-heath has remained within the baseline range during all compliance phase surveys (Figure 3.19). For all sites except Sites 1, 7 and 12, the compliance mean abundance has exceeded the baseline mean abundance (Table 3.12).

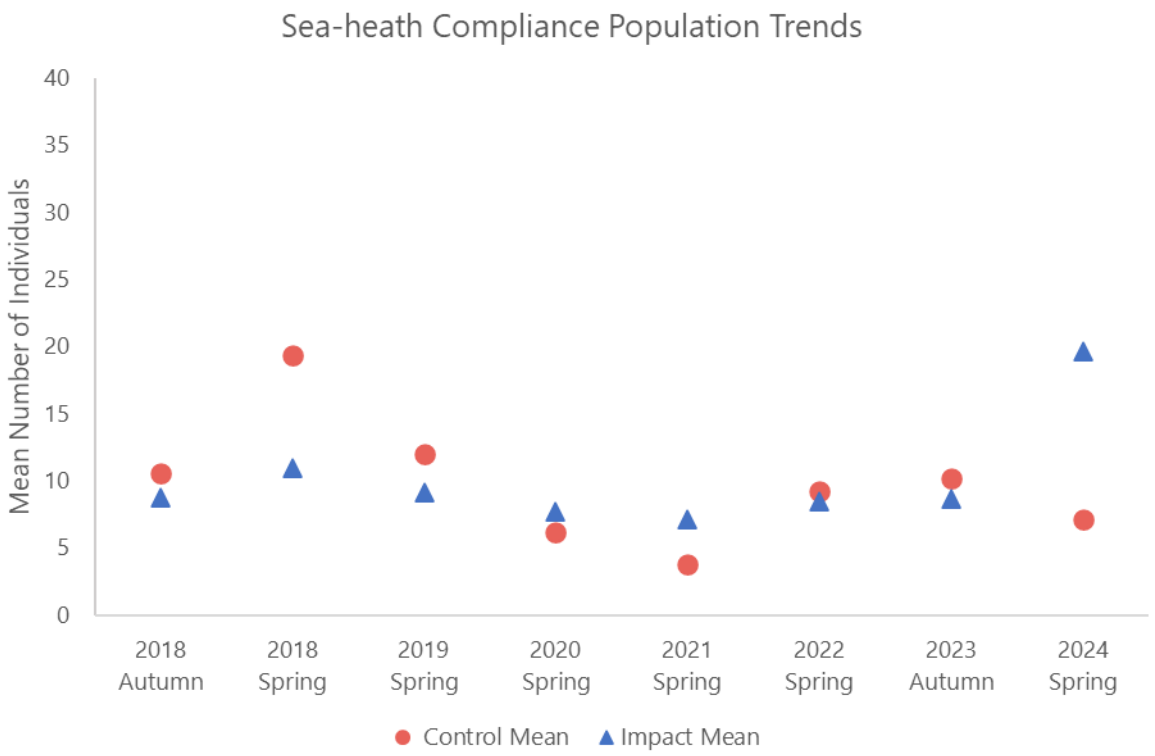



**Figure 3.17: Population trends in Sea-heath during compliance period, control and impact sites**

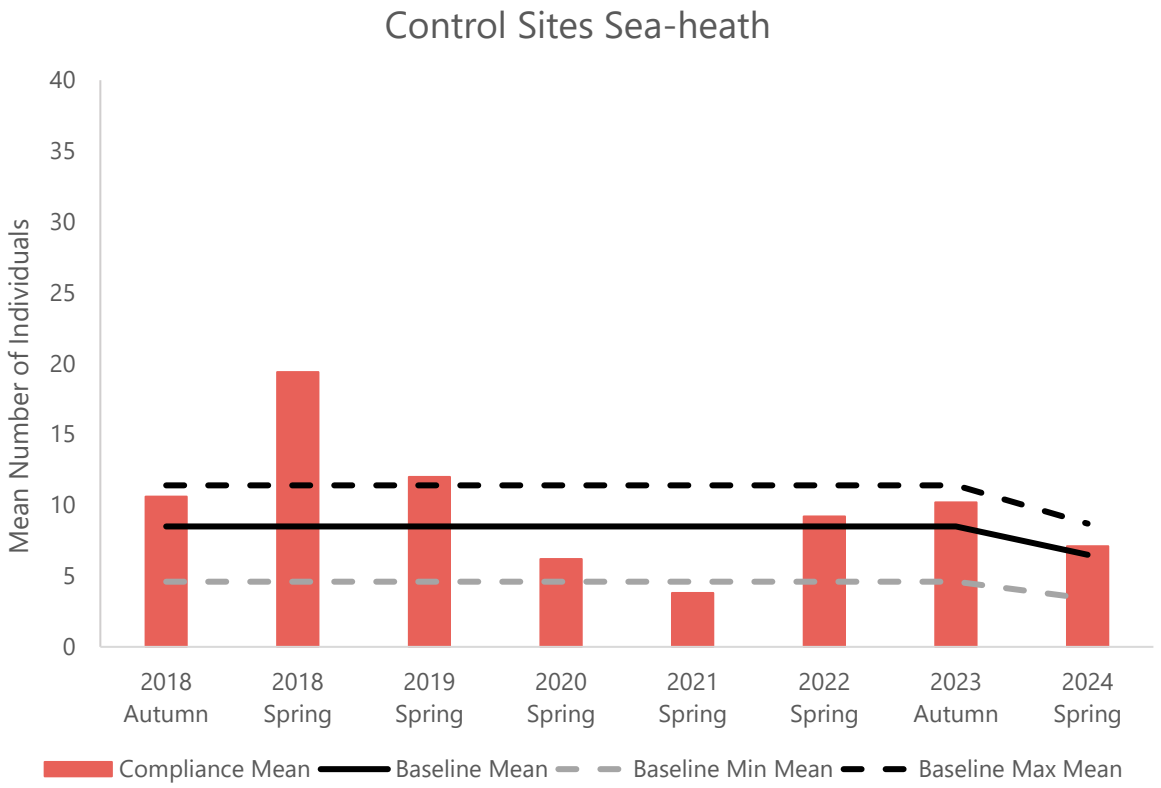



**Figure 3.18: Mean number of Sea-heath at Jessup control sites, baseline (2013-2015) vs compliance monitoring (autumn 2018 to spring 2024).**

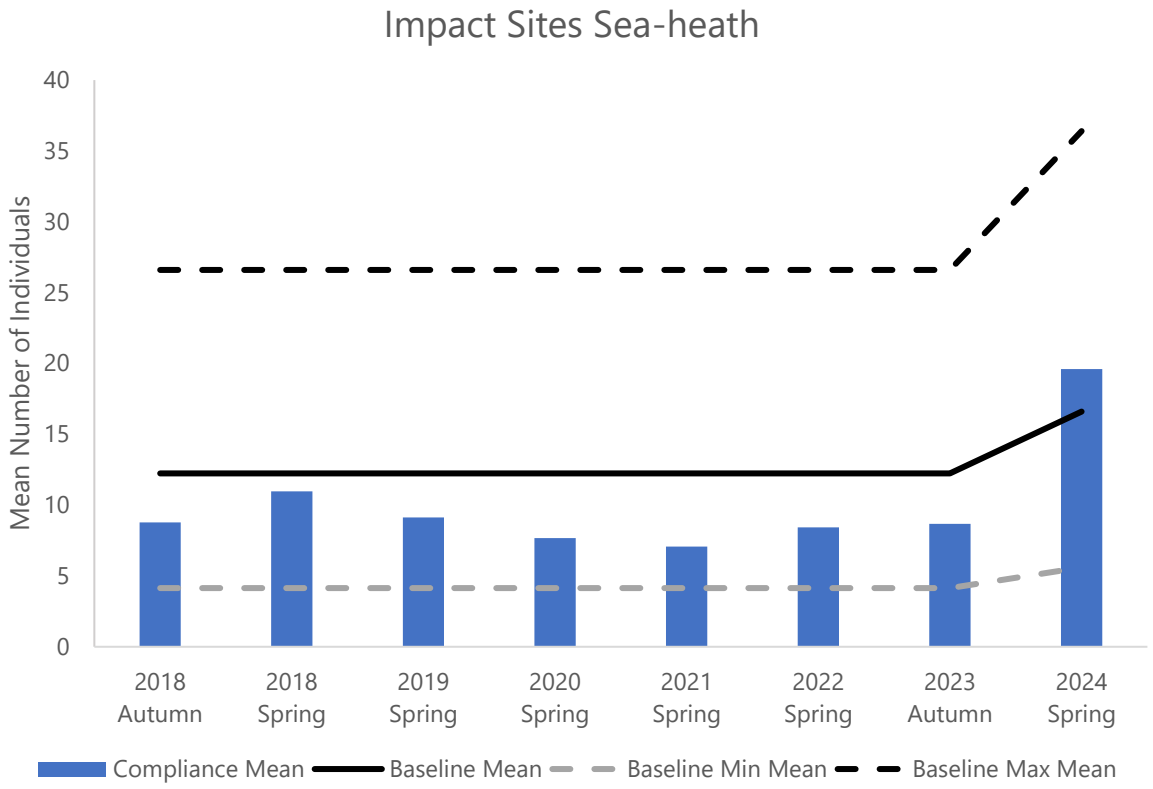



**Figure 3.19: Mean number of Sea-heath at Jessup control sites, baseline (2013-2015) vs compliance monitoring (autumn 2018 to spring 2024).**

**Table 3.12: Sea-heath abundance (adults and juveniles) at individual sites, baseline (2013 – 2015) and compliance (2018 – 2024)**

| Jessup Site | Baseline Mean | Baseline Min | Baseline Max | Compliance Mean | Compliance Min | Compliance Max |
|---|---|---|---|---|---|---|
| 1 | 8 | 4 | 14 | 1 | 0 | 4 |
| 2 | 1 | 0 | 2 | 1 | 0 | 5 |
| 3 | 22 | 9 | 39 | 26 | 9 | 45 |
| 4 | 1 | 0 | 3 | 2 | 0 | 12 |
| 5 | 54 | 9 | 135 | 77 | 14 | 116 |
| 6 | 1 | 0 | 2 | 2 | 0 | 5 |
| 7 | 17 | 11 | 20 | 11 | 3 | 21 |
| 9 | 3 | 0 | 5 | 13 | 2 | 28 |
| 11 | 2 | 1 | 3 | 10 | 0 | 65 |
| 12 | 2 | 1 | 3 | 1 | 0 | 2 |
| 13 | 14 | 6 | 27 | 23 | 1 | 58 |
| 15 | 4 | 0 | 21 | 6 | 4 | 8 |

**Bush Minuria (*Minuria cunninghammii*) and Plains Lantern Bush (*Abutilon halophilum*)**

Previous compliance reporting has compared the abundance of Bush Minuria and Plains Lantern Bush with baseline data. As with other Jessup data comparisons, baseline data available for Jessup transects is limited to a relatively short period (2013 – 2015) which did not reflect a wide range in rainfall extremes. Given there are high inherent spatial and temporal variability in the density of these two species, and the relatively small abundances at most Jessup sites, a comparison of compliance abundance levels with baseline abundance levels is somewhat spurious.

However, because Bush Minuria is relatively widespread at the gibber sites and is one of the larger long lived perennials present, abundance in 2024 at Jessup sites was briefly compared to baseline data. Bush Minuria is a long-lived shrub that is highly palatable in the Carrapateena region. Previous compliance reporting has shown that the abundance of Bush Minuria at Jessup sites has varied widely both between surveys and also within survey sites. This was attributed to both variation in yearly rainfall totals and also grazing impact.

The 2024 data, however, shows that the current population of Bush Minuria exceeds the baseline populations for both control and impact sites, and the extent of occurrence has also increased. The mean abundance at baseline control and impact sites (based on 2024 infrastructure) was 5 individuals and 4 individuals, respectively (with means ranging from 3.2 to 7 individuals per site at control sites, and from 1.2 to 8.8 individuals per site at impact sites). In 2024 the mean abundance at control and impact sites was 12.5 individuals and 6.8 individuals, respectively. During baseline surveys (2013 to 2015), Bush Minuria was recorded at 8 sites. During the 2024 survey, Bush Minuria was surveyed at 11 Jessup sites.

#### 3.2.2.2 Jessup transects Eliza Creek Sites

To assess potential impacts on vegetation downstream of the Tailings Storage Facility (TSF), four sites were established in autumn 2018 progressively downstream from the TSF embankment within Eliza Creek. In addition, Site 10 was established in 2012 during baseline surveys, and is located downstream from site 20 (furthest from the TSF). At each site, the survey methods included a Jessup transect, which is a count of all adult and juvenile woody long-lived perennial species. Since 2018, all sites have recorded a net increase in the total number of long-lived woody perennials (Figure 3.20). Sites 17, 19 and 20 have recorded approximately 50% increase since 2018 and Sites 10 and 18 have recorded an increase of approximately 25%.

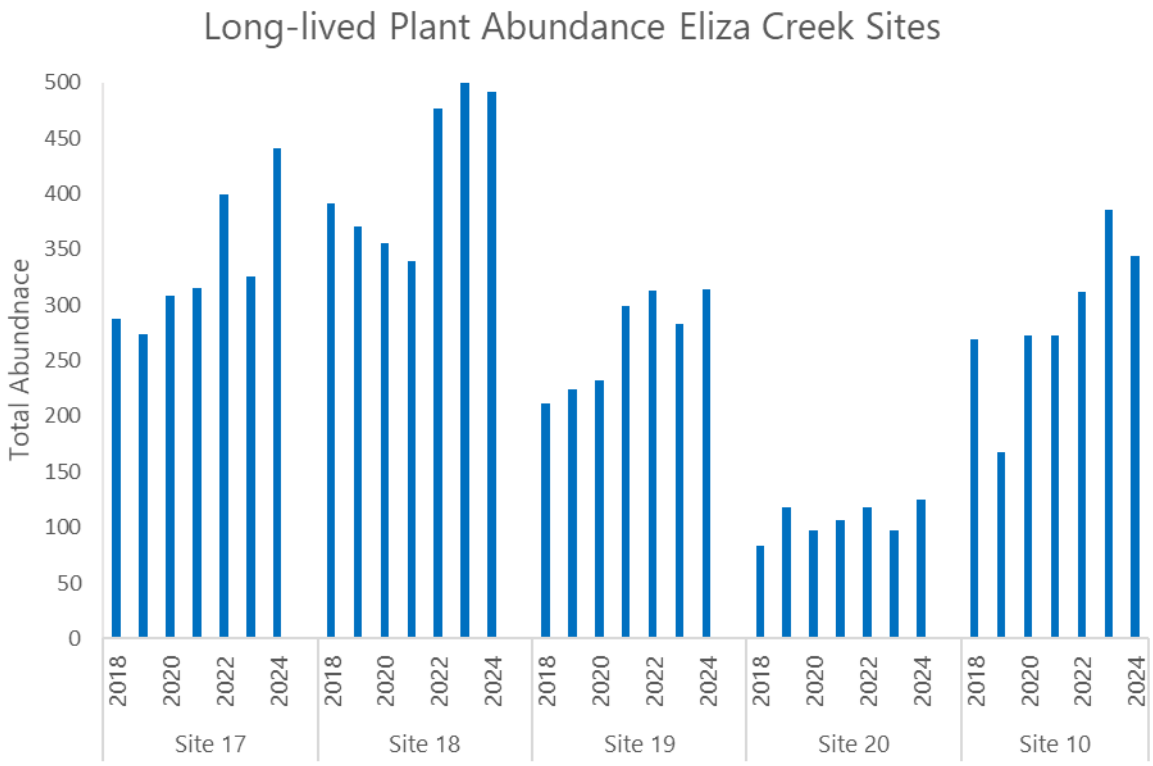



**Figure 3.20: Combined abundance of all species recorded at Eliza Creek Jessup survey sites (adults and juveniles included)**

### 3.2.2.3 Abundance of select long-lived perennials at Eliza Creek sites

To further analyse population trends in long-lived species at the Eliza Creek transects, the total number of individuals recorded for the most widespread and/or abundant long-lived species are presented in Figure 3.21 to Figure 3.30. Appendix D2 presents the data in tabular form.

**Dead Finish *(Acacia tetragonophylla)***

The results show all species populations have either remained stable of recorded an upward trend since 2018. The only exception is a downward trend for Dead Finish at Site 10, which is the furthest site from the TSF.

At the Jessup sites, Dead Finish is most abundant at Site 10, with abundance ranging from 22 individuals in 2019 to 43 individuals in 2020 (Figure 3.21). Dead Finish occurs in dense clusters at Site 10, and fluctuating numbers may reflect differences in distinguishing individual plants between survey periods. At the Jessup transects upstream from Site 10 (closer to the TSF), populations of Dead Finish have remained stable since 2018. Noting Dead Finish does not occur in the Jessup transect for Site 17.

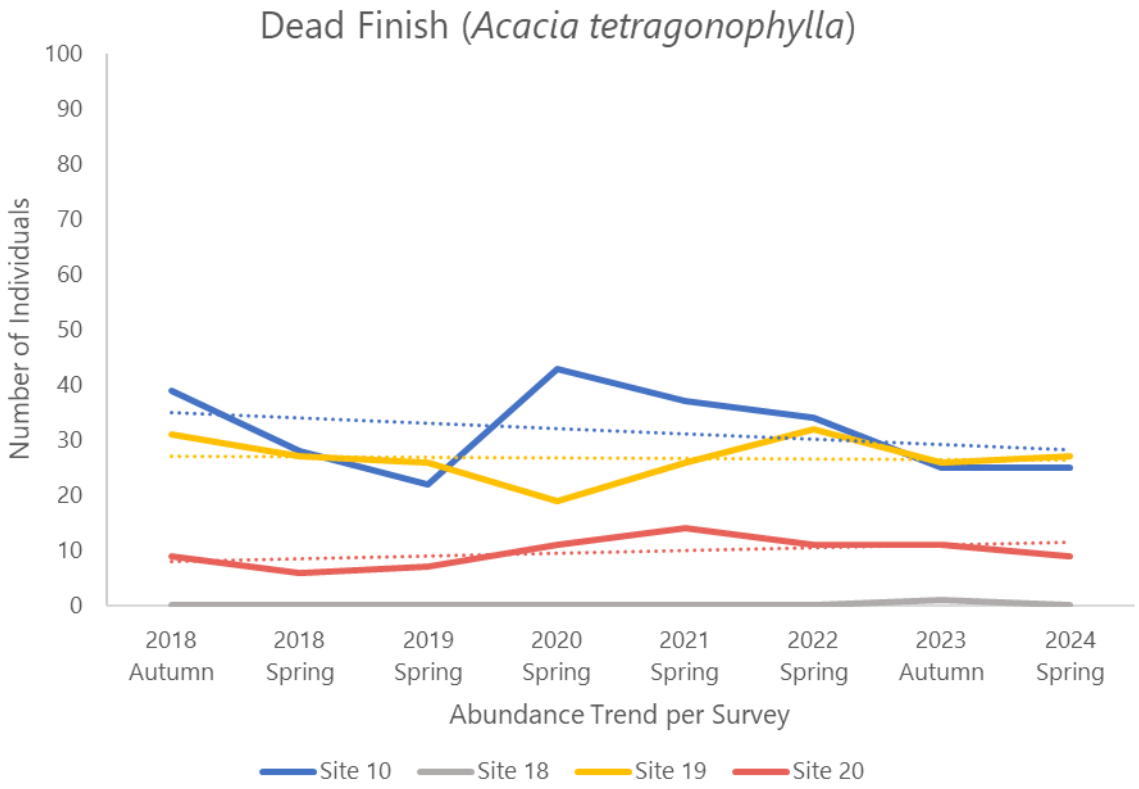



**Figure 3.21: Abundance of Dead Finish (adult and juveniles) recorded along Eliza Creek Jessup transects (2018-2024)**

**Western Myall *(Acacia papyrocarpa)***

Western Myall abundance has fluctuated widely at Site 18, largely due to fluctuations in seedling abundance (with some seedlings germinating but not surviving beyond a year). Regeneration of Western Myall has been widespread, and particularly at Site 17 where nine juveniles were recorded in 2024 (Figure 3.22). There is no notable decline in abundance of Western Myall which could be attributed to the TSF operation.

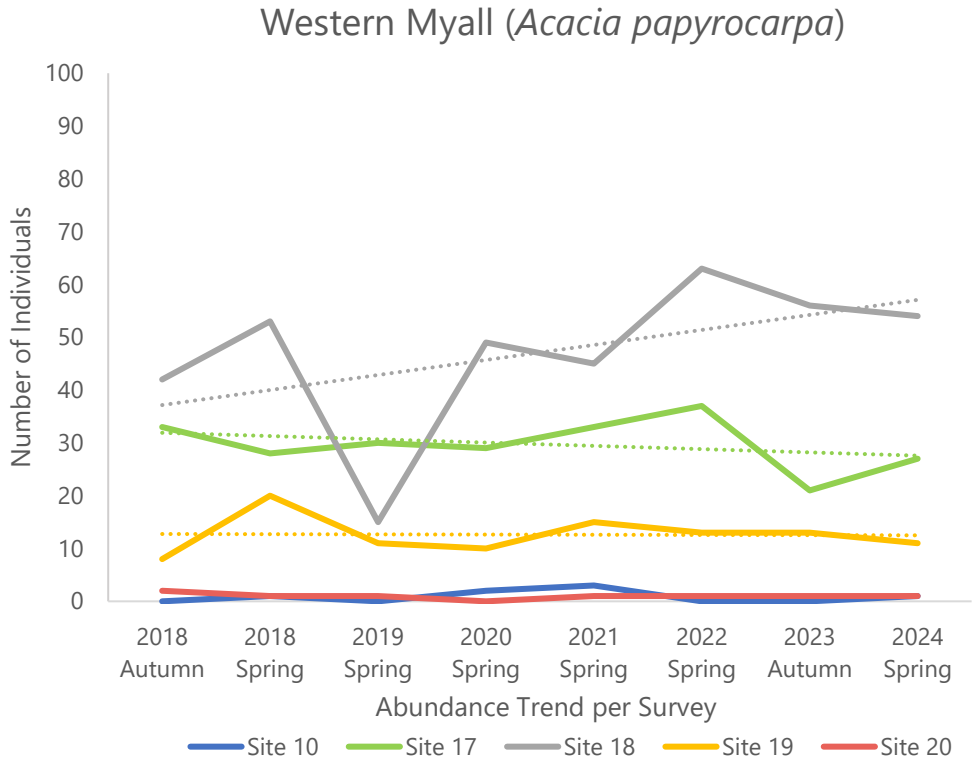



**Figure 3.22: Abundance of Western Myall (adult and juveniles) recorded along Eliza Creek Jessup transects (2018-2024)**

### Lobed-leaf Hopbush *(Dodonaea lobulata)*

Lobed-leaf Hopbush abundance has remained stable at Sites 10, 17, 18 and 20. At Site 19, population levels at the Jessup site have fluctuated but show no distinct long-term trends (Figure 3.23). In 2024, one juvenile was recorded, with the remaining 188 individuals being adults. There is no notable decline in abundance of Lobed-leaf Hopbush which could be attributed to the TSF operation.

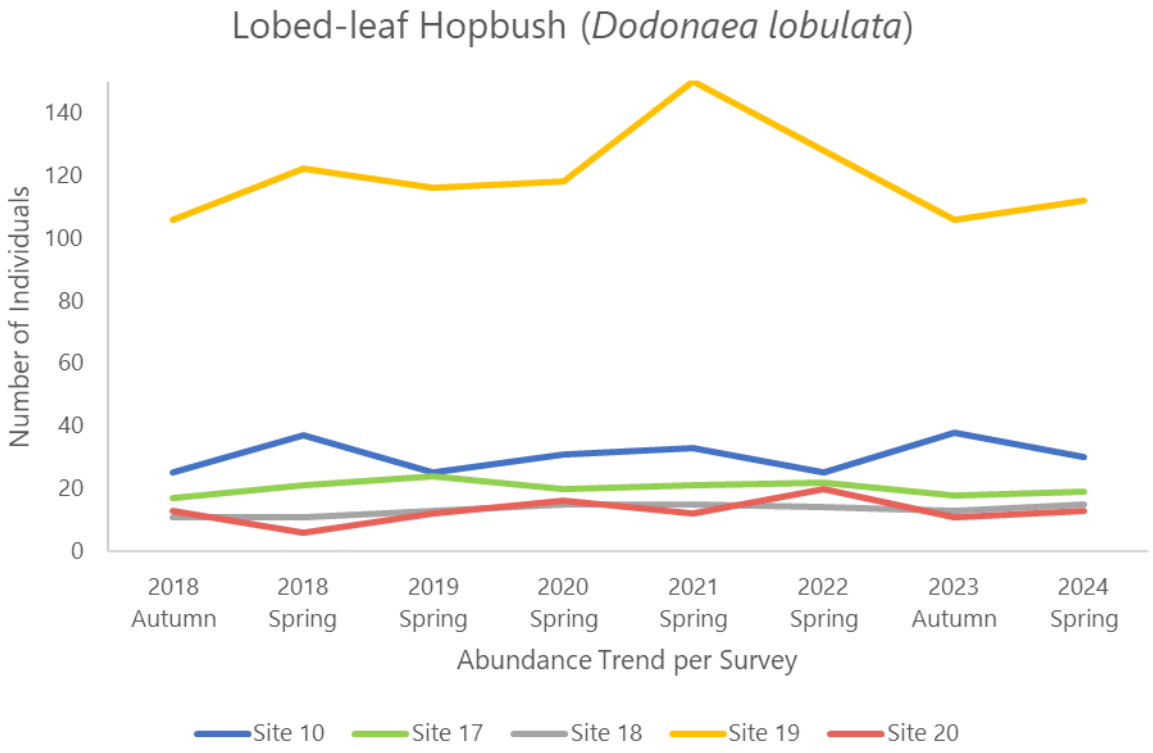



**Figure 3.23: Abundance of Lobed-leaf Hopbush (adult and juveniles) recorded along Eliza Creek Jessup transects (2018-2024)**

**Lignum *(Duma florulenta)***

Lignum is sparsely present at Sites 10 and 19, and more abundant at Site 21, but populations have remained stable at all sites (Figure 3.24). There is no notable decline in abundance of Lignum which could be attributed to the TSF operation.

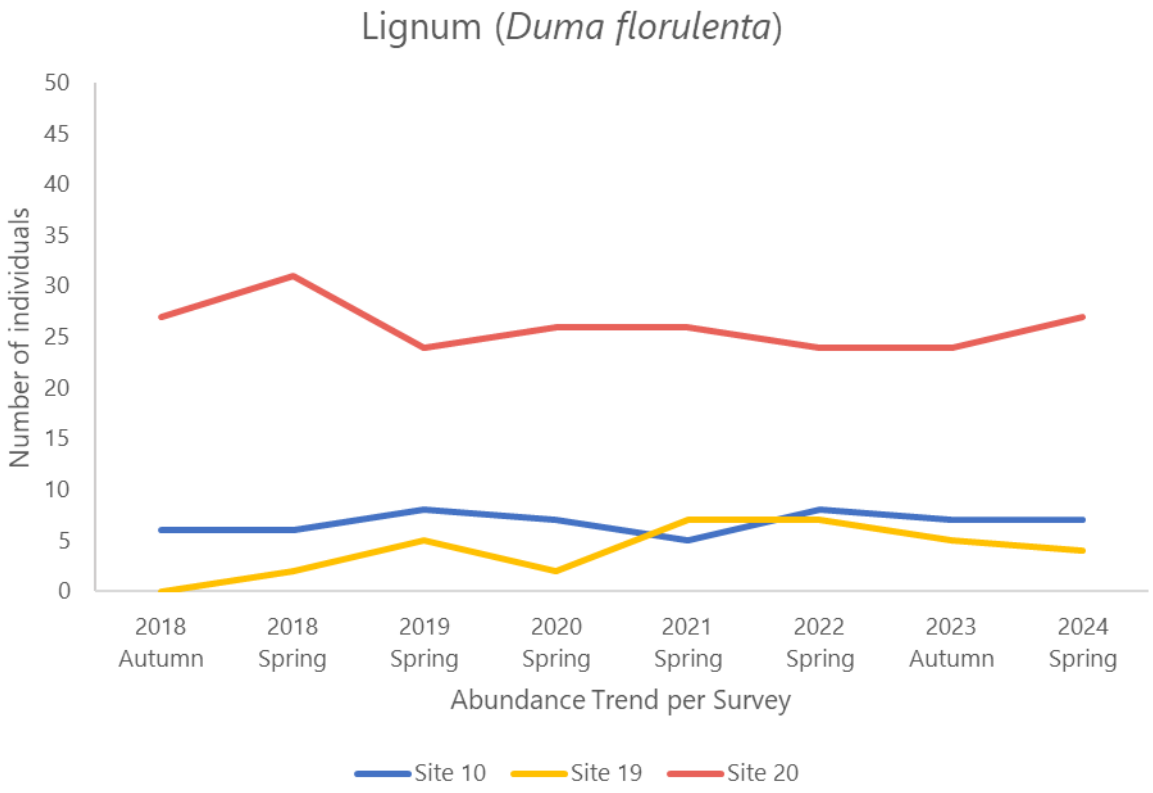



**Figure 3.24: Abundance of Lignum recorded along Eliza Creek Jessup transects (2018-2024)**

**Crimson Emubush *(Eremophila latrobei)***

Crimson Emubush is sparsely present at Sites 10, 17 and 20, but has remained stable at these sites. At Jessup Site 18, the population has increased from 3 plants in 2018 to 9 plants in 2024 (Figure 3.25). There is no notable decline in abundance of Crimson Emubush which could be attributed to the TSF operation.

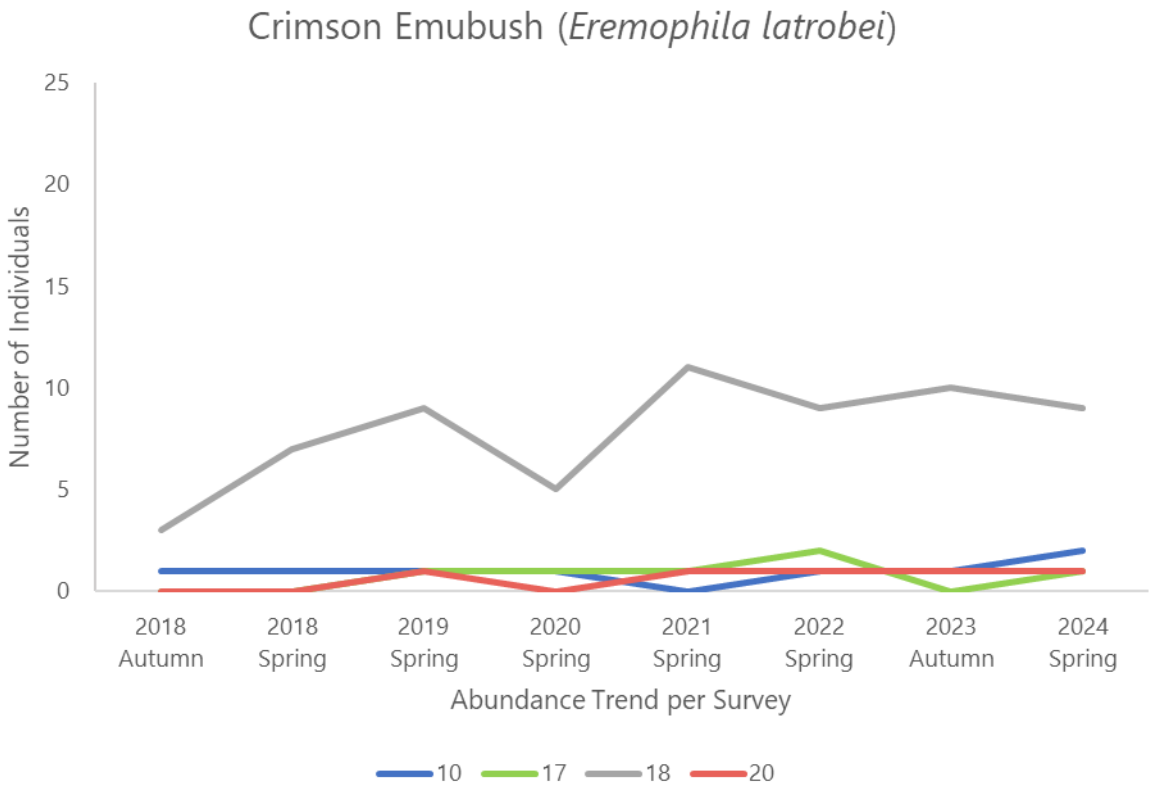



**Figure 3.25: Abundance of Crimson Emubush (adult and juveniles) recorded along Eliza Creek Jessup transects (2018-2024)**

**Spongy-fruit *Bluebush (Maireana spongiocarpa)***

Spongy-fruit Bluebush is highly palatable but the populations as Sites 17 and 18 have increased since 2018 (Figure 3.26). Note data for species was not collected in autumn 2018. There is no notable decline in abundance of Spongy-fruit Bluebush which could be attributed to the TSF operation.

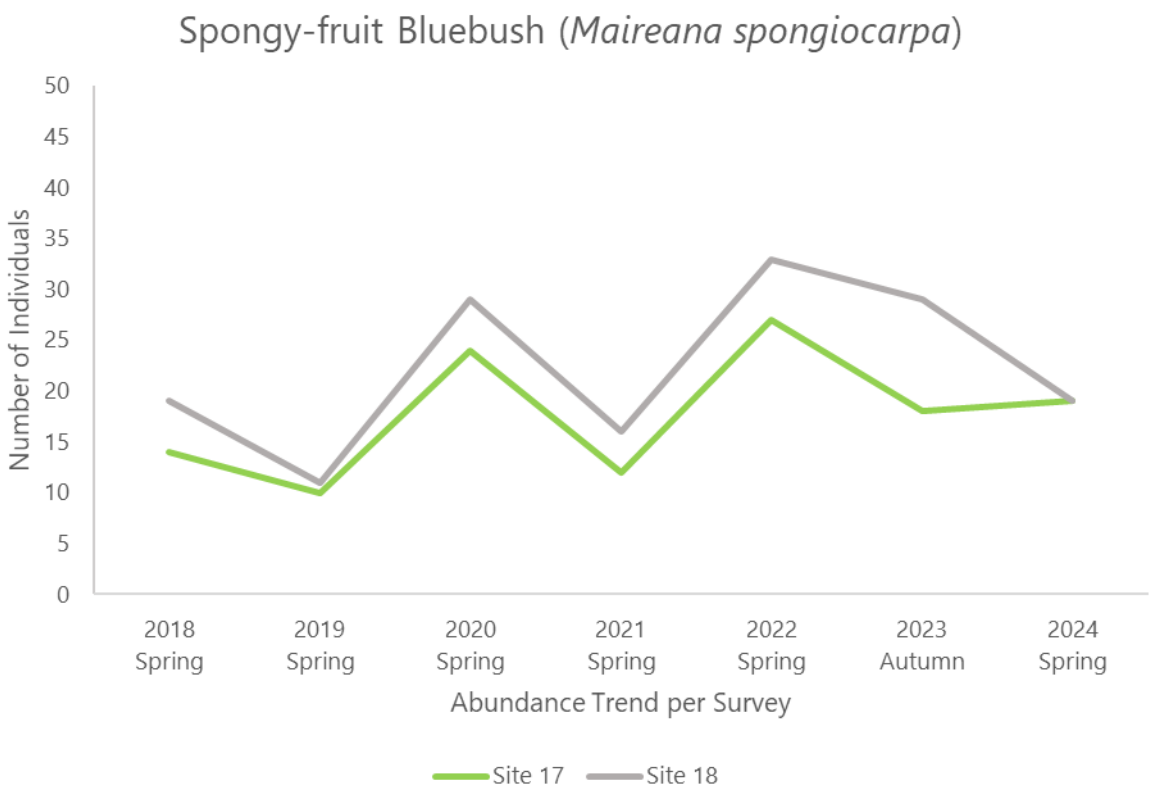



**Figure 3.26: Abundance of Spongy-fruit Bluebush (adult and juveniles) recorded along Eliza Creek Jessup transects (2018-2024)**

### Native Myrtle *(Myoporum montanum)*

In 2024, 75 adults and juveniles of Native Myrtle were recorded from Eliza Creek Jessup sites, the highest recorded since 2018 (Figure 3.27). Of these, 33 individuals were juveniles, likely accounting for at least part of the increased abundance in 2024. In 2023, only five Native Myrtle were recorded from Site 10, whereas 7 adults and 7 juveniles were recorded from Site 10 in 2024. There is no notable decline in abundance of Native Myrtle which could be attributed to the TSF operation.

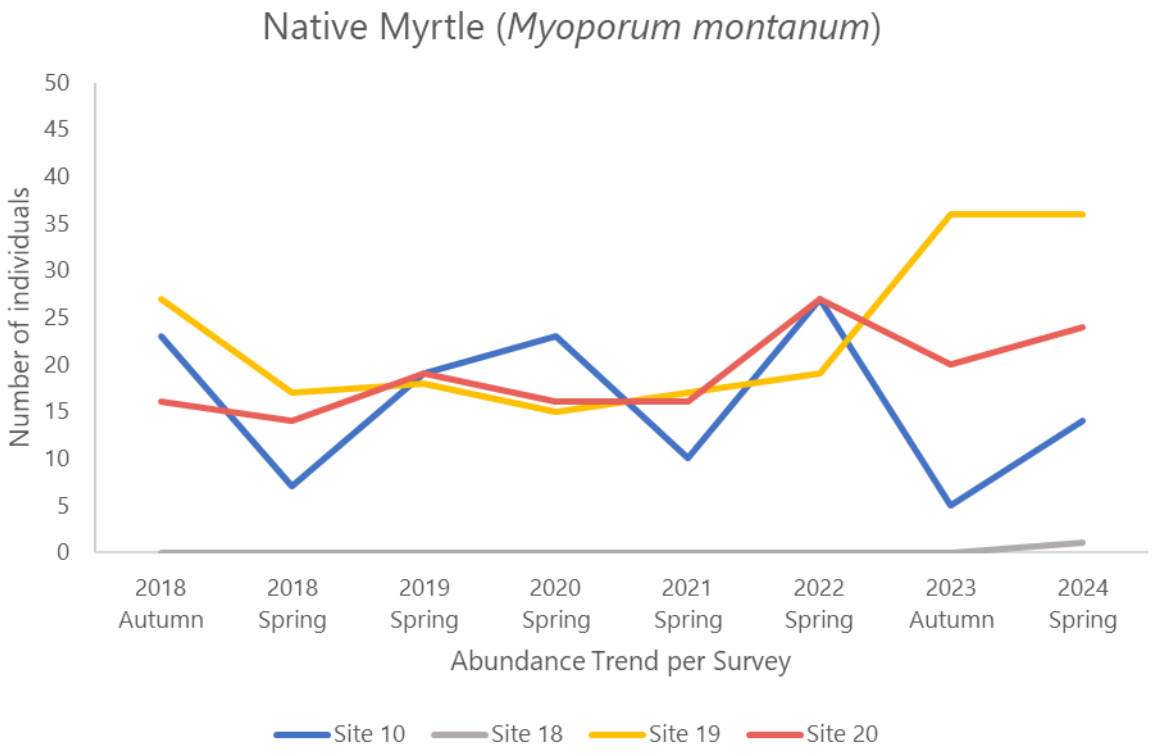



**Figure 3.27: Abundance of Native Myrtle (adult and juvenile) recorded along Eliza Creek Jessup transects (2018-2024)**

**Silver Mulla Mulla *(Ptilotus obovatus)***

Silver Mulla Mulla has increased at each survey site, and especially at Site 10 and 17 where the species has at least doubled in abundance since 2018 (Figure 3.28).

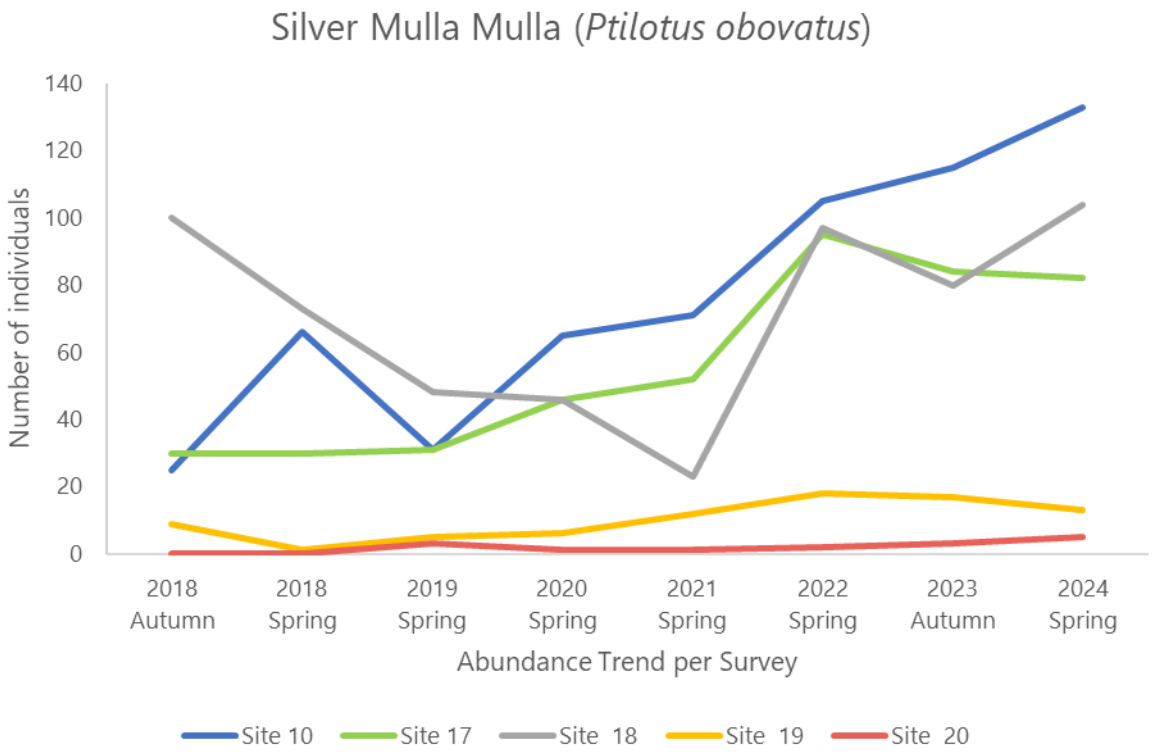



**Figure 3.28: Abundance of Silver Mulla Mulla (adult and juveniles) recorded along Eliza Creek Jessup transects (2018-2024)**

**Spiny Fanflower *(Scaevola spinescens)***

Spiny Fanflower has steadily increased at Sites 10 and 19, and remained stable at Site 17, Site 18 and Site 20 (Figure 3.29).

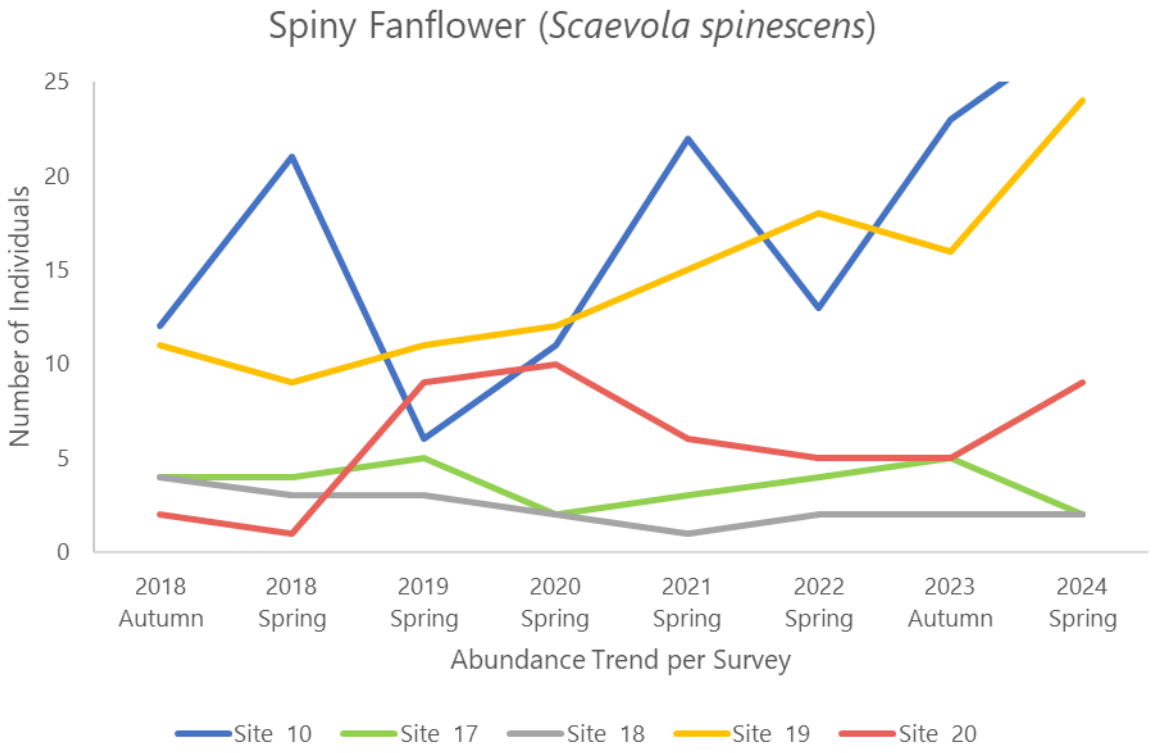



**Figure 3.29: Abundance of Spiny Fanflower (adult and juveniles) recorded at Eliza Creek Jessup transects (2018-2024)**

***Senna sp.***

Although recording yearly fluctuations, at each site, there have been no obvious increasing or decreasing trends for Senna species. The 2018 and 2024 populations varied by no more than two individuals at any one site (Figure 3.30). There is no noticeable decline in Senna, which could be attributed to the TSF.

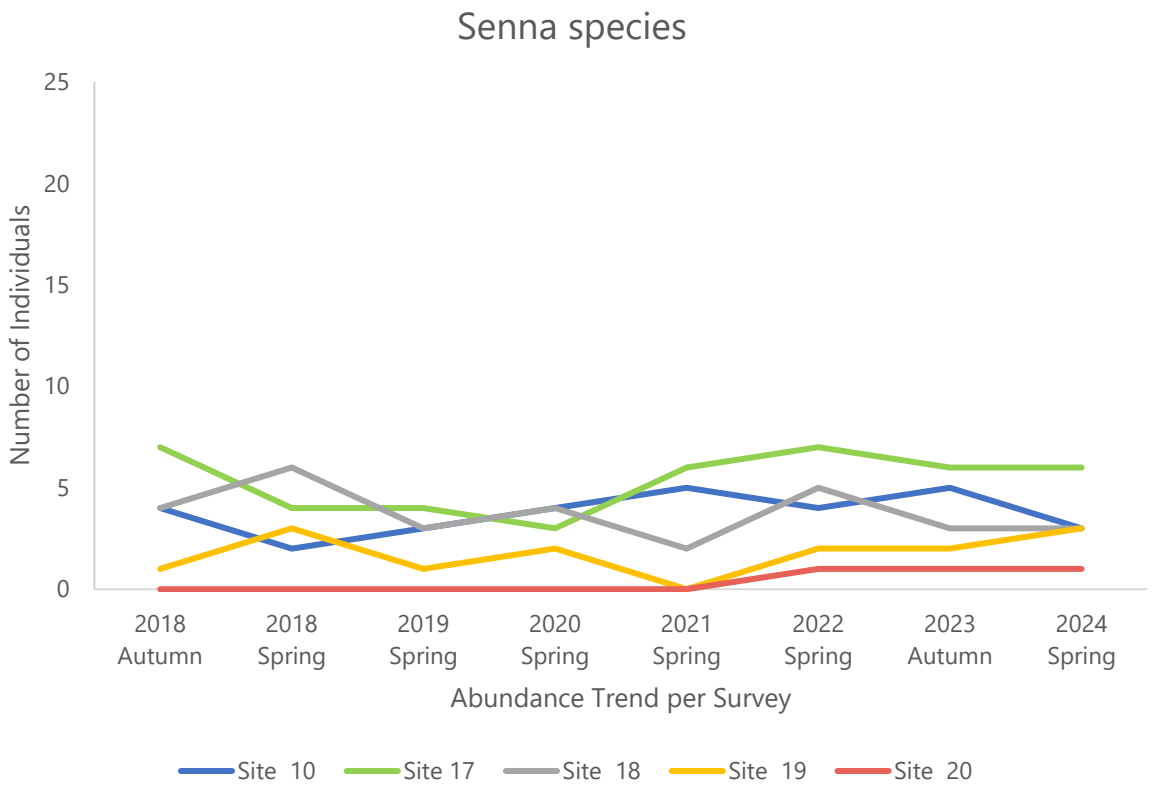



**Figure 3.30: Abundance of Senna species (adult and juveniles) recorded along Eliza Creek Jessup transects (2018-2024)**

### 3.2.3 Canopy cover tree health, Eliza Creek

In addition to Jessup transects, tree canopy cover was assessed at transects in the Eliza Creek sites to assess potential impacts on tree health due to seepage from the TSF or reduced water flows down the catchment as a result of the TSF. It is noted that Sites 17 and 18 are Western Myall sites and Sites 19 and 20 are River Red Gum dominant (refer Table 3.13 for approximate distance from TSF). No canopy cover sites were installed in Eliza Creek Site 10 because it was part of the original RAM / Jessup program and is furthest downstream, therefore least likely to demonstrate impacts from the TSF.

### 3.2.3.1 Canopy cover change

Table 3.13 summarises changes in canopy cover along each transect, since 2018, using two techniques: the densitometer, and visual estimates of individual canopy extent.

**Table 3.13: Summary of canopy changes between 2018 to 2024**

| Transect, landscape position, trees in 2024 | New Trees and Tree Death | Number of Foliage Intercepts | Net % Change in # of Foliage Intercepts | Tree Mean Canopy Extent | Net % Change in Mean Canopy Extent |
|---|---|---|---|---|---|
| 17A, channel (270 m from TSF), WM: 12 live | New trees: 5<br>Deaths: 0 | 2018: 25<br>2024: 27 | +8% | 2018: 86%<br>2024: 86% | 0 |
| 17B, bank (270 m from TSF), WM: 8 live | New trees: 1<br>Deaths: 0 | 2018: 17<br>2024: 16 | -6% | 2018: 90%<br>2024: 90% | 0 |
| 18A, bank (930 m from TSF), WM: 17 live | New trees: 6<br>Deaths: 1 | 2018: 13<br>2024: 32 | +146% | 2018: 81%<br>2024: 80% | -1% |
| 18B, channel (930 m from TSF), WM: 5 live | New trees: 1<br>Deaths: 1 | 2018: 7<br>2024: 7 | 0 | 2018: 42%<br>2024: 33% | -21% |
| 19A, channel (3km from TSF), RG: 6 live WM: 8 live | RG<br>New trees: 0<br>Deaths: 0<br>WM<br>New trees: 6<br>Deaths: 0 | RG 2018: 26<br>2024: 28 | +8% | RG 2018: 59%<br>2024: 61% | +3% |
| 19B, channel edge (3 km from TSF), RG: 5 live WM: 6 live, 0 dead | RG<br>New trees: 1<br>Deaths: 1<br>WM<br>New trees: 4<br>Deaths: 0 | RG 2018: 16<br>2024: 12 | -25% | RG 2018: 41%<br>2024: 47% | +15% |
| 20A, channel edge (4.65 km from TSF), RG: 9 live WM: 1 live | RG<br>New trees: 0<br>Deaths: 0<br>WM<br>New trees: 0<br>Deaths: 0 | RG 2018: 21<br>2024: 28 | +33% | RG 2018: 39%<br>2024: 61% | +56% |
| 20B, channel (4.65 km from TSF), RG: 4 live WM: nil | RG<br>New trees: 0<br>Deaths: 0 | RG 2018: 24<br>2024: 19 | -21% | RG 2018: 51%<br>2024: 78% | +53% |

[1]WM = Western Myall (*Acacia papyrocarpa/Acacia sp. Blyth Range*), RG = River Red Gum (*Eucalyptus camaldulensis subsp. arida*)

### 3.2.3.2 Live foliage estimates (densitometer data)

Comparing the total number of densitometer foliage records along a transect over time provides an indication of changes in total canopy cover along the transect. Potential changes in total canopy cover may be a combination of canopy expansion of individual trees (natural growth, improved canopy health), dieback; and/or recruitment of new trees.

#### *Western Myall (Acacia papyrocarpa/ Acacia sp. Blyth Range)*[2]

The total number of Western Myall foliage records for the two transects combined at each site has varied between survey periods, but Sites 17 (Western Myall), 18 (Western Myall) and 19 (River Red Gums and Western Myalls present) have trended strongly upwards (Figure 3.31). The increase in foliage records at each site is largely due to additional trees being recorded along each transect (refer below). At Site 20, there has been only one Western Myall tree intercepted at all recording periods, and the foliage records have been relatively constant. Figure 3.31 shows the sum of Western Myall foliage records for the two transects combined at each site. Figure 3.32 and Figure 3.33 show foliage records for individual transects at Site 17 and Site 18, respectively.

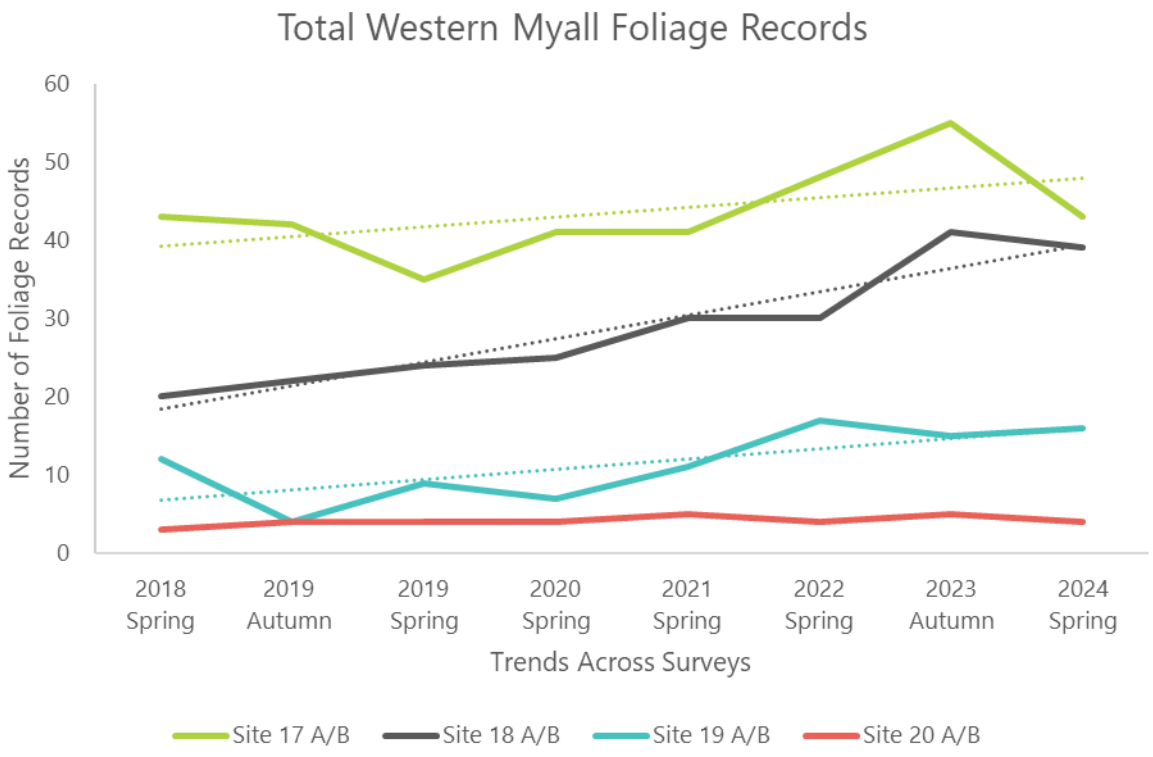



**Figure 3.31: Total number of Western Myall foliage records 2018-2024 at each site**

[2] Note that the Western Myalls in the Carrapateena operational area may be *Acacia papyrocarpa* and/or the very similar Acacia sp. Blyth (formerly *Acacia affinity papyrocarpa*). Distinction requires fruiting pods which were absent during surveys

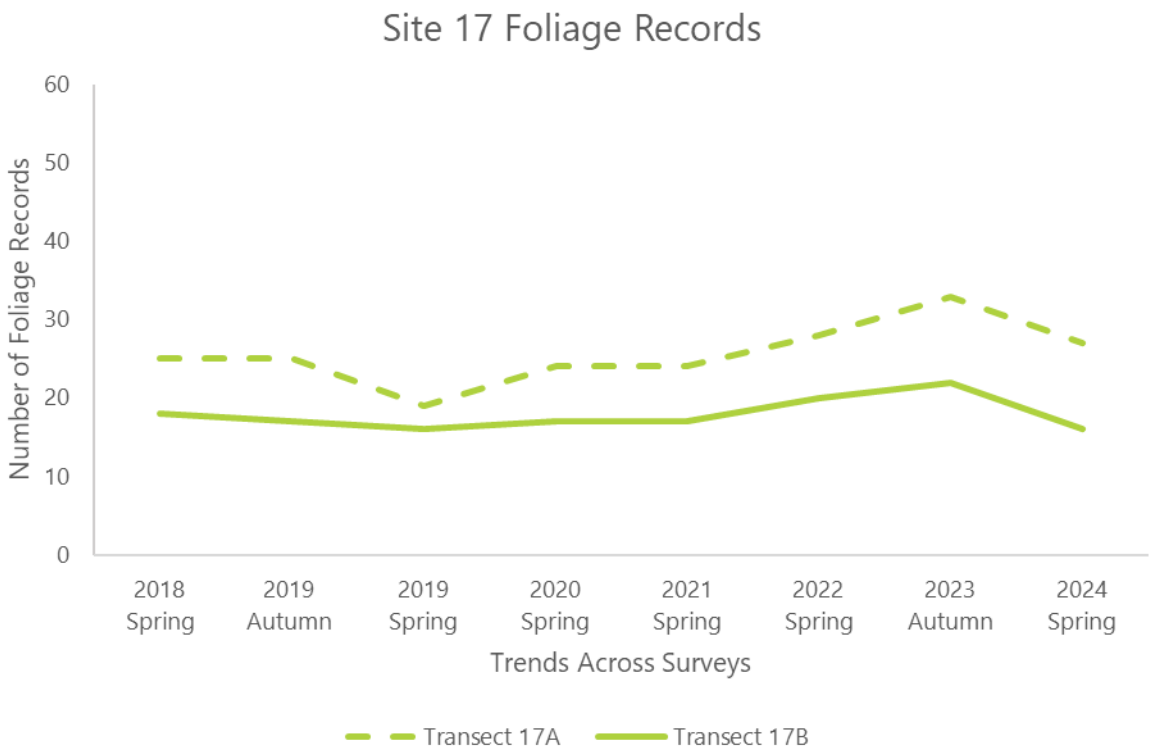



**Figure 3.32: Number of Western Myall foliage hits along Site 17 transects (2018 to 2024)**

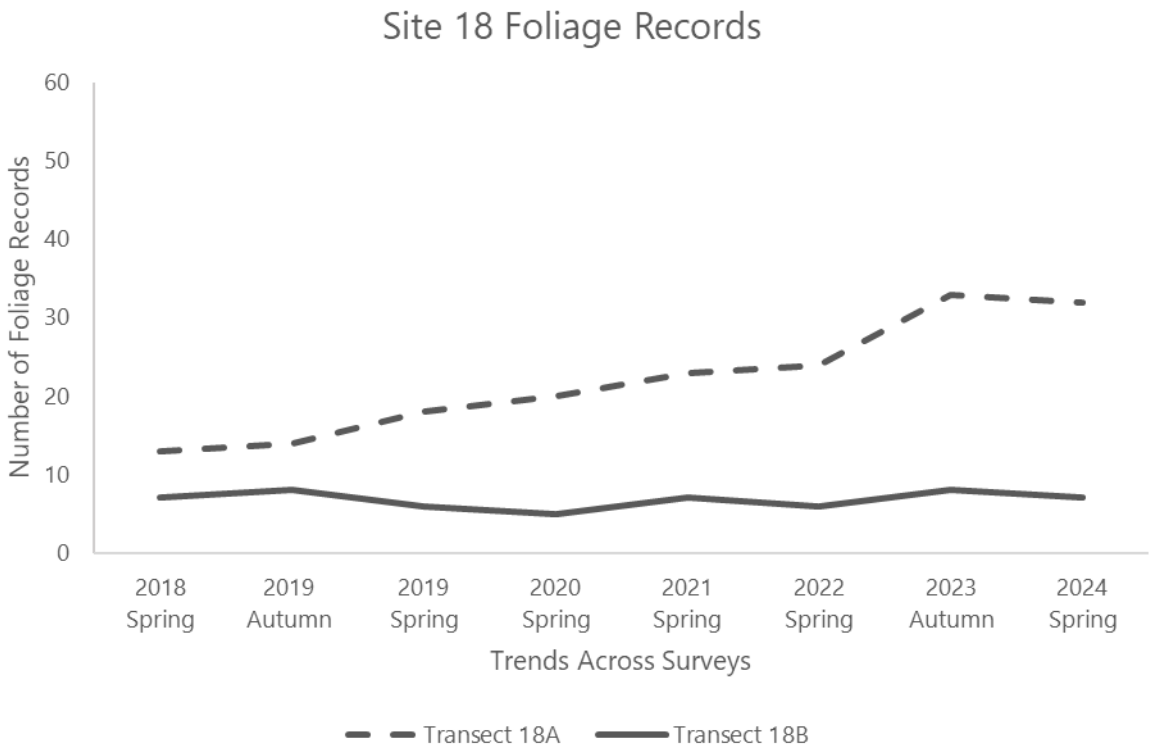



**Figure 3.33: Number of Western Myall foliage hits along Site 18 transects (2018 to 2024)**

### Northern River Red Gum *(Eucalyptus camaldulensis* ssp. *arida)*

The number of foliage records for Sites 19 and 20 (for both transects combined at each site) has fluctuated, often quite markedly, between survey periods. However, there has been no trend apparent at Site 19 (nor for each individual transect at Site 19), and an upward trend in total foliage records at Site 20 (and also for each individual transect at Site 20). At Site 19, the total number of foliage records declined sharply during 2019 to 2021 before recovering between 2022 and 2024, to 2018 levels. Similarly, at Site 20, following declines in canopy foliage in 2019 and 2020, canopy foliage records recovered in 2021 to 2024 to 2018 levels.

Figure 3.33 shows the River Red Gum foliage records for the two transects combined at each site. Figure 3.35 and Figure 3.36 show River Red Gum foliage records for individual transects at Sites 19 and 20, respectively.

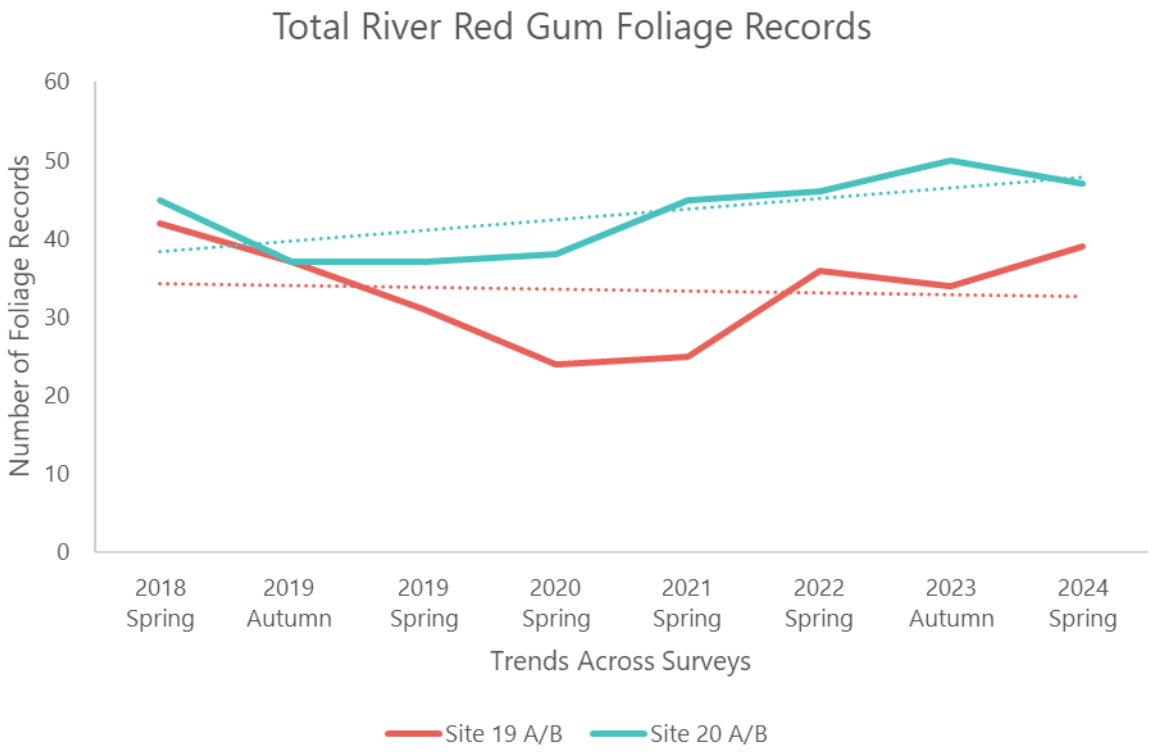



**Figure 3.34: Total number of River Red Gum foliage hits for each site (autumn 2018 to spring 2024)**

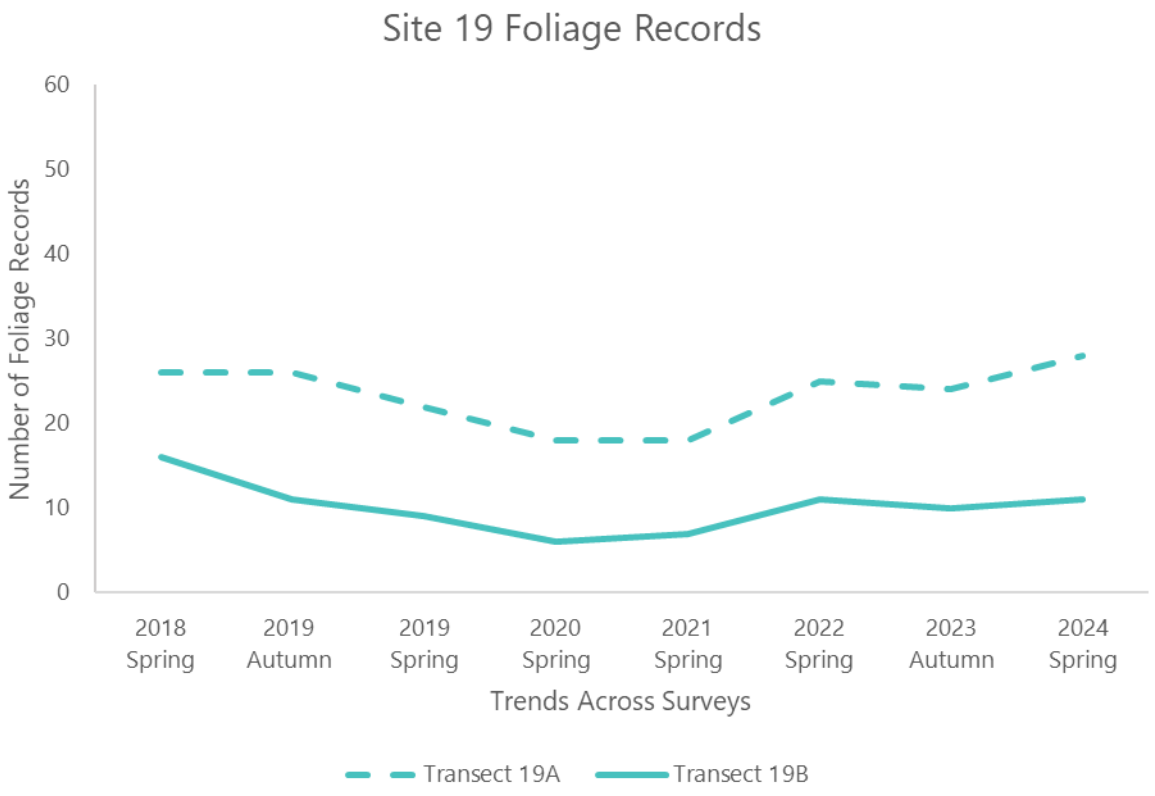



**Figure 3.35: Number of River Red Gum foliage hits along Site 19 transects (2018 to 2024)**

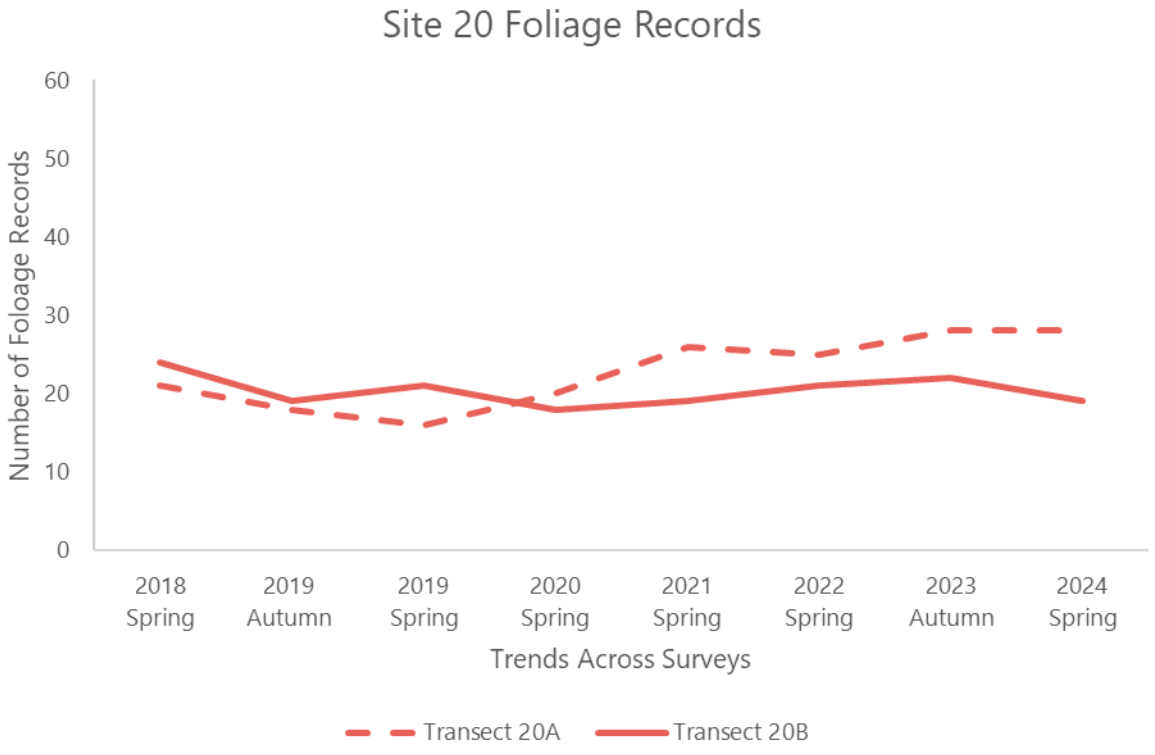



**Figure 3.36: Number of River Red Gum foliage hits along Site 20 transects (2018 to 2024)**

### 3.2.3.3 Tree death and new trees

Given the surveyed trees are individually numbered along each transect (initiated in 2019), it is possible to identify: individual tree death, canopy loss resulting in trees no longer being recorded along the alignment, and tree canopies that are intercepted along the alignment for the first time. New trees are recorded as a result of expansion of mature tree canopies onto the transect alignment and/or younger trees that newly meet the survey criteria for densitometer recordings (i.e. minimum plant height of 1 m and intercepting the transect).

#### *Western Myall*

In 2024, 4 new Western Myall trees were recorded along the transects (one at Site 17, two at Site 18 and one at Site 19). No tree deaths were recorded (Figure 3.37).

Since 2018, there have been two Western Myall tree deaths and 23 new Western Myall trees recorded along the combined transects. The two deaths both occurred at Site 18. These trees were estimated to have retained less than 10% of their canopy foliage prior to the operation of the TSF (see Jacobs 2020a report for full details). There have been no Western Myall deaths at Sites 17, 19 or 20. The great majority of new trees intercepted along transects have been juveniles that have increased in size, namely whose canopy had expanded to a sufficient degree to be intercepted along the alignment and/or whose height of canopy above the ground met the survey criteria (as above).

The number of existing, new and dead Western Myall trees recorded at each site (transects combined) is shown in Figure 3.37 and Appendix E, respectively, noting that Site 17 is the closest to the TSF.

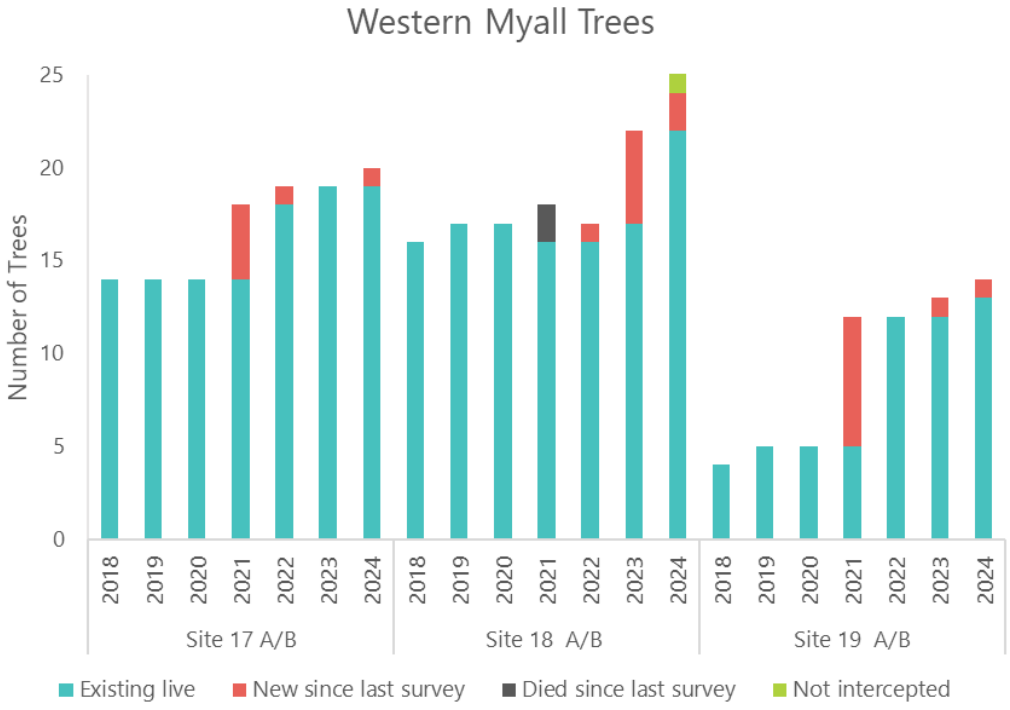



**Figure 3.37: Change in Western Myall abundance (new = meets criteria, not intercepted = tree present but not intersecting transect yet)**

Site 20 not shown, given only one Western Myall present at all survey periods.

***River Red Gums***

In 2024 one new Red Gum was recorded (Site 19) and there were no River Red Gum deaths. Since 2018, one River Red Gum has died (at Site 19) and one new tree has been intercepted along the transects (also at Site 19). The dead tree recorded in 2021 at Site 19 had a visually estimated canopy extent of approximately 50% in 2019 and 3% in 2020. Transect 19 is 3,000 m downstream of the TSF.

In 2020, loss of a large branch resulted in one tree not intercepting the transect at CC20. However, by 2022, this tree had regained canopy, resulting in it once again being intercepted along the transect, and recorded in 2022, 2023 and 2024. Figure 3.38 shows the number of live Red Gum trees, deaths and new trees for each survey period since 2018.

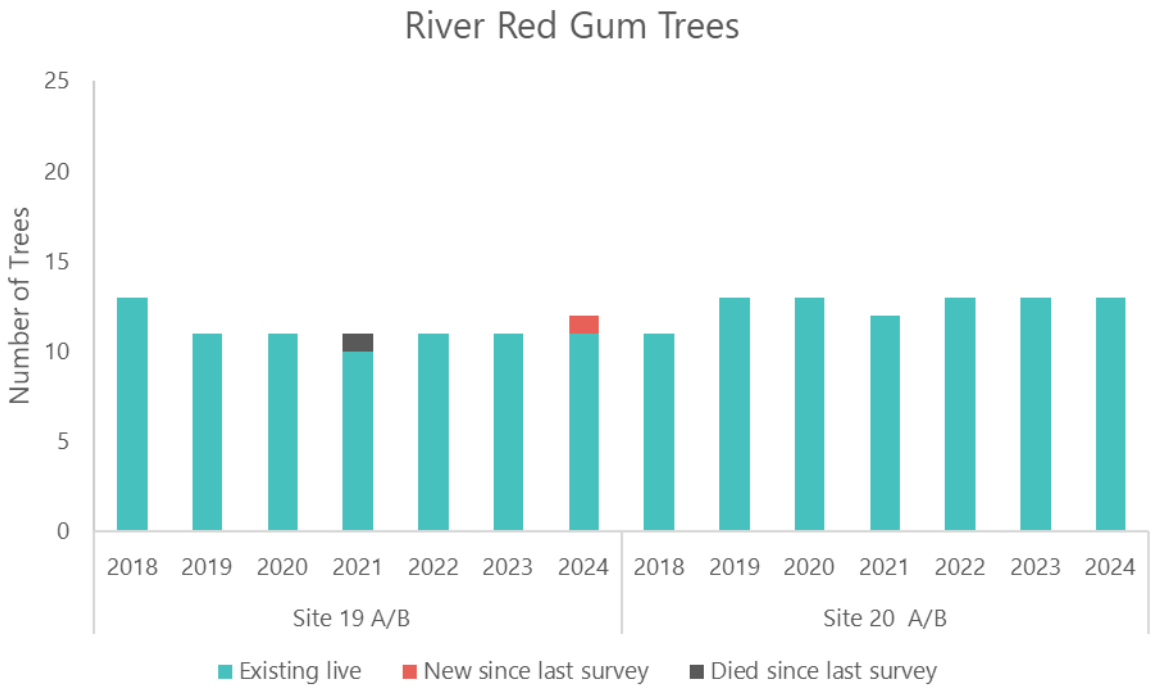



**Figure 3.38: Change in River Red Gum abundance (new = met criteria, not intercepted = tree present, but not intersecting transect yet)**

### 3.2.3.4 Visual estimates of canopy intactness

Visual estimates of canopy intactness for individual trees commenced in 2019 as an additional alternate means of estimating overall tree health. Results for all trees are shown in Appendix E. Mean canopy intactness for each transect is shown in Figure 3.39, Figure 3.40, and summarised in Table 3.14 and Table 3.15.

#### Western Myall

For all transects, there has been no obvious decline in canopy intactness (Figure 3.39). At all transects except 18B and 19B, the majority of Western Myall trees retain almost complete canopies, with canopy intactness estimated at close to 90% or higher (Figure 3.21 and Figure 3.39). This includes both transects at Site 17, which is closest to the TSF (approximately 250 to 350 m downstream).

Mean canopy intactness has remained between 68% and 86% at Transect 19B and has remained stable (from a relatively low base) at Transect 18B. Some variation between survey periods is likely due to observer variation (different observers are likely to differ slightly in their estimates of canopy extent).

**Table 3.14: Visual estimates of canopy intactness for Western Myall trees**

| Transect | Mean % Canopy Intact[1] Western Myall Trees | | | | | |
|---|---|---|---|---|---|---|
| | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 17A | 86 | 87 | 94 | 90 | 92 | 86 |
| 17B | 90 | 92 | 93 | 91 | 97 | 90 |
| 18A | 81 | | 72 | 80 | 89 | 80 |
| 18B | 42 | | 18 | 28 | 35 | 33 |
| 19A | 100 | 100 | 96 | 99 | 100 | 97 |
| 19B | 69 | 68 | 75 | 77 | 86 | 79 |
| 20A | 100 | 90 | 77 | 100 | 100 | 70 |

[1]Visual estimate of canopy extent compared with expected canopy extent for tree in optimum health. No Western Myall on transect 20B.

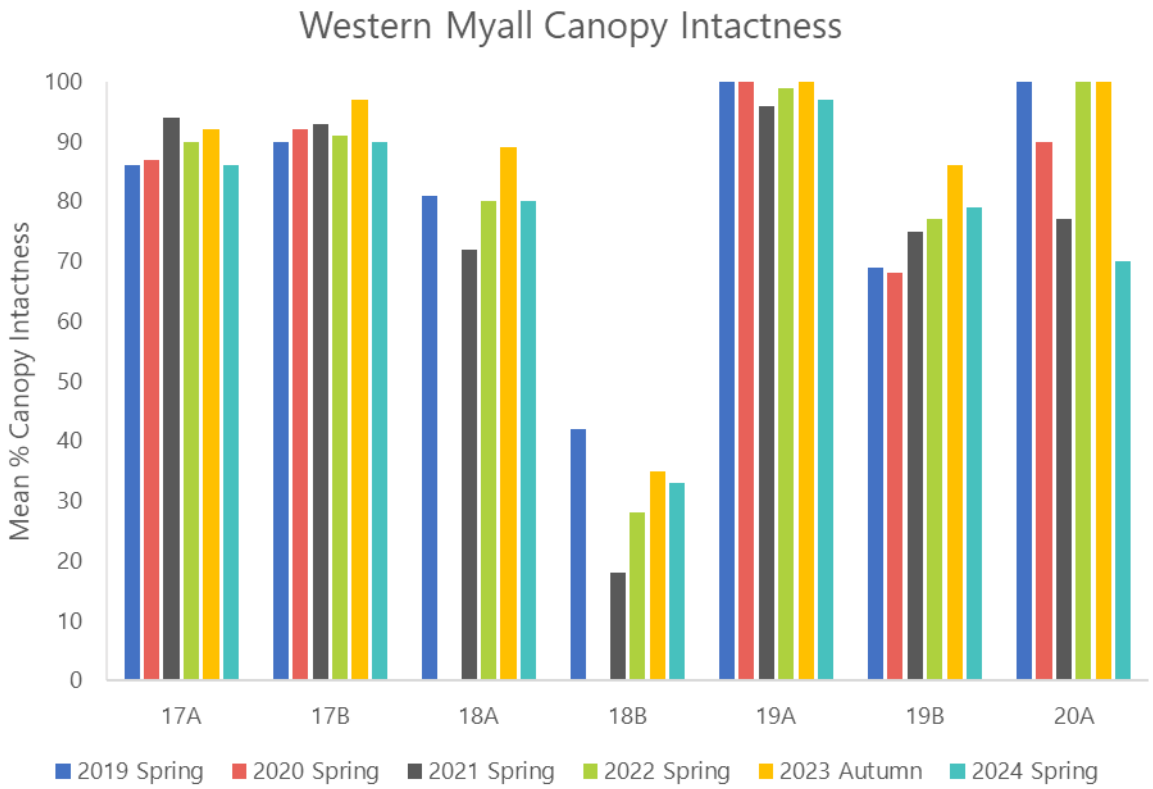



**Figure 3.39: Visual estimates of mean canopy intactness for Western Myall trees (2019-2024)**

[Canopy intactness not recorded in 2020 for transects 18A and 18B. In the above graph, 2019 values have been used for transects 19A and 18B transects].

### *River Red Gum*

Canopy intactness for all the Red Gum transects fluctuated between survey periods, generally being relatively low until 2021, before 50% to 90% increases in canopy intactness in 2022 and 2023. In 2024, all transects recorded declines in mean canopy intactness of Red Gums but intactness levels were still mid-range for the recording period 2019 to 2024 (Table 3.15, Figure 3.40).

**Table 3.15: Visal estimates of canopy intactness for River Red Gum trees**

| Transect | Mean % Canopy Intact[1] River Red Gum Trees | | | | | |
|---|---|---|---|---|---|---|
| | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 19A | 70 | 63 | 60 | 72 | 87 | 61 |
| 19B | 54 | 47 | 43 | 42 | 67 | 47 |
| 20A | 49 | 40 | 47 | 80 | 91 | 61 |
| 20B | 63 | 46 | 46 | 75 | 85 | 78 |

[1]Visual estimate of canopy extent compared with expected canopy extent for tree in optimum health

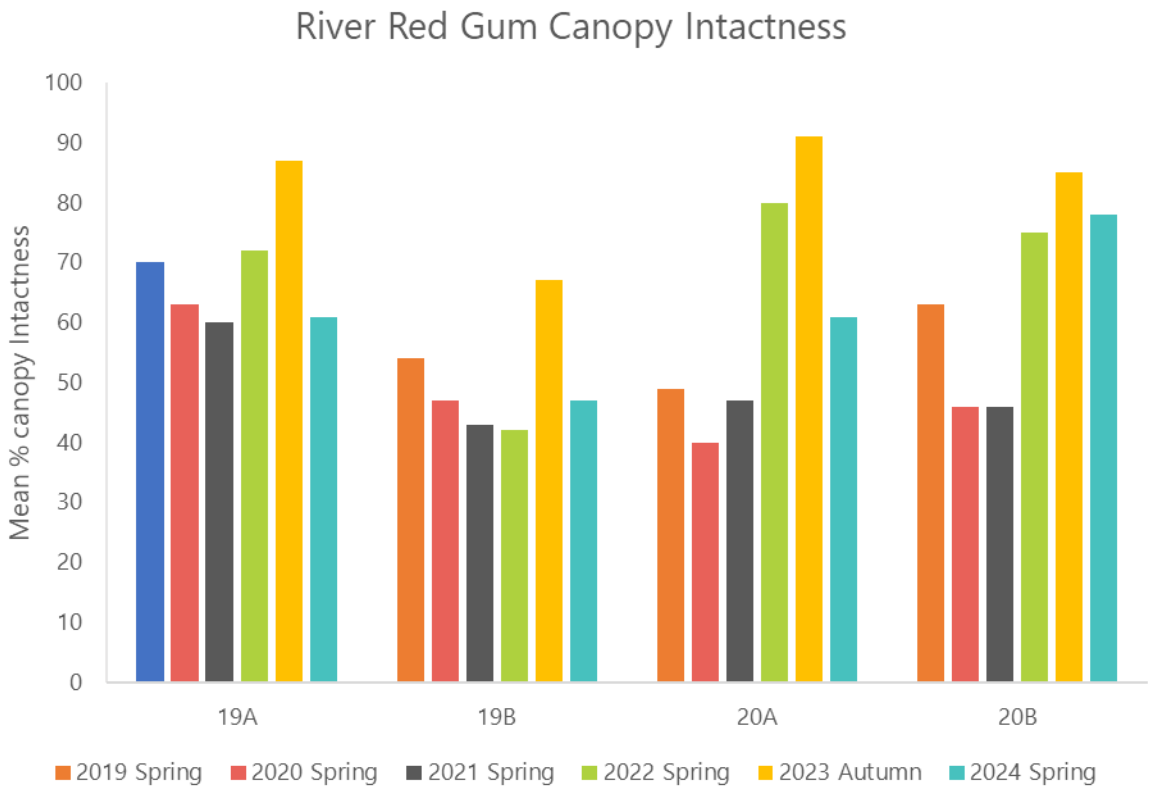



**Figure 3.40: Visual estimates of canopy intactness for River Red Gum trees**

### 3.2.4 Weed diversity and abundance

Weeds were surveyed at standard flora sites, designated weed transects, targeted sites (dams and villages), and opportunistically. All weed species recorded during baseline surveys (2012 to 2016) and compliance monitoring (2018 to 2024) are summarised in Appendix G1 and Appendix G2.

Although Dawson Dam, South Eliza Dam, North Eliza Dam and Anzac Dam are outside of existing mineral leases, weed species are documented at these locations to:

- Identify potential sources of new weed infestations into the mineral leases and/or
- Document potential spread of weeds from the mineral leases into dams.

#### 3.2.4.1 New weed species

No new weed species were recorded during the 2024 spring survey.

#### 3.2.4.2 Increase in abundance

Compared with surveys conducted between 2019 and 2023, Smooth Mustard (*Sisymbrium erysimoides*) had increased in abundance in October 2024, particularly on the sand dune flora Site 22. At this site, Smooth Mustard was recorded with a CSR density of 5 for over 50% of the survey area, and CSR 4 over the remainder of the survey area. Previous surveys have recorded the highest CSR cover rating of 4 at this site (and CSR of 2 in 2023). Site 22 is within 200 m of the WAR, hence a designated impact site. At the other dune flora Site, 21, no change in the density of Smooth Mustard was recorded between 2023 and 2024, remaining sparsely distributed but with localised patches of CSR 4. In 2024, Smooth Mustard was also of greater abundance at Dawson Dam and at weed transects CWM05 and CWM06 compared with previous levels. Conversely Smooth Mustard was not recorded in 2024 at RAM Sites 10, 12 and 17 (where it has been previously recorded during operational monitoring).

#### 3.2.4.3 Species recorded at previously unreported locations

Six weed species were recorded in 2024 at previously unreported locations.

***Wards Weed (Carrichtera annua)***

Two plants were recorded on the northern shoulder of the WAR at the 500 m survey point of weed transect CWM05 (within 25 m of Easting 701080 Northing 6518800). Within the Carrapateena operational area, Wards Weed has only previously been recorded along the SAR; in 2021 an isolated patch was recorded along weed transect CWM01. Wards Weed has not subsequently been recorded along CWM01. The 2024 location of Wards Weed was near the western end of the WAR (approximately 5.5 km from the Stuart Highway), which was constructed/upgraded in 2022, specifically for vehicle access to the Carrapateena Mine site.

***Maltese Thistle (Centaurea melitensis)***

In 2024, Maltese thistle was recorded for the first time along weed transect CWM01; one plant was located at a culvert along the SAR (Easting 737045 Northing 6517110) and numerous plants were recorded where the Whitata Creek crosses the SAR. Maltese thistle has previously been recorded during baseline and compliance surveys in Eliza Creek and at Dawson Dam.

***Mallow (Malva parviflora)***

In 2024 a few plants were recorded at North Eliza Dam. This species has previously been recorded at South Eliza Dam, Anzac Dam and ephemeral watercourses along weed transects CWM01 and CWM02.

***Smooth Mustard (Sisymbrium erysimoides)***

Several plants were recorded at flora Site 20 (Eliza Creek) for the first time in 2024.

***Scarlet Pimpernel (Lysimachia arvensis)***

A few plants were recorded for the first time at North Eliza Dam. This species has previously been recorded from the Expo Village Effluent Irrigation Area and along weed transects CWM001 (culvert area) and CWM06 (ephemeral drainage line).

***Trailing Verbena (Verbena supina)***

One plant was recorded at North Eliza Dam for the first time. This species has previously been recorded at Anzac Dam.

Appendix G1 and Appendix G2 contain further details on weed records during baseline and compliance monitoring.

#### 3.2.4.4 Weeds recorded at RAM sites (Control and Impact)

Only three species of weeds were recorded at Rangeland flora sites:

- Maltese Thistle (*Centaurea melitensis*) – small isolated clusters at Eliza Creek Site 20. This species was also recorded at Site 20 in 2020 and 2023.
- Smooth Mustard (*Sisymbrium erysimoides*) - recorded at both dune sites (21 and 22) scattered plants to locally common at Site 21 and widespread and abundant at Site 22. Smooth Mustard has been recorded every year since 2020 at Site 21 and every year since 2019 at Site 22. In 2024 a few plants were also recorded at Eliza Creek Site 20 (refer above).
- Sow Thistle (*Sonchus oleraceus*) – one or two plants were recorded at Eliza Creek Sites 18 and 19. Sow Thistle has been previously recorded as sparsely present at these sites.

These results are very similar to previous surveys during compliance (operational) monitoring (and noting that the dune sites and Eliza Creek sites were not surveyed during baseline monitoring). Maltese Thistle and Smooth Mustard have been consistently recorded at the Eliza Creek and dune sites, respectively, and at similar levels of abundance since 2018. Sow Thistle occurs infrequently and sporadically at RAM sites, and at very low levels of abundance.

#### 3.2.4.5 Northern Wellfields lease area

Within the Northern Wellfield Lease area, operational monitoring sites are weed transects NWM01, NWM02, NWM03, and RAM Sites 1, 2 and 7. These were all surveyed in spring 2024 by Lathwida ecologists, and no weeds were recorded (similarly no weeds were recorded at these sites during annual surveys from 2020 to 2023).

#### 3.2.4.6 Weeds of National Significance

**Prickly Pear *(Opuntia species)***

The isolated population of Prickly Pear near the Yeltacowie homestead has been actively managed by poisoning with cochineal since 2021.

A cluster of *Opuntia* was first observed during operational monitoring in 2018 near the Yeltacowie homestead, occurring within an area of approximately 10 m x 10 m (Easting 724000 Northing 6530688 Zone 53). A few plants remain in this cluster, but it has not expanded since 2023.

**Athel Pine *(Tamarix aphylla)***

Athel Pine has been recorded as clustered trees around Yeltacowie Homestead and the nearby dam. These trees are being actively controlled with numerous dead trees and/or cut trees. In 2024 it was noted that a few trees remain at the site.

#### 3.2.4.7 Declared Weeds

In addition to being Weeds of National Significance, Prickly Pear and Athel Pine are also Declared species under the Landscape Act 2019. Athel Pine is declared for control within 100 m of a watercourse.

***Bathurst Burr (Xanthium spinosum)***

In 2024, Bathurst Burr was recorded within the operational area only at previously recorded locations: Dawson Dam, South Eliza Dam, and weed transects CWM01 (including Whittata Creek) and CWM02 both transects adjoining the Southern Access Road. No new populations, and no expansion of existing populations, were recorded.

The population of Bathurst Burr at Dawson Dam remains extensive, and similar to that recorded in 2021, 2022 and 2023. The 20 m wide drainage line adjoining the north-west and north-east aligned dam walls contains patches of densely spaced plants (possibly 1000's of individuals) over approximately 150 m. The circular depression, approximately 30 m in diameter, and southeast of the dam wall also contained densely spaced plants when observed in October 2024. It is noted that Dawson Dam resides is excluded from ML6471, hence managed by the landholder and management and control is ongoing.

Bathurst Burr has been recorded since 2021 along and near Whittata Creek, which intercepts Weed Transect CWM011. In 2024, approximately 30 seedlings were present in a culvert 130 m north of where Whittata Creek crosses the Southern Access Road. A few seedlings were also recorded where the main channel crosses the Southern Access Road.

Bathurst Burr was recorded along weed transect CWM02 in 2021 and 2023 (approximately 10 plants recorded adjoining the Southern Access Road in the vicinity of South Eliza Creek). In 2024, isolated plants were recorded near a culvert crossing the SAR and near the waters' edge (overflow from the dam). In 2024 the South Eliza Dams were overflowing due to pumping in of waste treatment water. Bathurst Burr was recorded as sparsely present, in the drainage channel south of the main dam wall, and also sparse near the SAR.

#### 3.2.4.8 Other weeds of high environmental threat

***Tobacco Bush (*Nicotiana glauca*)***

Although not a Declared Weed, an extensive population of Tobacco Bush persists at South Eliza Dam (in the drainage channels behind the dam). Due to is high rate of fruit and seed set, high viability of seeds and successful survival of seedlings, it forms dense stands and has the potential to increase still further in this location.

***Couch (*Cynodon dactylon*)***

Patches of couch grass were recorded on the banks / floodout area of Whittata Creek, which was surveyed as part of the weed transect CWM01. Couch was recorded as moderately dense patches within an area of approximately 30 m x 10 m, when surveying the 50 m radius of a designated survey point in the weed transect.

### 3.2.5 Assessment of grazing impacts

An indication of grazing impact at each site was obtained to enable potential mining and/or climate related impacts to be separated from baseline impacts due to grazing. Grazing was first reported on in 2018 when the operation survey area was still being widely grazed by domestic stock. Since 2018, the operation area has been largely destocked. However, ongoing grazing continues at some sites, including the dunes. Although total grazing pressure has been reduced since 2018, ongoing grazing occurs largely through kangaroos and feral animals.

The Rangeland Assessment Method (RAM) (NVC 2024a) provides a single index of grazing impact called the Site Vegetation Utilisation Score (hereafter referred to as the Site Utilisation Score) and is based on a combination of the proportion of a species' population that is grazed (either heavily or severely) and the palatability of that species, and whether juveniles are present. The lower the Site Utilisation Score, the heavier the grazing impact and/or lower regeneration levels. Heavy grazing that has modified the habit of a plant is referred to as Modified impact. Severe grazing results in removal of more than 50% of the leaves and twigs, and impairs the reproductive function of a plant; referred to as Over Utilised impact (Native Vegetation Council 2024). Site utilisation scores were lowest (indicating heaviest grazing) in 2018 and 2019 before increasing in 2020 – 2023 and decreasing slightly in 2024 (Figure 3.41). However, in 2024 Site Utilisation Scores were still well above those of 2018 and 2019. Noting that for 2018-2023 Sites 4 and 6 were classified as Impact sites and swapped to Control sites in 2024.

The heaviest grazing impact (lowest Site Utilisation Scores) was recorded at the sand dune flora sites, and for gibber Sites 2, 6 and 13 (Figure 3.42). Cattle dung was present at the sand dune sites and sheep dung was present at the gibber habitat Sites 6 and 13; a large flock of sheep observed at Site 6 during the survey (18 and 19 October). At Site 2 only seven long-lived perennials were recorded, of which two were heavily grazed grasses, strongly influencing the Site Utilisation Score.

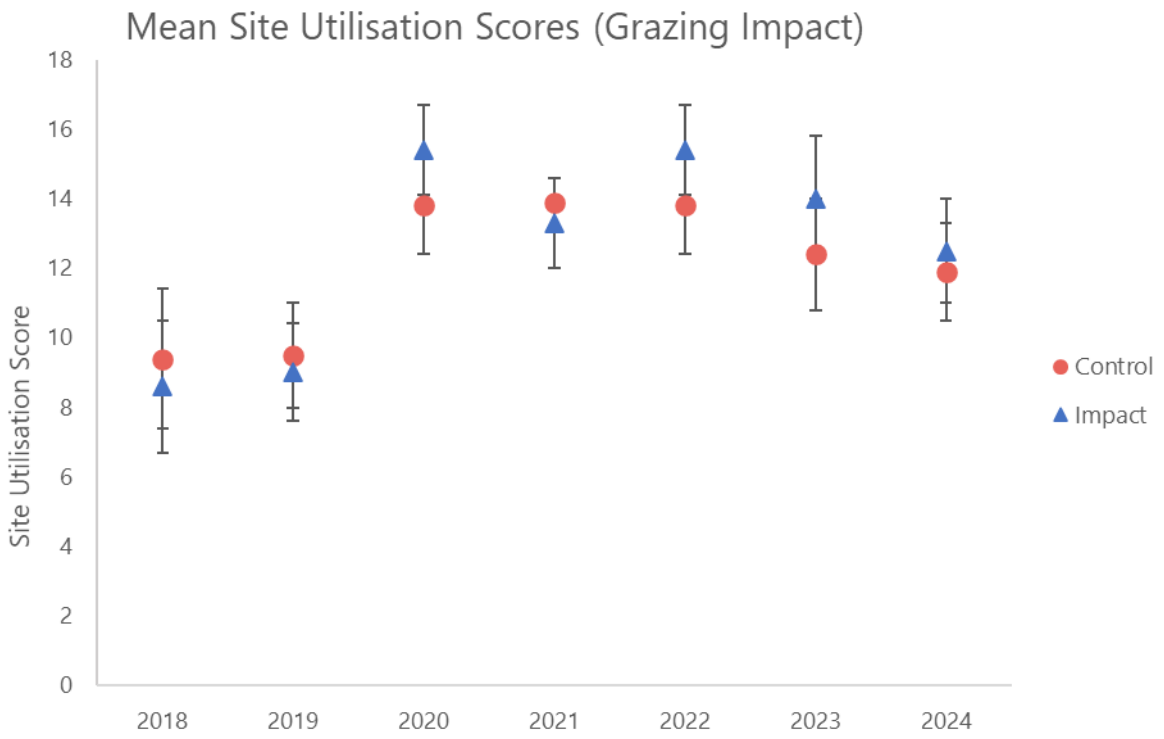



**Figure 3.41: Mean site utilisation scores for control and impact sites during compliance monitoring, 2018-2024**

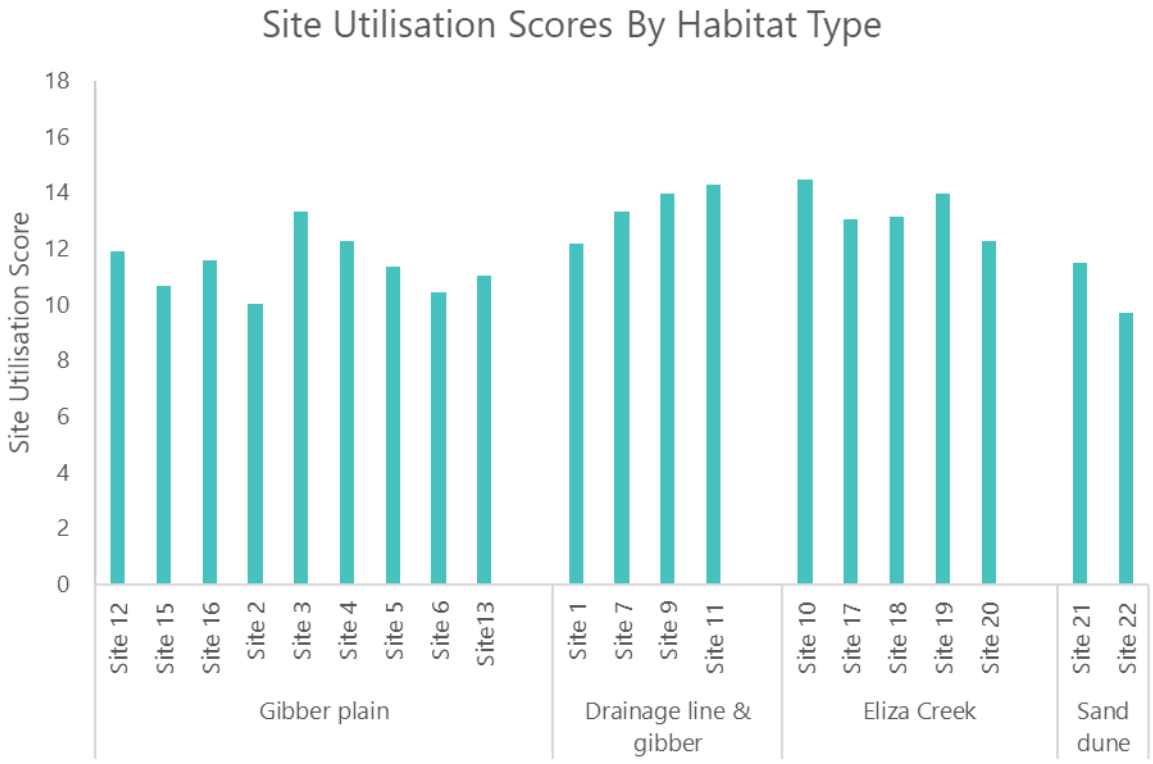



**Figure 3.42: Mean site utilisation scores (grazing impact) for each site, grouped by habitat**

Table 3.16 lists the species where over-utilised grazing impact was recorded at RAM sites. For the gibber habitat (stony tableland) and creek sites, heavy grazing of > 50% of the population was largely restricted to a relatively few highly palatable species e.g. Spongy-fruit Bluebush (*Maireana spongiocarpa*), Bush Minuria (*Minuria cunninghammii*), Kangaroo Grass (*Themeda triandra*), Bristly Love-grass (*Eragrostis setifolia*) and Twiggy Sida (*Sida intricata*). However, there has been no loss of these species at any site, nor decline in population recorded at Jessup transects and/or as indicated by Crown Separation Ratio estimates of abundance (refer Appendix B for 2024 CSR values). Where domestic stock grazing is absent, grazing of palatable shrubs was much reduced. For example, at Site 3 which adjoins the Processing Plant / car park and main administration areas, all shrubs of the highly palatable, Bush Minuria were ungrazed.

Several species were heavily grazed in the creeklines, but for the majority of species, < 50% of individuals were heavily grazed at a site. The exception was Opposite-leaved Emubush (*Eremophila oppositifolia*), where only a few individuals were present at each of two sites, but numbers were not declining.

At the dune sites, no species were recorded as being over-utilised. Although grazing was considered to have modified some species such as Horse Mulga (*Acacia ramulosa*), grazing had not removed more than 50% of the canopy/stems and the individual plant's regeneration potential was not impacted.

**Table 3.16: Species with evidence of grazing impact**

| *Scientific Name* | Common Name | # flora sites where recorded | % of flora sites where > 50% of individuals were over-utilised | % of flora sites where any individuals were over-utilised |
|---|---|---|---|---|
| *Astrebla pectinata* | Barley Mitchell-grass | 8 | 25 | 38 |
| *Atriplex vesicaria* | Bladder Saltbush | 16 | 0 | 19 |
| *Dodonaea lobulata* | Lobed-leaf Hop-bush | 5 | 0 | 20 |
| *Eragrostis australasica* | Cane-grass | 1 | 100 | 100 |
| *Eragrostis setifolia* | Bristly Love-grass | 13 | 23 | 54 |
| *Eremophila oppositifolia ssp. oppositifolia* | Opposite-leaved Emubush | 2 | 100 | 100 |
| *Eulalia aurea* | Silky Brown-top | 4 | 0 | 75 |
| *Maireana aphylla* | Cotton-bush | 11 | 0 | 9 |
| *Maireana appressa* | Pale-fruit Bluebush | 12 | 8 | 8 |
| *Maireana astrotricha* | Low Bluebush | 1 | 0 | 100 |
| *Maireana spongiocarpa* | Spongy-fruit Bluebush | 8 | 13 | 25 |
| *Maireana turbinata/ Maireana georgei** | Top-fruit Bluebush/ Satiny Bluebush | 3 | 33 | 67 |
| *Minuria cunninghamii* | Bush Minuria | 13 | 23 | 69 |
| *Sida intricata* | Twiggy Sida | 10 | 0 | 50 |

*Identification uncertain due to absence of fruit is some plants

### 3.2.5.1 Impact versus control site grazing impact

In 2020 and 2022, the mean Site Utilisation Scores for impact sites was significantly higher than for control sites. But for all other survey periods, there has been no significant difference between mean Site Utilisation Scores for impact and control sites (Table 3.17). Noting that Site 4 and 6 were designated as Impact sites from baseline to 2023 and swapped to Control sites in 2024.

**Table 3.17: Site Utilisation Scores* (grazing intensity) for each flora site**

| Type | Landform | Site | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| Control | Gibber Plain | 2 | 7.3 | 8.2 | 15.8 | 14.6 | 15.8 | 14.79 | 9.9 |
| | Gibber Plain | 4 | | | | | | | 12.3 |
| | Gibber Plain | 6 | | | | | | | 10.25 |
| | Gibber Plain | 13 | 11.4 | 11.4 | 14 | 14.3 | 14 | 12.42 | 10.58 |
| | Drainage Line & Gibber | 1 | 10.5 | 9.6 | 12 | 12.7 | 12 | 11.45 | 12.89 |
| | Drainage Line & Gibber | 7 | 11.5 | 11 | 13.5 | 14.5 | 13.5 | 11.64 | 13.06 |
| | Drainage Line & Gibber | 9 | 8.3 | 8.1 | 12.5 | 14 | 12.5 | 13.66 | 13.97 |
| | Sand Dune | 21 | 7.2 | 8.4 | 14.9 | 13.4 | 14.9 | 10.3 | 11.5 |
| **Control** | | **Mean** | **9.4** | **9.5** | **13.8** | **13.9** | **13.8** | **12.4** | **11.9** |
| | | **St Dev** | **2** | **1.5** | **1.4** | **0.7** | **1.4** | **1.6** | **1.4** |
| Impact | Gibber Plain | 4 | 9.5 | 8.7 | 16.6 | 11.7 | 16.6 | 13.5 | |
| | Gibber Plain | 6 | 7.2 | 8.9 | 14.5 | 14.4 | 14.5 | 14 | |
| | Eliza Creek | 10 | 9.6 | 8.9 | 15.8 | 13.3 | 15.8 | 14.34 | 14.33 |
| | Eliza Creek | 17 | 8.7 | 9.3 | 16.7 | 10.8 | 16.7 | 14.45 | 13.15 |
| | Eliza Creek | 18 | 9.6 | 9.3 | 16.5 | 12.1 | 16.5 | 15.76 | 13.16 |
| | Eliza Creek | 19 | 12.8 | 12.6 | 16.8 | 13.9 | 16.8 | 14.19 | 13.96 |
| | Eliza Creek | 20 | 10.1 | 9.9 | 15.4 | 12.4 | 15.4 | 15.52 | 12.48 |
| | Gibber | 12 | 7.5 | 7.5 | 14.6 | 14 | 14.6 | 13.25 | 11.89 |
| | Gibber | 15 | 9.4 | 9.1 | 15 | 14 | 15 | 12.15 | 10.65 |
| | Gibber | 16 | 9.8 | 10.7 | 15.6 | 16 | 15.6 | 16.56 | 11.49 |
| | Gibber Plain | 3 | 5 | 7 | 17.6 | 14.1 | 17.6 | 15.9 | 13.34 |
| | Gibber Plain | 5 | 6.7 | 7.8 | 12.9 | 12.8 | 12.9 | 13.75 | 11.18 |
| | Drainage Line & Gibber | 11 | 7.3 | 8.2 | 13.6 | 13.7 | 13.6 | 12.49 | 14.11 |
| | Sand Dune | 22 | 7.8 | 7.7 | 14.6 | 12.9 | 14.6 | 9.5 | 9.72 |
| **Impact** | | **Mean** | **8.6** | **9.0** | **15.4** | **13.3** | **15.4** | **14.0** | **12.5** |
| | | **St Dev** | **1.9** | **1.4** | **1.3** | **1.3** | **1.3** | **1.8** | **1.5** |
| | | **t-test p value[2]** | **0.47** | **0.52** | **0.04** | **0.19** | **0.04** | **0.08** | **0.34** |

[1] Based on the sum of all Utilisation Scores for individual species – which incorporates grazing intensity and presence of regeneration, scores rounded to one decimal point

[2] Two-tailed T-test assuming equal variances comparing control means and impact means. Values greater than 0.05 indicate not significantly different.

Given the widespread destocking of Rangeland sites, grazing is not considered to be causing loss of abundance of species (compared to baseline levels). This is supported by Jessup results (refer Section 3.2.2) that indicated a widespread increased abundance of widespread palatable species (e.g. *Atriplex vesicaria,* including an increase in abundance of juveniles.

### 3.2.6 Landscape Function Analysis

The following provides a summary of changes in key parameters – plant density and diversity for Landscape Function Analysis transects. Each LFA site comprised 2 transects, each 50 m long. Photos taken at the start and end of each transect are contained in Appendix A.

#### 3.2.6.1 Site 1: Aerodrome (LFAAL1)

***Aerodrome transect 1A: LFA established method***

Transect 1A comprised two zones, namely one patch type 'vegetation' and one interpatch 'rocky/ soil'. In 2024, Transect 1A continued to show increases in vegetative cover with an increase in the width of vegetation patches, and the continued emergence of long-lived plant species.

The proportion of transect occupied by patches in 2024 was very similar to 2023 but the width of patches increased by approximately 50%. Vegetation patches comprised 21% of the linear transect in 2022, 29% in 2023 and 30% in 2024 (the remainder being rocky inter patch). The mean patch width increased from 73 cm in 2022 to 135 cm in 2023 to 198 cm in 2024. The number of intercepted plants that were long-lived perennials had increased from 2 plants in 2022, 3 plants in 2023, to 7 plants in 2024. In 2024 long-lived perennial plants comprised 23% of all plants recorded along the transect. The long-lived plant species present in 2024 were: Samphire (*Tecticornia medullosa*) and Bladder Saltbush (*Atriplex vesicaria*), the dominant species in the adjoining non-cleared vegetation, as well as Plains Lantern Bush (*Abutilon halophilum*). The majority of vegetation patches were Salt Sclerolaena, (*Sclerolaena ventricosa*), a prominent component of the Bladder Saltbush community is this region. The first 15 m of the transect, however, remained devoid of vegetation (Plate 3.1). Species recorded along LFA linear transects are shown in Table 3.18.

**Plate 3.1: Aerodrome transect 1A showing re-establishment of vegetation largely concentrated in the second half of the transect**

### *Aerodrome transect 1A: PCQ method*

Due to the high number of vegetation patches recorded along the transect, and notable changes being detected by the LFA method, the PCQ was no longer considered a necessary supplementary method to show yearly changes.

### *Aerodrome transect 1B: LFA established method*

Transect 1B also comprised two zones, namely one patch type 'vegetation' and one interpatch 'rocky/ soil'. In 2024, there were continued increases in the percentage of the transect comprised of vegetation patches and the number of patches intercepted along the transect (Plate 3.2). The number of patches had increased from 7 patches in 2021 to 19 patches in 2024. Mean patch width was 117 cm in 2022, 47 cm in 2023 and 86 cm in 2024. Up to 2023, patches comprised only short-lived perennials (mainly *Sclerolaena* species and *Atriplex holocarpa*). However, in 2024, two long-lived perennial species were in patches that intercepted the transect in addition to nine short-lived perennial species (Table 3.18).

*Aerodrome transect 1B: PCQ method*

As with Transect 1A, due to the increased number of vegetation patches and notable changes being detected by the LFA method, the PCQ was no longer considered a necessary supplementary method to show yearly changes.

**Plate 3.2: Aerodrome transect 1B. From 0 m at start, facing the end. Moderately dense vegetation covers much of the first half of the transect**

### 3.2.6.2 Site 2: Ventia (LFAVOL2)

*Ventia transect 2A*

This transect was decommissioned in 2024 due to approximately half of the transect being recently graded and used as a temporary laydown area for construction/widening of the adjoining road (Plate 3.3). In October 2024, no plants were present along the entire transect alignment and less than 10 plants were present within 10 m of the alignment. In 2023, nine patches represented by only short-lived perennials, intercepted the transect, hence re-establishment of vegetation at this site had been sparse.

**Plate 3.3: Ventia transect 2A. The majority of the transect has been recently graded and no vegetation remains along the alignment**

### *Ventia transect 2B: LFA established method*

Transect 2B comprised two zones, namely one patch type 'vegetation' and one interpatch 'rocky/ soil'. The number of vegetation patches increased from no patches in 2021 to 5 patches in 2023. However, in 2024 only one patch was intercepted along the transect – the short-lived species Pop Saltbush (*Atriplex holocarpa*) (Plate 3.4). The percentage of transect comprised of vegetation patches showed a corresponding decline from 1.3% of the linear transect in 2023 to just 0.8% in 2024.

### *Ventia transect 2B: PCQ method*

In 2024, the PCQ recorded only short-lived perennials (no long-lived perennials), and in particular Pop Saltbush (*Atriplex holocarpa*). As with the LFA results the PCQ data also recorded a decline in plant density with the mean distance between plants increasing from 2.3 m in 2023 to 2.46 m in 2024. The 2024 density, however, was an increase on the 2020 and 2021 plant densities of 5.3 m and 5.2 m respectively. Similarly, the mean number of plants per $m^2$ showed a net increase since 2020 (0.03 to 0.16), but a slight decline between 2022 (0.18 plants per $m^2$).

In 2024 Pop Saltbush was the most common species recorded, representing a shift from previous years where the slightly longer-lived Salt Bindyi (*Sclerolaena ventricosa*) was dominant.

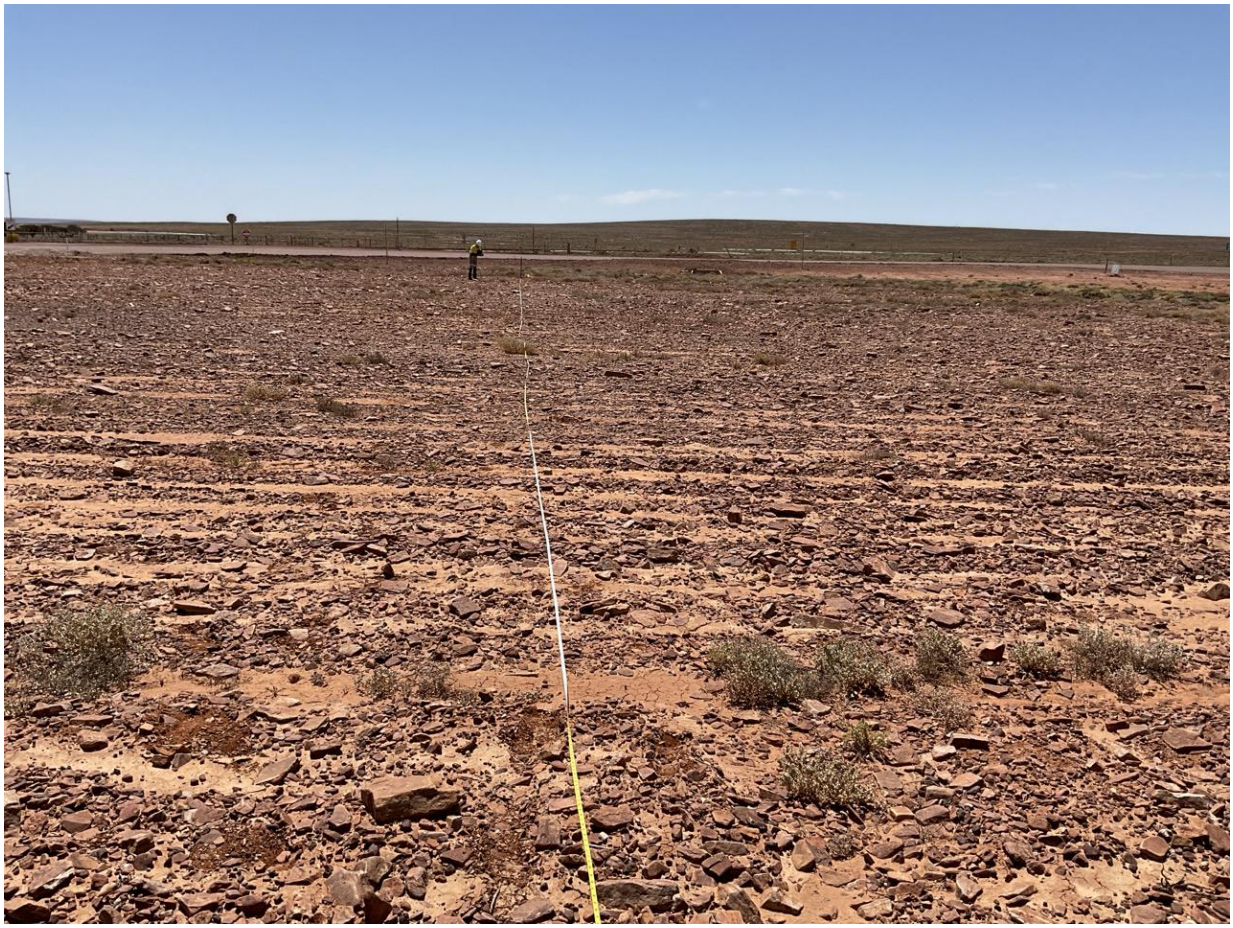


**Plate 3.4: Ventia transect 2B: Only one vegetation patch was intercepted along the transect**

### 3.2.6.3 Site 3: Midway Quarry (LFAQUA3)

***Midway Quarry Transects 3A and 3B: LFA established method***

Transects 3A and 3B are located adjacent each other on relatively flat deeply ripped ground and both comprised two zones, namely one patch type 'vegetation' and one interpatch 'rocky/ soil'.

In 2022, the sites were assessed using the LFA Bank and Trough Method whereby the trough created by ripping is equivalent to a patch (e.g. collects deposited materials and nutrients to encourage recruitment). The deep-ripped troughs comprised the majority of the transects in 2022 (72% for 3A and 60% for 3B). By 2023, however, the troughs had eroded and were no longer deep enough to be considered effective patches (Plate 3.5 and Plate 3.6), and both transects were assessed using the established LFA method. It is noted that a dense patch was also observed just off transect 3A (Plate 3.7).

Between 2023 and 2024, the LFA recorded an increase in both density and size of plant patches. Three patches were recorded along Transect A, compared with no patches in 2023. The 3 patches were all short-lived perennials and occupied 2% of the linear transect. In 2024, 8 patches were recorded comprising 4.4% of the linear transect, compared with 4 patches comprising 1.1% of the transect in 2023. Mean patch width also increased from 28 cm in 2023 to 43 cm in 2024.

*Midway Quarry transects 3A and 3B: PCQ method*

In 2022 the PCQ method was not conducted due to the transect and adjoining 10 m being devoid of plants. By May 2023, however, plants were recorded in most PCQ quadrats. The PCQ method was also conducted in 2024. Plant density increased between 2023 and 2024. Along transect A, the mean distance between plants decreased from 4.1 m in 2023 to 3.0 m in 2024 (mean number of plants increased from 0.06 plants per m2 to 0.11 plants per $m^2$). Transect B recorded an even greater increase in plant density. The mean distance between plants decreased from 2.9 m in 2023 to 1.4 m in 2024 (mean number of plants increased from 0.12 plants per $m^2$ to 0.51 plants per $m^2$).

**Plate 3.5: Midway Quarry transect 3A from start (0 m) facing end. Most re-establishment of short-lived perennials has occurred near the start of the transect.**

**Plate 3.6: Midway quarry transect 3B, the contours have levelled out, now < 10 cm deep and plants have sparsely revegetated. Although still sparse, plant density is notably denser than in 2023**

**Plate 3.7: Dense patch of vegetation just off Midway Quarry transect 3A**

### 3.2.6.4 Site 4: Tjungu to WAR (LFATJU4)

#### *Tjungu transects 4A and 4B: LFA established method*

Transects 4A and 4B are in one linear alignment sloping toward a minor drainage line. Due to the deep troughs and almost complete absence of plants, in 2022 the sites were assessed using the LFA Bank and Trough Method whereby the trough is equivalent to a patch (e.g. collects deposited materials and nutrients to encourage recruitment). In 2022, the troughs (patches) comprised 64% and 61% for transects 4A and 4B, respectively.

However, between spring 2022 and autumn 2023, there had been prolific plant establishment along both transects and were assessed using the established LFA method. Both transects comprised two zones, namely one patch type 'vegetation' and one interpatch 'rocky/ soil'.

Transects A and B comprised similar plant densities. In 2024, transect 4A rand 4B recorded 37 vegetation patches and 33 patches, respectively; both representing increases from 2023 when 26 patches and 28 patches were recorded. Vegetation patches comprised 23% of Transect 4A and 33% of Transect B, also representing an increase form 15% and 16% of Transects A and B in 2023. Mean patch width increased from 43 cm in 2023 to 78 cm in 2024 for Transect A, and from 42 cm to 70 cm for Transect B.

Long-lived perennial species comprised 24% of plant records recorded along Transect A, including eight records of Bladder Saltbush (*Atriplex vesicaria*), the dominant species of the reference vegetation type. Long-lived perennials comprised 22% of Transect B including 10 records of Bladder Saltbush.

#### *Tjungu transects 4A and 4B: PCQ method*

Due to the high number of vegetation patches recorded along the transects in 2023 and 2024, notable changes between survey periods were detected using the LFA method. Hence, in 2024 the PCQ was no longer considered a necessary supplementary method to show changes and was not conducted at the Tjungu to WAR site.

**Plate 3.8: Tjungu transect 4A: From start at 0 m facing end. Large and abundant surface rock is present due to the deep ripping and vegetation is densely spaced**

**Plate 3.9: Transect 4A close up showing densely spaced vegetation in rip lines**

**Plate 3.10: Tjungu t transect 4B from start (0m). Densely spaced vegetation. Plant diversity comparable with adjoining non-cleared vegetation**

### *Emergence of species used in hand-seeding at Tjungu LFA sites*

Following deep-ripping of the area in 2022, the following species were hand-seeded at site LFATJU4 (Transect 4A and 4B) Pop Saltbush (*Atriplex holocarpa*), a Saltbush (*Atriplex lindleyi*), Lagoon Saltbush (*Atriplex suberecta*) Sandhill Saltbush (*Atriplex velutinella*), Bladder Saltbush (*Atriplex vesicaria*), Grey Bluebush (*Maireana appressa*), Fleshy Bluebush (*Maireana erioclada*), Black Bluebush (*Maireana pyramidata*), Nitrebush (*Nitraria billardierei*), Thorny Saltbush (*Rhagodia spinescens*), Desert Cassia (*Senna artemisioides*) and Shrubby Twinleaf (*Roepera aurantiacum*).

Of these species only Pop Saltbush and Bladder Saltbush were recorded during the LFA and/or PCQ surveys in 2023 and 2024. Species recorded along LFA linear transects are shown in Table 3.18.

**Table 3.18: Species recorded along LFA transects 2024**

| Species | Number of patches species was recorded in along each transect | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1A | 1B | 2B | 3A | 3B | 4A | 4B |
| **Short-lived Perennials** | | | | | | | |
| *Atriplex holocarpa* | 1 | 1 | 1 | 2 | 8 | 26 | 14 |
| *Cullen cinereum* | | 1 | | | | | |
| *Dissocarpus biflorus* | | 6 | | | | | |
| *Dissocarpus paradoxus* | 1 | 1 | | | | 1 | |
| *Enneapogon avenaceus* | | 1 | | | | | |
| *Panicum decompositum* | | 1 | | | | | |
| *Salsola australis* | | | | | | 2 | |
| *Sclerolaena brachyptera* | | 2 | | | | | |
| *Sclerolaena divaricata* | 2 | 3 | | | | 1 | 3 |
| *Sclerolaena ventricosa* | 19 | 16 | | 1 | | 3 | 10 |
| *Sclerolanea intricata* | | | | | | 1 | 9 |
| **Long-lived Perennials** | | | | | | | |
| *Tecticornia medullosa* | 3 | 2 | | | | 1 | |
| *Atriplex vesicaria* | 3 | 3 | | | | 8 | 10 |
| *Abutilon halophilum* | 1 | | | | | 1 | |
| *Maireana spongiocarpa* | | | | | | 1 | |
| | | | | | | | |
| Short-lived total number of patches | 23 | 32 | 1 | 3 | 8 | 34 | 36 |
| Short-lived patches as % of total | 77 | 86 | 100 | 100 | 100 | 76 | 78 |
| Long-lived total number of patches | 7 | 5 | 0 | 0 | 0 | 11 | 10 |
| Long-lived patches as % of total | 23 | 14 | 0 | 0 | 0 | 24 | 22 |
| Total number of patches | 30 | 37 | 1 | 3 | 8 | 45 | 46 |

### 3.2.6.5 Indices of Rehabilitation Success

Results for 2019 when the Bank and Trough Method was used are detailed in Jacobs (2023h). As discussed above, the Bank and Trough method was used immediately following ripping of the sites and prior to plants re-establishing. In 2019, the sites were a combination of troughs and rock/soil inter-troughs with no plants present.

The following results compare data at the rehabilitation sites, surveyed using the LFA Established Method (2020 to present) with 'analogue' (reference) sites that were also surveyed using the LFA Established Method. Six analogue sites were surveyed prior to the compliance/operational period (by EBS Ecology). The LFA indices reviewed below are:

- Plant density, the mean number of plants per $10m^2$;
- The Landscape Organisation Index, which is the total length of patches/length of the transect. This is considered a key parameter as it encapsulates vegetation cover. Patch density (mean number of patches per $10m^2$) and total patch area are also presented below; and

- LFA Surface Soil Assessment, where the three indices derived from the Surface Soil Assessment are stability, infiltration and nutrients.

### *Plant density*

Plant density at both the Tjungu and Aerodrome sites has exceeded the analogue mean since 2022 (Aerodrome site) and since 2023 (Tjungu site) (Figure 3.43). Plant density at the Aerodrome Site has increased only slightly since 2022. Plant density at the Tjungu site increased from no plants present in 2022 to well above the analogue mean in 2023 and further increasing almost 50% in 2024. At the Aerodrome site, most re-establishment to date occurred between 2021 and 2022, with a slight decline recorded in 2023. This reflects the majority of re-establishment to date comprises short-lived perennial species, and hence there will be year to year fluctuations, but with an expected long term trend of increasing plant matter. At the Midway Quarry Site 3, plant density has increased slowly since 2024 but remains sparse at just over 1 plant per $10m^2$ compared with the analogue mean of 3 plants per $10m^2$. At Ventia, only one transect was still active, and only one plant was present along the transect.

The Landscape Organisation Index for the Tjungu to WAR site and the Midway Quarry site have also increased since the sites were established. In 2024 the Landscape Organisation Index reached the analogue range of values (but still remains below the analogue mean (Figure 3.43). However, the Landscape Organisation Index remains very low for the Ventia site and the Aerodrome site.

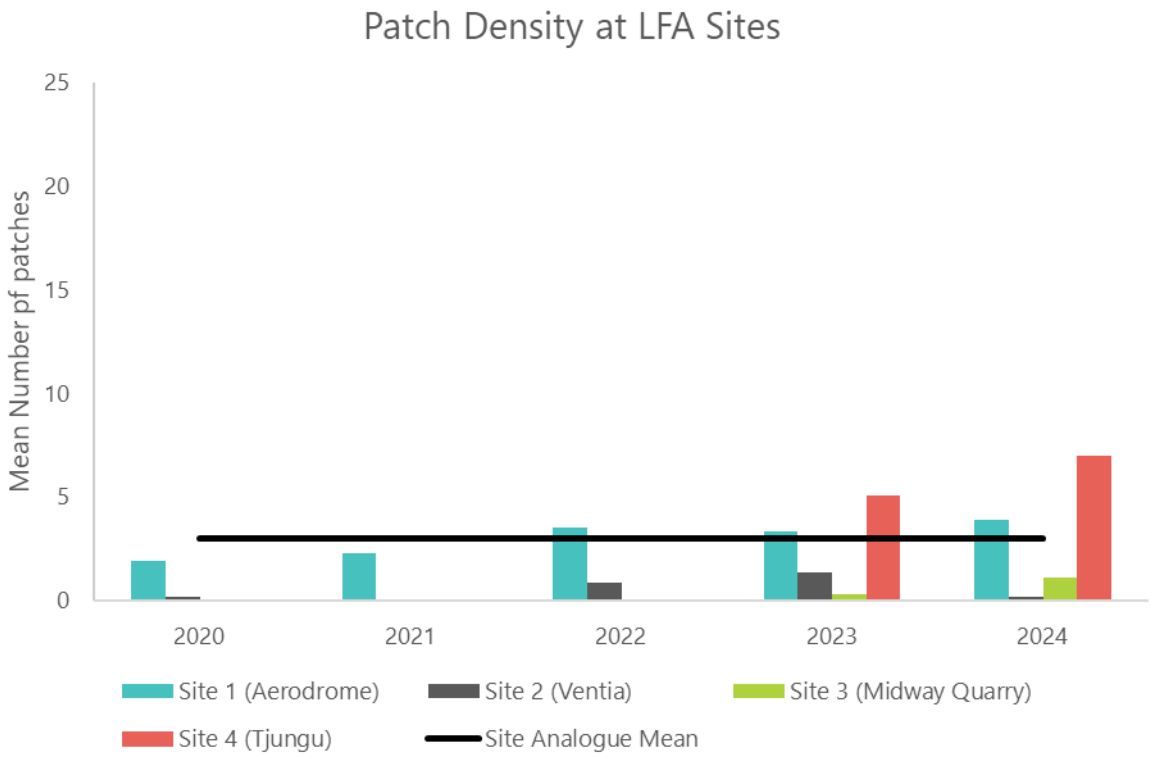



**Figure 3.43: Plant density, mean number of patches (transect average for site) based on LFA Established Method 2020 to 2024.**

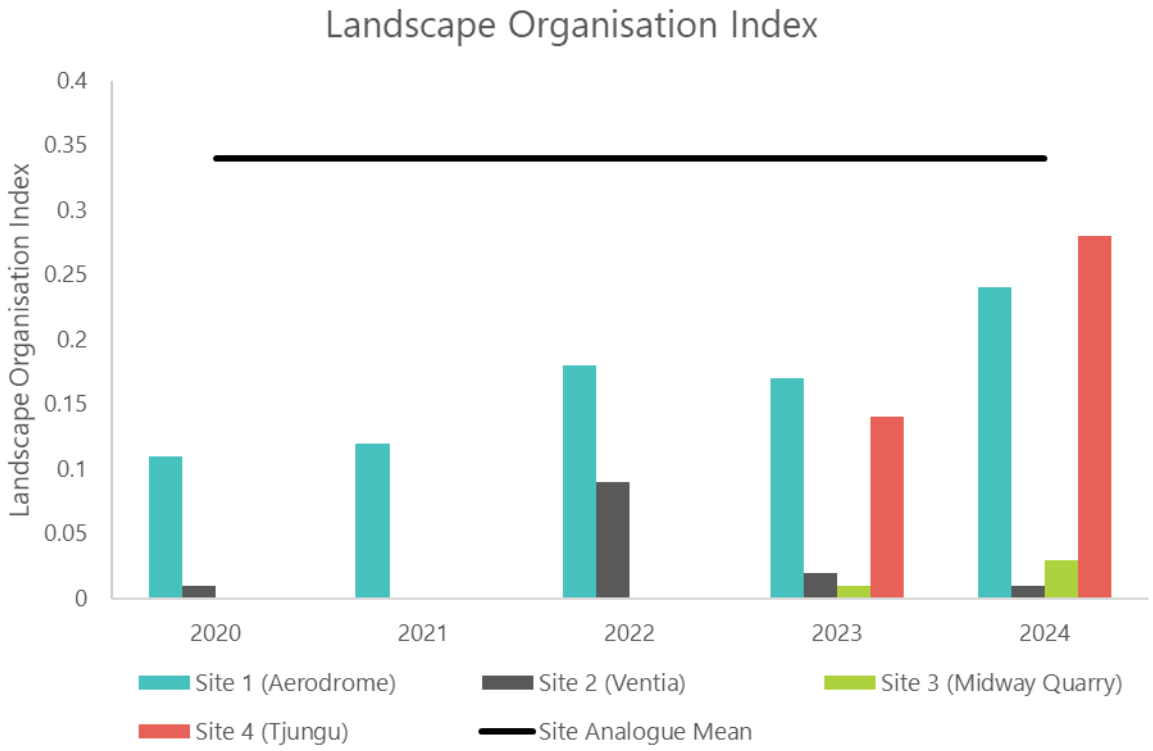



**Figure 3.44: Mean Landscape Organisation Index (transect average for site) based on LFA Established Method 2020 to 2024.**

### *Soil stability*

Soil stability index is derived from the following parameters scored in the field: soil cover, litter cover, cryptogram cover, crust broken-ness, erosion, deposited materials, surface resistance to disturbance and slake test.

Soil stability scores decreased between 2023 and 2024, and were slightly below the analogue mean (Figure 3.45, Table 3.19). This is because for most sites, a cryptogram cover has not yet developed and materials are not obviously coming into the sites. Leaf litter is still largely confined to beneath the canopy of each plant.

### *Soil infiltration*

The soil infiltration is derived from the following parameters scored in the field: vegetation cover, litter cover, surface roughness, surface resistance to disturbance, slake test and soil texture. For the Aerodrome Site LFAAL1 the soil infiltration has remained very similar since 2021, and very close to the analogue mean value (Figure 3.46). At the Ventia and Midway Quarry LFA Sites, the soil infiltration index has declined (Table 3.19). This is likely due to the evening out of troughs reducing soil roughness, while vegetation and litter cover remaining low. Soil infiltration values at Tjungu have fluctuated since 2022, but in 2024 were approaching the analogue mean value.

### *Nutrient cycling*

The nutrient cycling index is derived from the following parameters scored in the field: vegetation cover, litter cover, cryptogram cover and surface roughness. The results show that the Aerodrome Site has scored close to the analogue mean since 2021, albeit slightly declining in 2023 and 2024 (Figure 5). Results for the other three LFA Sites remain below the analogue mean and have been variable between survey periods. Sites 2 (Ventia) and 3 (Midway Quarry) recorded the lowest nutrient cycling indices, reflecting that these sites have the lowest vegetation cover, litter cover, cryptogram cover and surface roughness.

**Table 3.19: LFA Surface Soil Indices[1]**

| Year | Sites | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Aerodrome | | Ventia | Midway Quarry | | Tjungu | | Analogue | | |
| | 1A | 1B | 2B | 3A | 3B | 4A | 4B | Mean | Std Dev Upper | Std Dev Lower |
| **Soil Stability** | | | | | | | | | | |
| 2020 | 38 | 45 | 50 | | | | | 46 | 67 | 26 |
| 2021 | 46 | 43 | 43 | | | | | | | |
| 2022 | 45 | 45 | 45 | 40 | 41 | 36 | 37 | | | |
| 2023 | 42 | 39 | 41 | 47 | 47 | 45 | 46 | | | |
| 2024 | 41 | 38 | 38 | 38 | 37 | 36 | 41 | | | |
| **Soil Infiltration** | | | | | | | | | | |
| 2020 | 19 | 18 | 16 | | | | | 29 | 43 | 15 |
| 2021 | 23 | 34 | 27 | | | | | | | |
| 2022 | 24 | 31 | 26 | 32 | 29 | 38 | 38 | | | |
| 2023 | 33 | 27 | 24 | 20 | 20 | 22 | 22 | | | |
| 2024 | 30 | 29 | 15 | 16 | 17 | 27 | 28 | | | |
| **Soil Nutrient Cycling** | | | | | | | | | | |
| 2020 | 14 | 14 | 12 | | | | | 19 | 27 | 10 |
| 2021 | 18 | 19 | 16 | | | | | | | |
| 2022 | 20 | 26 | 15 | 14 | 14 | 17 | 16 | | | |
| 2023 | 26 | 16 | 9 | 9 | 9 | 15 | 15 | | | |
| 2024 | 20 | 17 | 9 | 12 | 12 | 15 | 16 | | | |

[1]Higher indices (percentages), reflect better landscape function

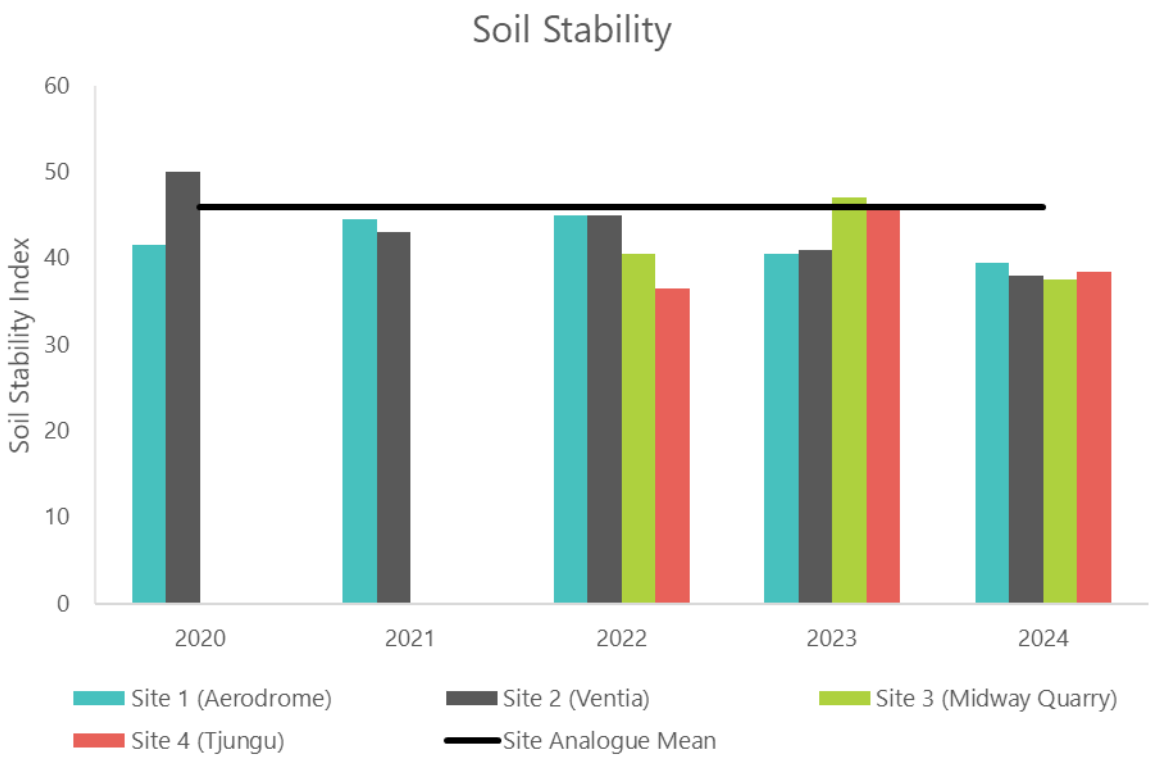



**Figure 3.45: Mean soil stability index of transect based on combined patch and interpatch at LFA sites (2020 to 2024)**

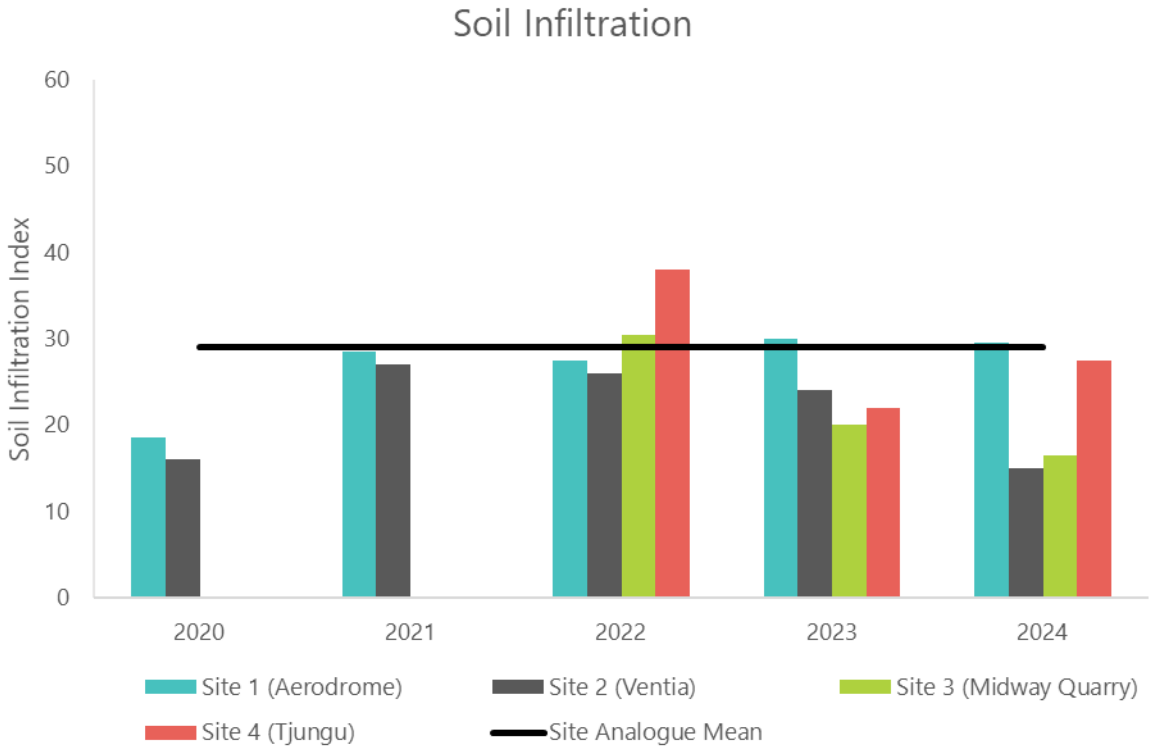



**Figure 3.46: Mean soil infiltration index of transect based on SSA (combined patch and interpatch) at LFA sites (2020 to 2024)**

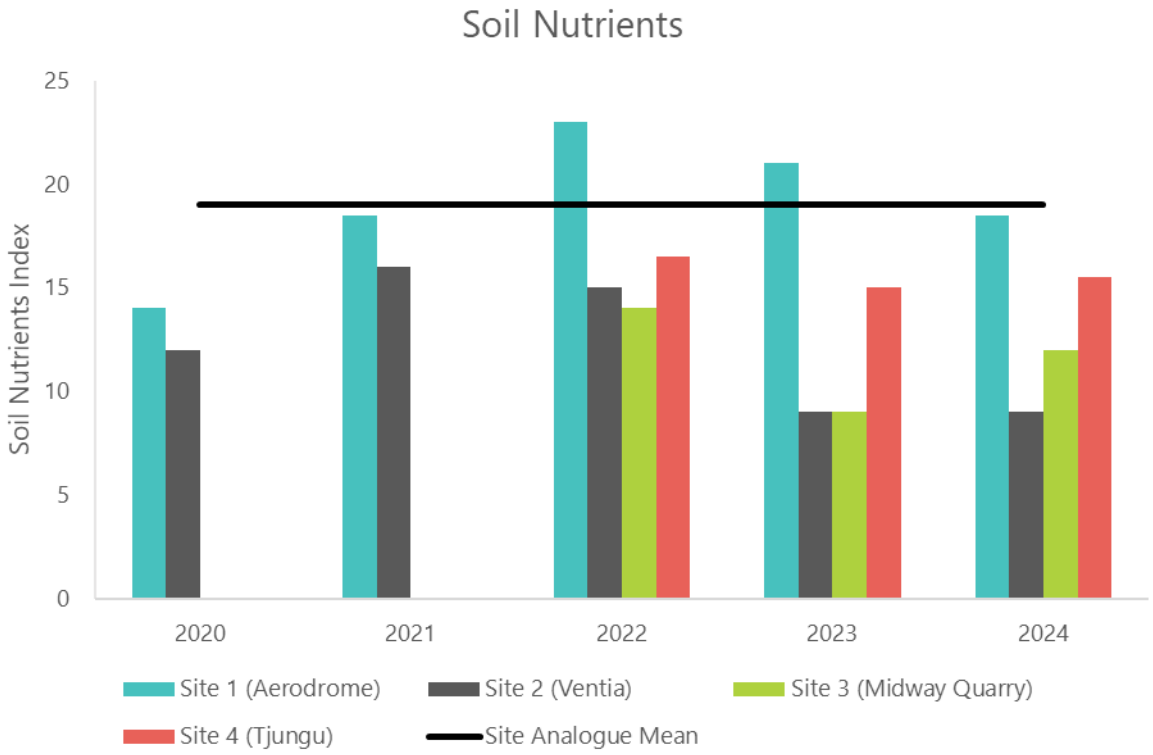



**Figure 3.47: Mean nutrient cycling index of transect based on SSA (combined patch and interpatch) at LFA sites (2020 to 2024)**

## 3.3 Fauna

### 3.3.1 Survey effort and capture rates

As per Section 2.6, fauna survey methods during compliance monitoring broadly followed the SA Vertebrate Survey guidelines (Owens 2000), with modifications aligning with the objectives of this survey, and based on recommendations from earlier surveys. The broadly accepted guidelines recommend a minimum of four trapping nights to ensure sufficient trapping effort for the purposes of documenting key faunal assemblages across a study area. A trapping line set up is shown in Plate 3.11.

Table 3.20 provides a summary of total trapping effort across the spring 2024 survey. Survey effort has been calculated by number of trapping nights (number of traps multiplied by the number of nights the traps were set for) and the total number of active surveys and searches. Active reptile searches / opportunistic observations and bird surveys were undertaken at all eight fauna sites, the four sites in Eliza creek, the dune Flora sites (21 and 22) and at opportunistic sites. Spotlighting was undertaken at sites 10 (creekline / drainage line); camera trapping and Song Meter deployment at fauna trapping sites also provided opportunity for capturing nocturnal activity.

**Plate 3.11: Site 16 fauna trapping set up**

**Table 3.20: Fauna Survey Effort, Spring 2024**

| Location | # of Trap Nights | | Total Trap Effort Per Site |
|---|---|---|---|
| | Funnel trap | Pit Trap | |
| Fauna Site 1 | 16 | 24 | 40 |
| Fauna Site 2 | 16 | 24 | 40 |
| Fauna Site 3 | 16 | 24 | 40 |
| Fauna Site 4 | 16 | 24 | 40 |
| Fauna Site 5 | 16 | 24 | 40 |
| Fauna Site 6 | 16 | 24 | 40 |
| Fauna Site 15 | 16 | 24 | 40 |
| Fauna Site 16 | 26 | 24 | 40 |
| **Total** | **128** | **192** | **320** |

#### 3.3.1.1 Capture rates

The spring survey returned a total of 577 observations, captures or evidence of fauna (excludes exact numbers for sheep, kangaroos, goats, rabbits and birds which were not counted). This included 344 detections / observations of birds, 73 of mammals and 160 of reptiles (excludes 64 Song Meter duplicate detections). Of the observations, 142 were pit or funnel trap captures. The highest capture rates were made in pitfall traps (93) and there were 49 captures in funnel traps. Capture rates for the number of pits and funnels deployed at each site are summarised in Table 3.21.

Total spring 2024 trapping capture rate for funnel and pit traps was calculated by dividing total captures by total trap effort (141/320 = 0.44). The total trapping capture rate was well above the 2018-2022 spring capture rates (~0.23) and the autumn 2023 capture rate (0.11). The 2024 total capture rate is well within the range reported during baseline surveys (0.14 to 0.97), where the lowest rates were recorded in autumn 2013 (0.14) and 2014 (0.13), and the highest rate was recorded in spring 2016 (0.97) (EBS 2017b). Capture rate numbers during the current survey are considered to be positive, particularly given the drier conditions preceding the survey. The diversity for small mammals was low, but within the range of baseline and previous construction monitoring surveys. Specific results per animal group and diversity results are presented further below.

As per above, both funnel and pit captures (142 in total) increased from the 2022 spring and 2023 autumn surveys, with only 10 recaptures (reptiles only) recorded. When reviewing trends across the control and impact site, as well as including captures and observations of additional species (opportunistic, spotlighting, bird surveys) there are no clear trends emerging between control and impact sites. It is noted that Impact Site 3 and new Control Site 4 had the highest overall fauna detection (39 and 38) and Control Site 1 and 2 had the lowest total species detection (19). Impact sites had variable numbers of bird species, varying levels of mammal / reptile captures and there are no clear trends when compared with spring 2022 and autumn 2023 results (Figure 3.48). Noting this comparison primarily relates to point of time comparison across the sites.

A summary of total fauna capture by site for the different survey methods (funnel, pitfall, opportunistic detection) is provided in Table 3.21, Table 3.22 and Table 3.23.

**Table 3.21: Fauna (trapping only) capture rates per site, spring 2024**

| Site | Funnel Trap | | Pit | | Total Capture Rate | Total Capture Rate Comparison to Autumn 2023 | Total Capture Rate Comparison to Spring 2022 |
|---|---|---|---|---|---|---|---|
| | Captures | Capture Rates | Captures | Capture Rates | | | |
| **Control** | | | | | | | |
| Fauna Site 1 | 4 | 0.25 | 8 | 0.33 | 0.333 | increase | Slight decrease |
| Fauna Site 2 | 7 | 0.44 | 6 | 0.25 | 0.325 | increase | same |
| Fauna Site 4 | 9 | 0.56 | 18 | 0.75 | 0.675 | increase | increase |
| Fauna Site 6 | 3 | 0.19 | 15 | 0.625 | 0.45 | increase | increase |
| **Impact** | | | | | | | |
| Fauna Site 3 | 11 | 0.69 | 12 | 0.5 | 0.575 | increase | increase |
| Fauna Site 5 | 6 | 0.375 | 10 | 0.42 | 0.4 | increase | increase |
| Fauna Site 15 | 5 | 0.31 | 15 | 0.625 | .5 | increase | decrease |
| Fauna Site 16 | 4 | 0.25 | 9 | 0.375 | 0.325 | increase | same |

As per Section 2.3.2, Site 4 and Site 6 have been changed from Impact to Control sites.

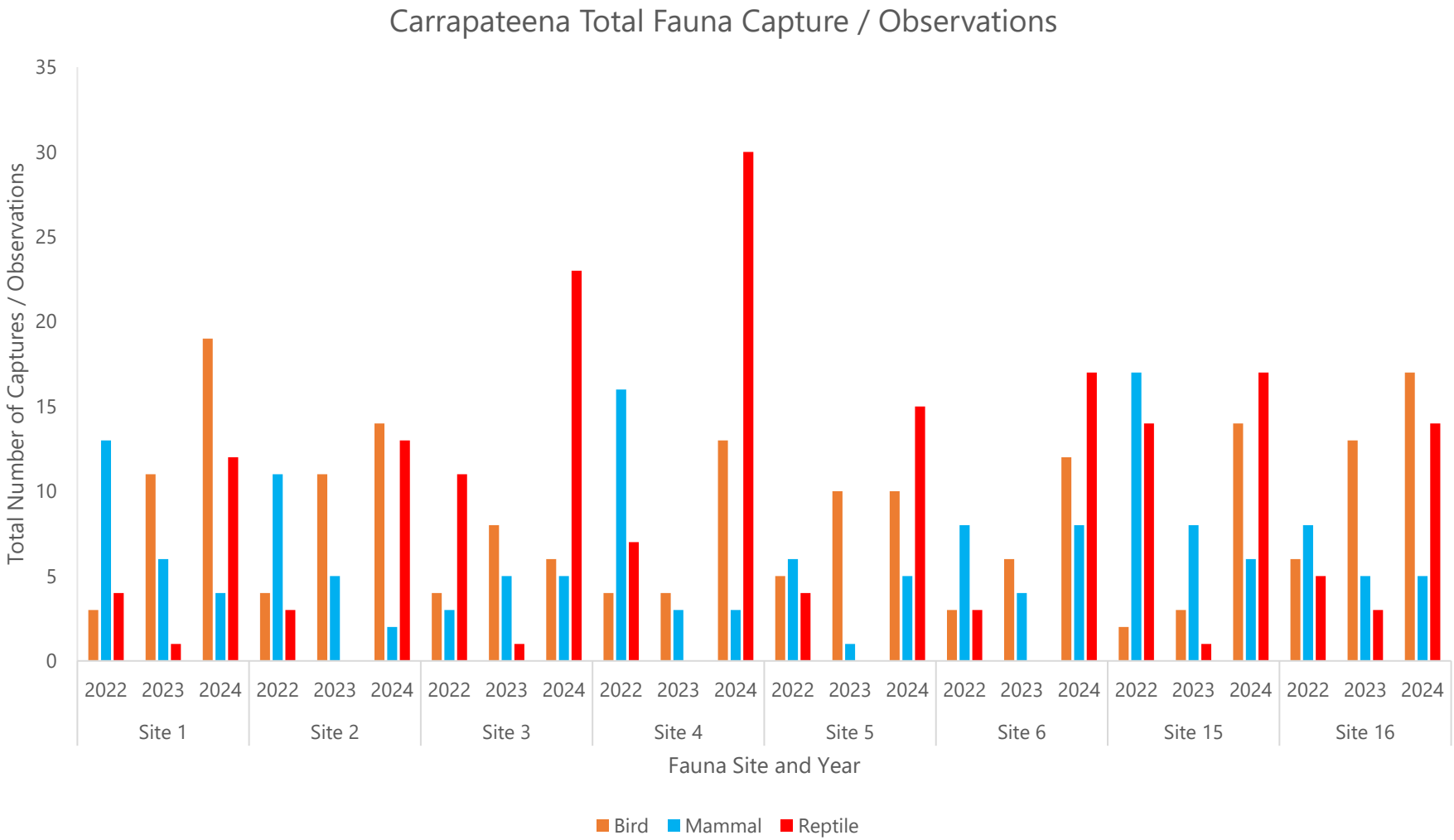



**Figure 3.48: Total fauna capture/observation (bird are species only), spring 2022, autumn 2023 and spring 2024**

### 3.3.2 Fauna diversity summary

During the 2024 spring fauna survey a total of 107 vertebrate species were detected from the 8 fauna survey sites, 20 bird survey sites and opportunistically within the study area. Of these 107 species, five species had not been observed / detected since the baseline surveys (2012-2017); Southern Four-toed Slider (*Lerista dorsalis*), Australian Pratincole *(Stiltia isabella*), Inland Forest Bat (*Vespadelus baverstocki*), Inland Free-tailed Bat (*Ozimops petersi*, previously only identified to genera *Mormopterus sp.*), and Lesser Long-eared Bat (*Nyclophilus geoffroyi*). Gould's Wattled Bat (*Chalinolobus gouldii*) was likely present in 2023, but calls could only be identified to genus rather than species level. In addition, three species which were detected during the current survey had not been detected at the site previously; Australian Pelican (*Pelecanus conspicillatus*), Rufous Songlark (*Cincloramphus mathewsi*), Red-necked Avocet (*Recurvirostra novaehollandiae*). The site occurs within the known range for these species (Menkhorst et al. 2019; Davies et al. 2022). The vertebrate species detected in the study area are summarised below:

- 74 bird species (53 at fauna sites and bird sites, 54 at opportunistic locations)
- 18 reptile species (13 fauna trapping captures, 15 camera trap / spotlighting / opportunistic observation)
- 15 mammal species (4 fauna trapping captures; 11 opportunistic including 3 exotic species, 5 microbat species) (excludes Sheep).

No NPW Act-listed as threatened species were detected, two EPBC listed were detected; Sharp-tailed Sandpiper (*Calidris acuminata*) listed as Threatened (Vulnerable) and Migratory, and Common Sandpiper (*Actitis hypoleucos*) listed as Migratory. Three Sharp-tailed Sandpipers and one Common Sandpiper were detected at the South Eliza Dams. This includes the original dam, overflow dam and temporary ponds that have developed following the release of surplus Class A treated wastewater from the Tjungu WWTP. This water source is temporary as the first use would be in the processing plant, only excess water is released to South Eliza Dam for livestock and wildlife. Previously Sharp-tailed Sandpipers and other waterbirds were detected in the WWTP irrigation areas, that are no longer active. Other shorebirds that were present included Banded Lapwing, Black-fronted Dotterel, Red-Kneed Dotterel, Black-winged Stilt and Red-necked Avocet. New records for the site included the Australian Pelican (one dead bird found at Site 4 over 2 km from the TSF), Rufous Songlark and Red-necked Avocet.

Introduced birds or mammals observed at the site included, House Sparrows (in similar numbers with previous years), live European Rabbits (observed at Site 15, North Eliza Dam, Site 21 and track / scats at five other locations) and Feral Cats (Site 21 tracks). There is still an active Rabbit Warren near Site 15, that requires ongoing management. Evidence of Feral Cats has decreased since the previous survey. Rock Doves (Feral Pigeon) were not detected.

The following sections provide detail on each faunal group identified, including summary tables of species.

Given the nature of fauna data from individual surveys, movement of species, the variations in weather conditions between surveys, variations in trapping effort (to baseline) and capture rates across surveys and sites, fauna data is reflective of high level trends over time only. Broadly, Figure 3.49 shows the total species diversity for mammals, birds, reptiles / frogs that were captured, recorded during dedicated bird surveys and recorded opportunistically across the Carrapateena site during spring baseline (2012 - 2017) surveys compared with data from the construction/operation period (2018 - 2024). Results indicate similar trends for some fauna types and increasing trends for other, with 2024 total diversity falling above the spring range reported from previous years, and snap shot autumn surveys from early baseline (2012), late baseline (2017) and early compliance monitoring (2017) (Figure 3.49). Similar to spring 2022 and autumn 2023 dams were full, plus South Eliza Dam had excess temporary ponds of Class A wastewater, where numerous waterbirds were present. There were increases in detection of bird species and families as a result of survey effort at these wetted areas, along with Song Meter detection.

Similar to previous years, there was evidence of breeding activity across the site. Given the arid environment, the breeding of many species is stimulated by climate conditions, hence breeding can occur throughout the year. The small mammals showed some evidence of breeding, however sample sizes were small for some species (e.g. Fat-tailed Dunnart, Sandy Inland Mouse). Stripe-faced Dunnarts were captured in higher numbers than Fat-tailed Dunnarts, as per previous surveys. Over 10 bird species were in breeding pairs / groups or had young present, which is a notable sign that species are persisting within the Operations area environment. Fauna with evidence of recent breeding included: multiple family groups of two fairywren species, numerous juvenile reptiles (Earless Dragon, Bynoes geckos, Four-toed Slider), various parrots in pairs or flocks or pairs (e.g. Mulga Parrots, Australian Ringneck, Blue Bonnets), pairs of Wedge-tailed Eagles and pregnant Stripe-faced Dunnart captured via camera trap (Plate 3.12).

No evidence of a significant reduction in species diversity was observed in spring 2024, with species numbers similar or greater than baseline and spring time compliance monitoring results, and with only the capture numbers of rodents reflective of the dry climate conditions preceding the survey (refer Section 3.1). House Mouse were captured in small numbers at Control Site 1 and Impact Site 16 during the survey (1 captured at each site). Survey for microbat species has not been undertaken every year, however with minimal survey effort in spring 2024 at three suitable sites (Flora Site 7, Flora Site 10 and South Eliza Dam), five microbat species were detected, three of these had not been detected since the baseline surveys.

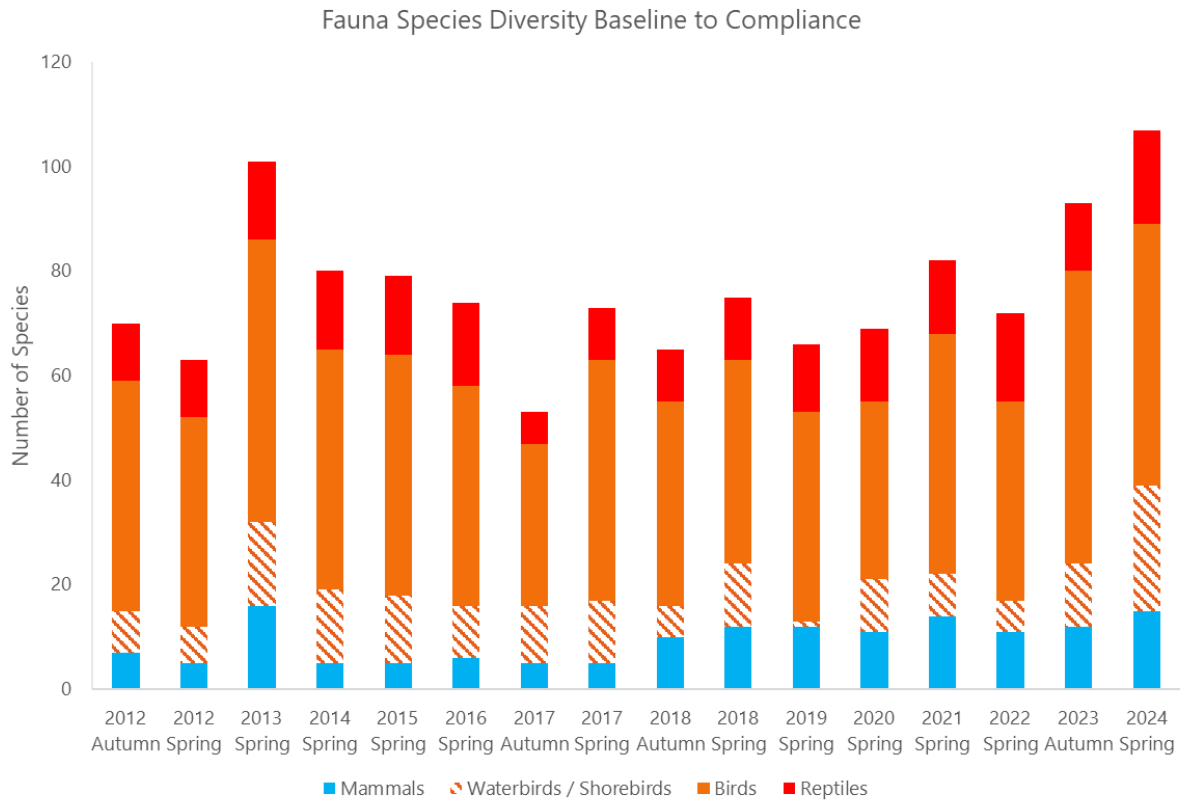



**Figure 3.49: Vertebrate total species diversity, during baseline (2012-2017), and compliance monitoring (2018- spring 2024).**


**Plate 3.12: Pregnant Stripe-faced Dunnart captures via camera trap at Site 5**

#### 3.3.2.1 Bird diversity

A total of 74 bird species were detected during the spring 2024 survey across the Carrapateena site (see Appendix F). Of these species, 53 were recorded during dedicated bird surveys across 20 sites and the additional species were recorded opportunistically when driving along tracks, around camp, effluent irrigation areas, during weed surveys and at dams. At the time of the spring survey all of the dams had water including coffer dams, and waterbirds and resident shorebirds were present, similar to previous years when all the dams were full. Two EPBC listed Migratory species were detected, and one of these is also EPBC listed as threatened; Sharp-tailed Sandpiper (Vulnerable) and Common Sandpiper (both observed at the South Eliza Dams). No State listed species were recorded.

There were three new records for the site; Pelican (one dead bird at Site 4 near the TSF), Rufous Songlark (heard at the South Eliza Dam) and Red-necked Avocet (seen at the South Eliza Dam). Whilst the Red-necked Avocet has not been detected before, this endemic shorebird is known to occur in small numbers across the broader region, e.g. small numbers observed at the Roxby Downs Wastewater Treatment Plant (WWTP) and near Olympic Dam in a small dam in 2024 as part of other surveys (Z. Bull pers. comm.). The Pelican is likely an overfly species that died as a result of lack of suitable habitat at the site (i.e. deep water with fish).

Bird families were well represented, with birds from 37 different families observed (increased from 22 in spring 2022 and 34 in autumn 2023). Many families were only represented by one species (20 families) or by two species (9 families). Meliphagidae (honeyeaters and chats) were the most represented (7 species), with Anatidae (ducks) represented by 6 species, Charadriidae (shorebirds) by five species and Psittacidae (parrots) by four species.

The species detected at the most fauna sites during site targeted bird surveys were the Australian Raven (17 sites), followed by Australian Pipit (15 sites), Rufous Fieldwren (14 sites), Singing Honeyeater (14 sites), White-winged Fairywren (13 sites), Black-faced Woodswallow (13 sites) and the Australian Magpie, Galah and Zebra Finch (all with 10 sites).

Family groups of two different types of Fairywren (White-winged and Purple-backed (Variegated) were present at a number of sites. White-winged Fairywren groups (males and females) were commonly observed across the Carrapateena Operation area in Chenopod habitats close to Western Myall Creeklines (e.g. Impact Site 3 adjacent the admin). Other species also showed breeding plumage, had juveniles present, were in breeding groups or nesting (e.g. Australasian Grebes, Black Swans, Black-fronted Dotterel, Orange and Crimson Chats, Eurasian Coots, Hooded Robin, Inland Dotterel, Wedge-tailed Eagle). The South Eliza Dams provided temporary nesting site for a number of waterbird species.

The House Sparrow (*Passer domesticus*) was again observed around both site camps in 2024, as per previous years. Both males and females were present, in similar numbers than previously, numbers are not declining. No Rock Dove (feral pigeon) (*Columba livia*) were detected.

**Plate 3.13: Sharp-tailed Sandpipers at South Eliza Dam**

***Comparison with baseline data – birds***

Mean bird species diversity per bird site in spring 2024 was 13.17 (increased from 5.6 spring 2022, 9.65 2023), with total diversity per site ranging from 4 to 35 species. More species were generally observed in creekline sites (e.g. Site 7, Site 10), or sites with Western Myall Woodland nearby (i.e. sites with a tree canopy in addition to shrubland understorey, such as Site 1, Site 16). Mean diversity per site in spring 2024 was well above the mean diversity observed in 2018-2023 (5-9.65). Species diversity per bird site was also well above the range recorded for baseline surveys (e.g. ranging from 4.1 in 2016, to 7.9 in 2013). This is likely related to the optimal conditions to detect birds (fewer windy days, warmer temperature and presence of water in dams), as well as the use of Song Meters to complement bird surveys. Noting that the lowest number of species detected was at Site 18, where a Song Meter was not deployed (also not deployed at Site 17, 19 and 20) and conditions were less suitable on the day this site was visited (warm and windy).

Total spring (74) bird species diversity across the site was above the range of diversity reported during baseline surveys (e.g. species diversity ranged from 42 in autumn 2017 to 70 in spring 2013; EBS 2017), and well above compliance monitoring numbers observed to date (2018 autumn to spring (46-51), 2019 (45), 2020 (44), 2021 (54), 2022 (37), 2023 (68)). Total number of bird families (37) represented across the site was within the range recorded during baseline survey results (e.g. families recorded ranged from 29 in spring 2012 to 38 in spring 2014 (EBS 2017)), and was also above results from previous compliance monitoring to date (e.g. 2018 (28-26), 2019 (21), 2020 (26), 2021 (29), 2022 (22), 2023 (34)). Given the

presence of water in all of the dams, the temporary excess Class A wastewater at South Eliza Dam, rainfall event in winter, and use of Song Meters to enhance survey effort, it is not unexpected that an increased diversity of species and families were detected. Although, noting only 10 additional species were detected via Song Meter. A variety of nomadic species were detected that had been rarely detected since baseline or early compliance monitoring (e.g. Rufous Fieldwren, Australian Pratincole). The variety of species and families of different types detected in 2024 and the ongoing evidence of numerous species breeding reflects stable conditions for an arid environment. In addition, the detection of Nationally listed shorebird species is a good indicator of stable conditions. Regardless, there is no evidence to suggest mining activities are impacting bird presence across the site.

**Plate 3.14: Male Red-capped Robin near South Eliza Dam**

**Plate 3.15: South Eliza Dam, excess temporary water source**

### 3.3.2.2 Reptile diversity

Eighteen reptile species from 160 detections were recorded across the sites during the spring 2024 survey (Table 3.22). During 2024, 73% of the records (116 out of 160) were through physical trapping, with the remainder detected opportunistically, including via spotlighting and via camera trap. In terms of diversity, 83% of species were detected opportunistically, and 72% of species were detected via pit / funnel captures (noting the overlap with some species detected through both pathways). The main species recorded in traps was the Salt-bush Ctenotus (*Ctenotus olympicus*) with the greatest numbers being detected at Site 4 (18) and Site 15 (15). The very high number of trap captures is likely due to the warmer temperatures during spring (refer Table 3.22).

Five common reptile families were well represented during the survey; including seven skink species, three dragon species and four gecko species. Juveniles of several species were detected during the survey (e.g. Earless Dragons, Bynoes Gecko, Salt-bush Ctenotus and Southern Four-toed Slider (Plate 3.16) indicating ongoing successful breeding activity across the site.

One species that has not been detected since baseline surveys (in 2016), the Southern Four-toed Slider (*Lerista dorsalis*), was detected at Site 6 through capture of a single juvenile individual. This species was detected during baseline surveys at Site 2, 3, 6, 15 and 16 (between 2012-2016), and detection of a juvenile individual during the current survey is a positive indication that the species persists in the area.

It is noted that in 2023 it was reported that the Eyrean Skink (*Ctenotus taeniatus*) was captured at Site 16, however there has been further taxonomic revision of this genus and the species was in fact the Short-legged Ctenotus (*Ctenotus strauchii*) (Mark Hutchinson pers. comm.) (refer Plate 3.17). This species was detected at Site 3 during 2024, previously detected in smaller numbers during baseline surveys and during previous compliance surveys in 2018, 2020 and 2023.

Also of note were detection of three snake species (Mulga Snake via camera trap (Plate 3.18), Curl Snake via funnel traps and Western Brown opportunistically in the Tjungu Village).

**Plate 3.16: Juvenile (indicated by red tail) *Lerista dorsalis* (Southern Four-toed Slider)**

**Plate 3.17: Short-legged Ctenotus (*Ctenotus strauchii*)**

**Table 3.22: Reptiles observed at Carrapateena in spring 2024**

| Family Name | Scientific Name | Common Name | Fauna Site | | | | | | | | OP/SP/CT Total[1] | All Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 15 | 16 | | |
| Agamidae | *Tympanocryptis sp.* | Earless Dragon | [1 CT] | | | [1 OP, 1CT] | [1CT] | | | | [4] | 4 |
| Agamidae | *Tympanocryptis tetraporophora* | Eyrean Earless Dragon | 1 (P), [2 OP] | 1 (P) | 2(P), 1(F), [1 OP] | 2(P), [2 OP] | 1(P) | 2(P), [1OP] | 2(P) | | [6] | 18 |
| Agamidae | *Tympanocryptis intima* | Smooth-snouted Earless Dragon | 1 (P), [1 OP] | | | [1 OP] | | | | 1(P) | 1 LFA TJU, [3] | 5 |
| Agamidae | *Pogona vitticeps* | Central Bearded Dragon | | [1 OP] | | | | | | | 1 CWM03 [2] | 2 |
| Elapidae | *Pseudechis australis* | Mulga Snake | | | | | | | | [1CT] | [1] | 1 |
| Elapidae | *Pseudonaja mengdeni* | Western Brown Snake | | | | | | | | | 1 TJU Village [1] | 1 |
| Elapidae | *Suta suta* | Curl Snake | 1 (F) | 1 (F) | | | | 1(F) | | | | 3 |
| Gekkonidae | *Diplodactylus tesselatus* | Tesselated Gecko | 1 (F) | 2 (P), 1 (F) | | 5(P) | | [2CT] | | | [2] | 11 |
| Gekkonidae | *Gehyra versicolor* | Eastern Tree Dtella | | | | | | | | | 5 SP [5] | 5 |
| Gekkonidae | *Heteronotia binoei* | Bynoe's Gecko | 1 (P) | | | | 1(F) | | | 1(P), 2(F) | 1 SED [1] | 6 |
| Gekkonidae | *Underwoodisaurus milli* | Common Barking Gecko | 1 (P) | | | | | | | | | 1 |
| Scincidae | *Ctenotus olympicus* | Saltbush Ctenotus | 2 (F) | 2(P), 4(F), [1 OP] | 3(P), 9(F) | 9(P), 9(F) | 6(P), 5(F) | 8(P),1(F), [1CT] | 9(P), 5(F) | 2(P), 1(F), [2OP,1CT] | 1 LFA TJU [6] | 82 |
| Scincidae | *Ctenotus robustus* | Eastern Striped Skink | | | | | | | | 1(P) | | 1 |
| Scincidae | *Ctenotus strauchii* | Short-legged Ctenotus | | | 2(P), [2] | | | | | | [2] | 4 |
| Scincidae | *Lerista dorsalis* | Southern Four-toed Slider | | | | | | 1(F) | | | | 1 |
| Scincidae | *Menetia greyii* | Common Dwarf Skink | | | | | [1OP] | | | 2(P) | [1] | 3 |
| Scincidae | *Morethia adelaidensis* | Adelaide Snake-eye | | | 1(P), [1 CT] | | | | | | 1 at S17, S19, SED [4] | 5 |
| Scincidae | *Tiliqua rugosa* | Sleepy Lizard | | | 1(F) | | | | | | 1 at S17, tracks at S21, S22, SED [4] | 5 |
| Varanidae | *Varanus gouldii* | Sand Goanna | | | | | | | | | Tracks at S21, S22 [2] | 2 |
| | Totals detected | 160 | 12 | 13 | 23 | 30 | 15 | 17 | 17 | 14 | 44 | |
| | Total species[1] | 18 | 7 | 5 | 5 | 4 | 4 | 5 | 2 | 6 | 14 | |

[1] OP/SP/CT = opportunistic (OP) / spotlighting / camera trap (CT), [X] = totals; all others captured in pit (P) or Funnel (F); total excludes *Tympanocryptus sp.* as most likely *T. tetraporophora*, but unable to confirm from camera trap footage.

***Comparison with baseline data – reptiles***

Total reptile captures / observations for spring 2024 (160) was well above autumn 2023 (39) and spring 2022 (88), and within the range for baseline spring surveys (49 in 2016, 184 in 2014 and 117 in spring 2017 (EBS 2017, site fauna database), and well above previous spring compliance monitoring totals (ranging from 39 to 112).

Results in 2024 for total species diversity (18) were above the baseline monitoring range, which ranged between 10 to 16 species (EBS 2017), suggesting firstly that there is no notable impact from the reduction in trapping effort and the number of trap lines deployed since 2017 (i.e. only one trap line per site), and secondly, that there is no evidence from the data for impacts to reptile diversity across the sites as a result of mining activity. Warmer daytime and overnight temperatures, and a storm event during the 2024 survey likely contributed to the result, presenting optimal conditions for a range of species. Regardless, detection of juveniles and species not recorded since baseline, suggests mining is not impacting reptile fauna at the site.

Total reptile species diversity across the Carrapateena location in 2024 (18 species) was just above spring of 2022 (17 species), and above the range of the previous compliance monitoring spring surveys in 2018, 2019, 2020, 2021 (12, 13, 14, 14 species respectively) and above the range of total species diversity reported during all baseline surveys between 2012 – 2017 (which ranged between 10 to 16 species, EBS 2017). All families previously detected in baseline and compliance monitoring were represented, with the exception of the Pygopodidae; however only one individual has previously been recorded across the Carrapateena location during the 2013 baseline survey (EBS 2013a) whilst spotlighting (*Pygopus nigriceps*, Black-headed Scalyfoot). The Pernatty Knob-tailed Gecko (Carphodactylidae family) and Centralian Blind Snake (Typhlopidae family) remain undetected since 2014, but these species were only previously reported during spotlighting (presumably in dune habitats, which are not part of the compliance monitoring program).

Similar to autumn 2023 compliance monitoring, detection of species that have not been detected since baseline is always a positive for the monitoring program. In 2024 the species not detected since baseline was the Southern Four-toed Slider. This species was only detected at Site 6, now classed as a control Site.

Mean reptile species diversity per fauna site was 4.8 in spring 2024, ranging from 2 to 7 species (Table 3.22). This has increased from 2022 (3.13) and 2021 (2.13) and is just within the baseline range (4.8 in 2012 to 6.6 in 2014). It is noted that mean diversity was not calculated in 2023 due to low reptile captures and was not reported in the baseline report in 2017. These results are positive, and despite a drier season, local climatic effects appear to be favouring certain species with warmer temperatures and humidity during the survey.


**Plate 3.18: Mulga Snake captured via camera trap at Site 16**

### 3.3.2.3 Mammal diversity

Fifteen mammal species were detected across the Carrapateena site during the spring 2024 survey (refer Table 3.23), excluding Sheep. Four mammal species were captured via trapping; Fat-tailed Dunnart, Stripe-faced Dunnart, Sandy Inland Mouse and House Mouse (28 captures in total). Rodents were recorded in lower numbers (1 and 2 respectively). No Forrest's Mouse or Planigales were detected during the current survey. Other animals detected include pest or exotic fauna, three Kangaroo species and five species of microbats.

Similar to 2021 to 2023, the Stripe-faced Dunnart was the most abundant small mammal captured at all sites (19 in total), slightly above 2023 (16) and 2021 (18), but lower than 2022 when conditions were more optimal (46) (Jacobs 2019a, 2023d, 2023h). Both males and females were captured, and a range of age classes were present with some evidence of pouch activity. One female captured via camera trap appeared to be pregnant (Plate 3.12). Fat-tailed Dunnarts represented the next highest number of records, with only five animals detected via fauna trapping and one detected via camera trap (Plate 3.19).

The White-striped Free-tail Bat is the only bat in South Australia that is audible to the human ear. This larger micro bat was not heard during spotlighting in Eliza Creek (Site 10) and was not detected via Song Meter at that site, however the species was detected at South Eliza Dam via Song Meter. Four other microbat species were also detected via Song Meter; Gould's Wattled Bat, Lesser Long-eared Bat, Inland Forest Bat and Inland Free-tailed Bat. There were a total of 25 detections of microbats at the three locations (Site 7, Site 10 and South Eliza Dam) across four nights, the majority at South Eliza Dam. Three species were detected at Site 7, three at Site 10 and all five species were detected at South Eliza Dam (Specialised Zoological 2025).

Minimal evidence of pest fauna species was observed at the fauna trapping sites and as mentioned in Section 3.2.5 evidence of grazing was limited at flora sites. Goats were not observed during this survey, but a small group is known to occur across the broader Carrapateena site. Rabbit scats, diggings and live animal were detected opportunistically, and an active warren was recorded on the track to Site 15. Foxes have been recorded on the site previously (2012, 2013, 2015, den in Eliza Creek 2019, dead fox at Anzac Dam in 2019). Similar to 2023, foxes were not detected during 2024. Cats are known to occur at the site and have increased slightly in recent times, particularly around administration areas, and management of the species is ongoing. No cats were detected at the fauna sites, but tracks and scats were detected at Flora Site 21.

Grazing management has changed across the site, with less areas under grazing and more fencing delineating grazed areas; flocks of sheep were only observed / detected (Song Meter) at Site 6. As a result, kangaroos are also being managed more effectively across the site and there is likely less competition for resources. Red Kangaroos, Euros and one Western Grey Kangaroo were observed across the study area and were noted to be in excellent health. Euros were recorded in similar smaller numbers than previous years and similar numbers of Red Kangaroos.


**Plate 3.19: Fat-tailed Dunnart detected by camera trap at Site 15**


Plate 3.20: Native Mouse, likely Sandy Inland Mouse at Site 5


Plate 3.21: Prey of Sandy Inland Mouse, key resource when grass seed is unavailable

**Table 3.23: Mammals recorded at Carrapateena during spring 2024 survey**

| Family Name | *Scientific Name* | Common Name | Site | | | | | | | | OP [Total]1 | Total[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 15 | 16 | | |
| Bovidae | *Ovis aries* | Sheep (Feral Sheep) | | | | | | Flock | | | | NA |
| Dasyuridae | *Sminthopsis crassicaudata* | Fat-tailed Dunnart | 1 | | | 1 | 1 | | 3 | | | 6 |
| | *Sminthopsis macroura* | Stripe-faced Dunnart | 2 | 2 | 4 | 1 | 2 | 5 | 1 | 2 | | 19 |
| Felidae | *Felis catus* | Cat (Feral Cat) | | | | | | | | | [S21[4]] | 1 |
| Leporidae | *Oryctolagus cuniculus* | Rabbit (European Rabbit) | | | | | | | Active Warren | | [S17, S22, LFA QUA, SED][3]; 1 x S21, 2 x NED, 1 x S19 [8] | 8 |
| Macropodidae | *Macropus (Osphranter) robustus* | Euro | | | | | | | | [2] | [2] | 2 |
| | *Macropus (Osphranter) rufus* | Red Kangaroo | | | [1] | [3] | | [1] | | [4] | S21, DD, S7 [11] | NA |
| | *Macropus fuliginosus* | Western Grey Kangaroo | | | | | | | | | S22 [1] | 1 |
| Muridae | *Mus musculus* | House Mouse | 1 | | | | | | | 1 | | 2 |
| | *Pseudomys sp.* | Native Mouse[4] | | | | | [1 CT][3] | | | | [1] | 1 |
| | *Pseudomys hermannsburgensis* | Sandy Inland Mouse | | | | | 1 | | | | | 1 |
| Vespertilionidae[5] | *Nyctophilus geoffroyi* | Lesser Long-eared Bat | | | | | | | | | 3 x S7, 1 x S10, 3 x SED [7] | 7 |
| | *Vespadelus baverstocki* | Inland Forest Bat | | | | | | | | | 3 xS7, 1 x S10, 4 x SED [7] | 7 |
| | *Chalinolobus gouldii* | Gould's Wattle Bat | | | | | | | | | 1 x S10, 4 x SED [5] | 5 |
| Molossidae | *Austronomus australis* | White-stripe Free-tailed Bat | | | | | | | | | 1 x SED [1] | 1 |
| | *Ozimops petersi (Mormopterus planiceps)* | Inland Free-tailed Bat | | | | | | | | | 2 x S7, 3 x SED [5] | 5 |
| | Total Trap Captures | | 4 | 2 | 4 | 2 | 4 | 5 | 4 | 3 | | |
| | Total Species Detected | | 3 | 1 | 2 | 3 | 3/4 | 3 | 3 | 5 | | |

[1]OP = Opportunistic, SED = South Eliza Dam, DED = North Eliza Dam, LFA QUA = Mid-way Quarry, DD = Dawson Dam; S21 = Site CAR021, S22 = Site CAR022, S11 = CAR011 etc.; [2]Not Accurate given kangaroos / sheep were not always counted; CT –recorded on Camera Trap. [3] fresh tracks and / scats. Excludes recaptures.[4] Rodent captured via camera cannot confirm *Pseudomys* to species level, but not Plains Mouse or *Leggadina*; [5]All microbats recorded on Song Meter, mice and dunnarts caught in pitfall trap unless otherwise mentioned as CT.

***Comparison with baseline data – mammals***

Small mammal species diversity from trapping effort alone during spring 2024 (4 small mammal species) was within the compliance monitoring range (3 – 5) and within the baseline range (4 – 6). Two House Mice were caught in traps in 2024, at Site 1 and Site 16. The Narrow-nosed Planigale was recorded in previous surveys in low numbers, but is an elusive species that is more active during warmer temperatures. This species was not detected in 2024 despite warm nights and a rainfall event. Forrest's Mouse were also previously detected in small numbers and were not detected in 2024. There were however five microbat species detected in 2024 opportunistically via acoustic methods at three sites with water and / or roosting habitat (e.g. Site 7 (men's site), Site 10 (Eliza Creek, dry at time of survey) and South Eliza Dam (water present).

In general, mammal species diversity did not differ notably from previous surveys. Red Kangaroos were present across the site, and similar to 2022/2023 remain in good health compared to previous years and were observed in moderate numbers (not counted). Evidence of feral goats was present (scats) and other feral animals still present in low numbers on par with baseline numbers. There were ongoing signs / evidence of rabbits and also live sightings at an established warren near Site 15, as well as North Eliza Dam and Site 19 (Plate 3.22).

Mean small mammal species diversity per fauna trapping site was 1.9, down from 2.4 in autumn 2023 and from 2.75 in spring 2022, but still ranging from 1 to 3 species per site, which is on par with previous compliance monitoring surveys (small mammal captures only) and within the baseline surveys results presented in EBS (2017). These results are considered satisfactory given the low number of small mammal captures for the autumn 2023 survey. There was very little difference between small mammal species diversity and captures across sites, with the highest diversity recorded at both control and impact sites (Site 1 and Site 5 both with 3 species). Captures ranged from 2-5 individuals, with four of the sites recording 4-5 captures (Site 1, 3, 6, 15).

Total diversity of mammals (15) observed or captured throughout the survey was above the range of mammal diversity reported during baseline surveys, which ranged from 4 to 6 (small mammals only), Figure 3.49). It is however noted that baseline surveys did not always report on presence of microbats, Kangaroos, Fox, Cow, Euro, Bat, Sheep, but occasionally recorded rabbit (e.g. spring 2014), hence it is difficult to compare data.

In terms of small mammal diversity and abundance, there were more Stripe-faced Dunnart captures (19) than Fat-tailed Dunnarts (6). This follows the trend observed during baseline and compliance monitoring (Table 3.24). Males and female dunnarts were recorded as present for both these species, some with evidence of brood patch, suggesting that at least one round of breeding may have occurred prior to the survey. Two small mammals that were not detected in 2024 include Forrest's Mouse (*Leggadina forresti*) and Planigale (Giles (*Planigale gilesi*) or Narrow-nosed (*P. tenuirostris*)). These small mammals have been detected in smaller numbers or not at all some years during baseline and compliance monitoring (Table 3.24), hence the lack of detection in 2024 is not cause for concern. Similarly, no Plains Mouse were detected, continuing the trend of no detections since the commencement of the compliance monitoring. Only two rodent species were detected, the Sandy Inland Mouse (one captured and one likely via camera) and the House Mouse, both in very low numbers. Low numbers of rodents in general is likely reflective of

drier conditions in the preceding months before the survey, given rodents require sustained rainfall and associated resources to breed in larger numbers. The one rainfall event in July unlikely to sustain rodent numbers.

Microbat data collection and analysis were increased in 2024 (e.g. data collected at three sites, over several nights) and analysed using new methods (Specialised Zoological 2025). This resulted in detection of five microbat species in total, of which three had not been detected since the baseline monitoring (2007 and/or 2013); Lesser Long-eared, Inland Forest Bat and Inland Free-tailed (Figure 3.50). The Inland Free-tailed Bat was detected as a species in 2024, likely due to advances in acoustic analysis, previously only detected to genus level (*Mormopterus sp.*). Similarly, the Gould's Wattled Bat was detected to genus level in 2023.

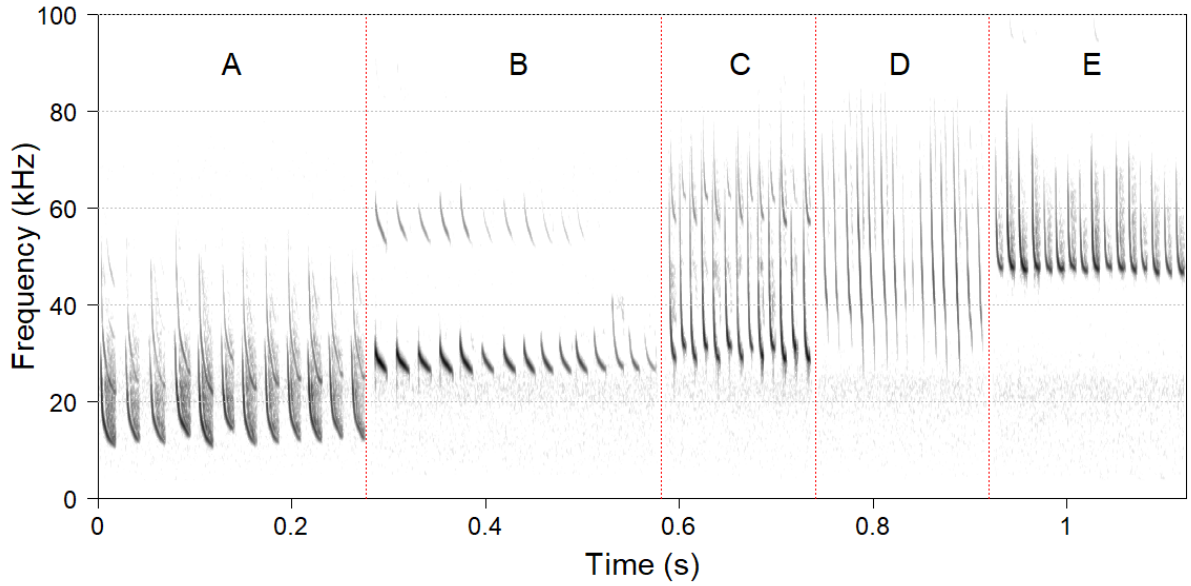



**Figure 3.50: Representative echolocation call sequence portions of the species identified; (A) White-stripe Free-tailed Bat, (B) Inland Free-tailed Bat, (C) Gould's Wattled Bat; (D) Lesser Long-eared Bat, (E) Inland Forest Bat (time between pulses compressed).**

**Plate 3.22: Active rabbit warren at Site 15**

**Table 3.24: Summary of small mammal captures, baseline (2012-2017) versus compliance monitoring (2018-2024)**

| Family Name | *Scientific Name* | Common Name | Baseline (2012-2017) | | | Compliance (2018-2024) | | |
|---|---|---|---|---|---|---|---|---|
| | | | Total[1] | Range per survey | Mean per survey | Total[1] | Range | Mean |
| Dasyuridae | *Sminthopsis crassicaudata* | Fat-tailed Dunnart | 217 | 4-30 | 18 | 71 | 3-20 | 9 |
| | *Sminthopsis macroura* | Stripe-faced Dunnart | 610 | 8-95 | 51 | 124 | 3-47 | 16 |
| | *Planigale gilesi* | Giles Planigale | 56 | 0-10 | <3 | 22 | 0-10 | 3 |
| | *Planigale tenuirostris* | Narrow-nosed Planigale | | | | | | |
| | | Planigale sp. | | | | | | |
| Muridae | *Leggadina forresti* | Forrest's Mouse | 65 | 0-19 | <7 | 23 | 0-8 | 3 |
| | *Pseudomys sp.* | Native Mouse[5] | 16 | 0-4 | <2 | 4 | 0-2 | <1 |
| | *Pseudomys hermannsburgensis* | Sandy Inland Mouse | | | | | | |
| | *Pseudomys bolami* | Bolam's Mouse | | | | | | |
| | *Pseudomys australis* | Plains Mouse | 37 | 0-20 | 3 | 0 | 0 | 0 |
| | *Mus musculus* | House Mouse | 11 | 0-10 | <1 | 7 | 0-3 | <1 |

Note: Numbers are rounded and do not account for recaptures as limited information is available for baseline data. [1]Number reflect totals, acknowledging that baseline totals include two surveys per year running two to four traplines per site and compliance surveys were reduced to one trapline per site and one survey per year from 2019 (two in 2018).

### 3.3.3 Control versus impact

Results from spring 2024 indicate that when combining total diversity of bird species observed, mammal species captured and reptile species captured / observed at fauna trapping sites, the mean species diversity is higher for impact sites than control sites using the original treatments (Table 3.25). However, when updating the treatments (Site 4 and 6 swapped to control Sites as explained in Section 2.3.2) the mean diversity is higher for control than impact. These results are summarised below in Table 3.25 and Table 3.26, respectively. A comparison of the mean total fauna diversity between control and impact sites (original treatment) using un-paired t-tests indicated no statistically significant difference (Control Mean +/- Standard Error (SE) = 32 +/- 3, Impact Mean +/- SE = 36.67 +/- 2.17, P = 0.3098). Similarly, comparison of means using the updated treatments, was also not statistically significant (Control Mean +/- Standard Error (SE) = 37 +/- 3.54, Impact Mean / SE = 34 +/- 1.41, P = 0.4608).

The mean number of total captures was higher at impact sites than control sites for the original treatment (Table 3.25) and the same for the updated treatment (Table 3.25). A comparison of mean total fauna captures (reptiles and mammals only) between control and impact sites using un-paired t-tests indicated no statistically significant difference for the original treatment, Control Mean +/- SE = 15.5 +/- 0.5, Impact Mean +/- SE = 24.5 +/- 2.17, P = 0.064; and for the updated treatment, Control Mean +/- SE = 22.25 +/- 4.23, Impact Mean +/- SE = 22.25 +/- 2.02, P = 1.0000.

These results indicated there are no differences in fauna species diversity or capture rates between impact and control sites with either of the treatment arrangements used (original or updated). This suggests there is no evidence that mining activity is impacting fauna diversity or trap capture rates. Whilst the differences for both diversity and captures were not statistically significant, the trends for the updated treatment suggest slightly higher at control Sites and aligns with the reallocation of treatment to Site 4 and 6. Similarly in the future there may be a need to reallocate control Site 1 and 2 to impact Sites, depending on influence of increased Khamsin Road traffic, Northern Wellfield activities. Regardless, overall diversity (birds, mammals and reptiles) and capture rates are within baseline ranges, and sites in closest proximity to the mine site (e.g. Site 3, 15 and 16) and camps provide good evidence that fauna impacts as a result of mining activity are not currently evident at Carrapateena.

**Table 3.25: Comparison of fauna diversity and captures at control and impact sites (original treatment)**

| Site | Treatment | Diversity number of bird, reptile, small mammal captures / observed[1,2] | Average diversity at fauna sites by treatment type | Captures number of reptile, small mammal captures/ observed[1] | Average captures at fauna sites by treatment type |
|---|---|---|---|---|---|
| 1 | control | 35 | 32 | 16 | 15.5 |
| 2 | control | 29 | | 15 | |
| 3 | impact | 34 | 36.67 | 28 | 24.5 |
| 4 | impact | 46 | | 33 | |
| 5 | impact | 30 | | 20 | |
| 6 | impact | 38 | | 25 | |
| 15 | impact | 36 | | 22 | |
| 16 | impact | 36 | | 19 | |

([1]Excludes kangaroos, goat, rabbit, [2]bird species only counted once)

**Table 3.26: Comparison of fauna diversity and captures at control and impact sites (updated treatment)**

| Site | Treatment | Diversity number of bird, reptile, small mammal captures / observed[1,2] | Average diversity at fauna sites by treatment type | Captures number of reptile, small mammal captures/ observed[1] | Average captures at fauna sites by treatment type |
|---|---|---|---|---|---|
| 1 | control | 35 | 37 | 16 | 22.25 |
| 2 | control | 29 | | 15 | |
| 4 | control | 46 | | 33 | |
| 6 | control | 38 | | 25 | |
| 3 | impact | 34 | 34 | 28 | 22.25 |
| 5 | impact | 30 | | 20 | |
| 15 | impact | 36 | | 22 | |
| 16 | impact | 36 | | 19 | |

([1]Excludes kangaroos, goat, rabbit, [2]bird species only counted once)

### 3.3.4 EPBC Act Protected Matters

The conditions of the PEPR require that records of three EPBC listed threatened species are reported if they a recorded during ecological surveys at site, namely Thick-bill Grasswren, Plains Mouse and Night Parrot. In addition, observations of the Migratory / Critically Endangered Curlew Sandpiper are to be noted as per EPBC referral commitments.

#### 3.3.4.1 EPBC1 – Thick-billed Grasswren (Vulnerable)

No evidence of the Thick-billed Grasswren (TBGW) (*Amytornis modestus indulkanna*) (calls, direct observations) were observed during the 2024 survey, including bird surveys at 20 sites, or during opportunistic observations at dams and other likely habitat during the survey. As per 2023, Song Meters were deployed at all dedicated fauna sites, a pastoral dam (South Eliza Dam), Eliza Creek (Site 10) and a small patch of potentially suitable Thick-bill Grasswren habitat within the Carrapateena Wellfield Expansion area (Site 7). There was no evidence of the distinctive high pitch calls on the Sonogram outputs, only calls of White-winged Fairywrens and Purple-backed Fairywrens.

A total of 74 bird species were observed throughout the survey including other similar sized species, such as two species of Fairy-wren (White-winged, Purple-backed) and the Rufous Fieldwren.

Whilst captures for mammals were reduced, bird detection was increased due to both Song Meter detection and presence of water in dams.

#### 3.3.4.2 EPBC2 – Plains Mouse (Vulnerable)

No evidence of Plains Mouse was recorded during pitfall and camera trapping at eight fauna sites during the spring 2024 survey, despite trapping effort within proximity to isolated patches of cracking clay habitat. However, it is noted that many gilgais did not show a large amount of activity, cracks and fauna runs into cracks. Native rodents were only captured on nocturnal cameras and in a pitfall trap at one site during the survey (Site 5). As per 2023, Plains Mice have also been detected in the region at the South Gap offset area (Nature Conservation 2025), and inside / outside the arid recovery area adjacent Olympic Dam, however in low numbers (i.e. only one at South Gap in 2024, Nature Conservation 2025). At South Gap it is considered the population has been undergoing a low, since mid-2022, and other small mammals have also been detected in low yet stable rates. The decline in detection in 2024, particularly given the survey effort (12 permanent camera sites, recording throughout the year) continues to suggest the population is currently declining (Nature Foundation 2025). The species was most recently caught at Carrapateena in 2017 (only 3 captured) prior to commencement of the compliance monitoring phase. Detection at South Gap in very low numbers, but not at Carrapateena us likely related to additional factors (reduced impacts from grazing and predators compared with Carrapateena). In addition, detection may also have been affected by the preceding climate conditions, reduced sustained rainfall that rodents require.

#### 3.3.4.3 EPBC3 – Night Parrot Records (Endangered)

During the annual flora and fauna survey (spring 2024) at the Carrapateena Mine site, there was no evidence of Night Parrot (calls, direct observations or distinct feathers) at eight flora and fauna monitoring sites, 20 bird survey sites and a number of opportunistic observations at dams, during spotlighting. There was also no detection via Song Meter at the fauna sites or other opportunistic locations deployed (e.g. South Eliza Dam, Eliza Creek (Site 10, Site 7). A total of four parrot species were detected throughout the survey including four common parrot species (Eastern Blue Bonnet, Mulga Parrot, Australian Ringneck and Budgerigar).

No EPBC listed Parrots were detected during the spring 2024 survey.

#### 3.3.4.4 Curlew Sandpiper (Critically Endangered)

The EPBC listed Critically Endangered and Migratory Curlew Sandpiper (*Calidris ferruginea*) is not covered by the PEPR conditions for Carrapateena, but is one of the four EPBC species that was considered in the Operation's EPBC referral. Whilst it was considered unlikely to occur at the site, there is potential the shorebird could visit water habitats at the site.

No evidence of Curlew Sandpiper (calls, direct observations) were detected during the 2024 spring survey, whilst undertaking bird surveys at 20 sites, or during opportunistic observations at dams or on Song Meter outputs. All dams contained water during the survey period and were quite full with little exposed mud areas. The South Eliza Dams had overflow and temporary wetland conditions, with large numbers of water bird species presence. A total of 74 bird species was observed throughout the survey; with two EPBC listed as Migratory shorebirds detected; Common Sandpiper and Sharp-tailed Sandpiper (also EPBC Vulnerable). A number of waterbird species and resident or endemic shorebirds were also recorded in water habitats; Banded Lapwing, Masked Lapwing, Black-fronted Dotterel, Red-kneed Dotterel, Red-necked Avocet, Inland Dotterel and Australian Pratincole).

### 3.3.5 Vouchers

For the spring survey no trap deaths occurred, hence no vouchers were provided as specimens to the SA Museum as required.

### 3.3.6 Pitfall line integrity

As mentioned earlier, the trapping effort at the site has been reduced over the years from four pit lines to one pit line per site being opened during each survey. The reduction in number of lines was undertaken to align the survey effort undertaken with the requirements of the PEPR (i.e. focus on species diversity and not focus on measures of abundance or a need for high capture rates). There has been some flexibility in the pits and lines opened during compliance monitoring to date, using only 6 of the 7 pits in a line, and potentially using different pit lines at a site over different surveys. Previously some of the pit lines contained pits that required maintenance or permanent removal as the integrity of the pit bases did not meet ethics standards. These holes were likely related to historical Planigale presence and potentially extraction of small skinks that had managed to get under the base liner. In 2019 it was recommended

that a whole pitfall line be removed from Site 5 which was completed by site environmental staff. In 2019 it was also recommended that other lines either have existing semi-permanent pits reinstated or maintenance of pit bases be added to the site enviro maintenance program which was undertaken. Initially, site environmental staff have replaced metal mesh bases (previously attached with large rubber bands / gaffer tape prior to inserting pit tube into the hole) with a similar size plastic mesh that could be attached with hot glue / selastic. This was required given the effort to extract the pit tubes which are wedged into the clay holes. The upgraded bases worked well in 2021 and 2022, but some still required further maintenance given Planigales and House Mice ongoing capture and damage of pit bases. Following the 2023 survey, the site environmental team began replacing damaged pit bases with custom-made stainless steel bases with numerous holes (2-3 mm) drilled in, to reduce ongoing maintenance and improve pitfall trap integrity across the mine site. The new bases were easy to install and can be removed with narrow-nosed pliers and a rubber mallet.

As per above regarding pit maintenance, data on pitfall traps and lines that still require new bases is provided to the BHP environment team at the end of the survey and maintenance is undertaken in the cooler months. During the maintenance schedule the pit lids are also checked to ensure that they are secure and there are no gaps where animals (particularly very small skinks, geckos, juvenile mammals) can squeeze into cracks can get in and become trapped outside of the survey period. This is required six monthly as per the Wildlife Ethics Permit. The process for securing the lid involves: digging around the top of the pit, below the lip of the pit lid (e.g. ~10cm), then aligning pit lid, banging the lid down and inserting the tech screw through the lip of the UV stable lid and the UV stable pit liner. Prior to this process the pit is checked that it is free of any fauna, particularly if pits are left open for a short time for maintenance or pit bases. These steps are required because the mine site has been approved to close pits with a tech screw rather than filling the traps with non-perishable material (e.g. rocks, sand or sandbags) at the end of the survey, as is the protocol associated with the permit for this Operation and in the Wildlife Ethics Guideline (DEW 2023). Rocks are also placed on top of closed pits to reduce UV exposure to the lid. Ethics require photos of the closed pits, and GPS coordinates of all pits, are provided in the annual Wildlife Ethics Report (due 1 February each year - Lathwida prepares on behalf of BHP), for the Permit requirements.

# 4 Discussion

## 4.1 Summary of Spring 2024 results

### 4.1.1 Assessment of mining impacts

Potential impacts from mining activity on vegetation would be represented by a decline in the number of native species present; a decline in the abundance of individuals within a species; a decline in plant health (e.g. due to potential raised dust settling on plants, saline seepage from tailings dam and/or altered groundwater levels) and/or an increase in weed presence. The discussion below outlines why the 2024 survey results do not indicate impacts on vegetation from mining at Carrapateena.

### 4.1.2 Native flora species diversity (RAM sites)

Monitoring of perennial species diversity (number of species present) provides an indication of long-term trends in plant populations. Prior to operational monitoring, baseline monitoring was conducted between 2012 and 2017. This period included years of average, well above-average and well below-average rainfall, hence providing a wide range of data, against which compliance data can be compared.

At the Carrapateena operational area, long-lived species diversity is monitored at the scale of individual one-hectare sites, at a habitat scale (stoney tableland, dunes, drainage lines) and at a landscape scale (number of plant species present across the whole operational area). Long-lived plant diversity is relatively constant in undisturbed environments. In contrast, ephemeral diversity varies greatly in response to rainfall in arid rangelands. Long-term monitoring of short-lived plant diversity however is also important because short-lived plant species often comprise most plant species in arid rangelands (Davies et al. 2018). Long-term changes (10+ years) in short-lived species diversity may indicate possible irreversible changes such as due to climate change, loss of soil seed bank, grazing impacts.

#### 4.1.2.1 Flora diversity across the whole Carrapateena operational area

In spring 2024, a cumulative total of 141 native flora taxa was recorded at the RAM flora sites across the Carrapateena Operation area. This was the equal highest diversity recorded during the any of the compliance monitoring surveys, which began in autumn 2018. The high species diversity was due to the high diversity of short-lived species: the total of 81 short-lived species in 2024 was the second highest recorded during the compliance monitoring to date, while the long-lived species diversity was within the range recorded during the previous compliance monitoring surveys. Long-lived plant diversity has been very stable, with yearly totals ranging from 58 to 62 since autumn 2018, and 60 species recorded in 2024. The very high number of short-lived species recorded in 2024 is likely to be the result of above-average rainfall received in June, July and August preceding the survey. For the stoney tableland flora sites, much of the short-lived species diversity is contained in the small gilgais (and as documented by Davies et. al. 2018), re-enforcing the importance of this micro-habitat. In 2024 the mean total species diversity for impact sites and for control sites was not significantly different (29 and 28 species, respectively), and within the baseline range. Given post-construction monitoring results have not shown clear trends

emerging in long-lived or short-lived species diversity, and no significant difference between control and impact site mean diversity, it is considered that there has been no impact on perennial or short-lived species diversity from mining.

#### 4.1.2.2 Flora diversity for individual habitats

***Eliza Creek sites***. Flora Site 10 was the only site on Eliza Creek to be established during the baseline survey period. To provide additional data against which to monitor potential impacts of the TSF dam embankment on downstream Eliza Creek habitats, flora Sites 17, 18, 19 and 20 were established in autumn 2018. Given the TSF became operational in 2020, the 2018 and 2019 surveys represent pre-construction species diversities. Since 2018, there has been no distinct trend in species diversity for any of the Eliza Creek sites, with mean diversity for 2020 to 2024 surveys (namely, TSF operational) being similar to 2018 and 2019 tallies.

***Dune habitats***. No dune habitat flora sites were included in baseline monitoring. Hence, flora Sites 21 and 22 were established to determine potential impacts from mining on sand dune habitat. Site 21 is considered a control site (> 2 km from mining infrastructure) and Site 22 a potential impact site as it adjoins the Western Access Road (< 2 km from mining infrastructure). Since 2018, no clear trend in long-lived species diversity has emerged at either site, hence species diversity in the dune habitat is not considered to have been impacted by mining activities.

***Gibber (stony tableland habitat).*** As at spring 2024, there were also no trends emerging in species diversity at either control or impact sites in gibber (stony tableland) habitats, the dominant habitat within the mining lease.

#### 4.1.2.3 Flora diversity for individual sites

At individual impact and control sites, perennial species diversity has been very consistent between surveys, for all sites except impact Site 12 and control sites 1 and 2. The latter have fluctuated between survey periods, but show no obvious trends. Variations at these sites occurred prior to 2022, and are thought likely to be due to variation between observers in interpreting survey boundaries, rather than actual changes in perennial diversity. Given that there have been no consistent trends in plant diversity for individual sites, it is considered that there has been no impact on mining at either the site level, habitat level or landscape level.

### 4.1.3 Long-lived woody perennial species diversity and abundance (Jessup transects)

To analyse potential mining impacts population trends (abundance) in long-lived woody plants, Jessup transects have been surveyed during baseline and construction monitoring. Since 2018, the population of the three most abundant and widespread shrubs have been analysed in detail, namely: Bladder Saltbush, Sea-heath and Samphire. Following declines in the abundance of all three species in 2019 and 2020/2021, the abundance of all three species across all sites, has increased or remained stable since 2021/2022. The widespread declines were associated with below average rainfall in 2017, 2018 and 2019, with the total rainfall in 2019 being 30% of the long-term mean, and with widespread dieback of shrubs noted during the 2019 and 2020 surveys. During prolonged drought, Bladder Saltbush drops its leaves and hence even

if still present may have become less obvious in the Jessup transects. The increases in population abundance since 2021 have been associated with average or near-average long term rainfall totals. In 2024, the populations of the above four species either remained within the baseline range, or had recovered to once again be within the baseline range.

Bladder Saltbush is the dominant shrub and plant cover at all gibber sites and is slightly to moderately palatable in this environment. Bladder Saltbush has a lifespan of approximately 25 to 30 years and is recognised as an important species for ecosystem stability in rangelands of southern Australia (Walsh et. al. 2005). Widespread regeneration of Bladder Saltbush was recorded at the Jessup sites, in both 2023 and 2024, largely contributing to the recovery of Bladder Saltbush populations since 2020. In 2024 the number of juveniles recorded was the highest since construction monitoring began. Although many of the juveniles in 2024 were less than 10 cm tall, not woody and unlikely to survive an extended hot dry period, the survival of even a small percentage is likely to assist in there being a sustainable population. At control sites, the mean number of Bladder Saltbush (adult and juvenile combined) in 2020, 2021, 2022 and 2023 were all below the baseline range but in 2024 had recovered to be once more within the baseline range. Bladder Saltbush appears to germinate readily in cooler months, after good rains. The widespread regeneration in 2023 and 2024 correlates with average to near-average yearly rainfall totals. Since 2018 (compliance monitoring) the correlation of population size with rainfall and the greater recovery at impact sites (compared with control sites) indicates that rainfall totals rather than mining has influenced Bladder Saltbush populations.

As with Bladder Saltbush, the abundance of Samphire plants in Jessup sites declined in 2020/2021 following below average rainfall years. The population means for both impact and control sites returned to being within baseline ranges, in 2023 and 2024. As with Bladder Saltbush, the greater recovery at impact sites rather than control sites indicates that Samphire abundance has not been affected by mining related activities. During compliance monitoring, the population of Sea-heath recorded at Jessup transects also declined during the below average rainfall years of 2018 – 2020 but has increased since 2021 with increased yearly rainfall. During compliance monitoring the mean population of Sea-heath at impact sites has remained within the baseline range, while the mean population at control sites has been within the baseline range for all years except 2021. Samphire and Sea-heath are unpalatable species not grazed by stock, kangaroos or feral animals. Hence changes in abundance are potentially due to mining activities or climate changes. Impact sites, however, have either shown similar trends to control sites, or even increased population trends. Changes in abundance also show a strong correlation with rainfall totals - with increased populations recorded since 2021. Hence this suggests that changes in abundance in these species are related to climatic changes rather than impacts from mining. Plains Lantern Bush and Bladder Saltbush are moderately palatable and their increased abundance may be due to both increased rainfall and widespread destocking across the lease area.

In 2024, the Plains Lantern Bush population at Jessup transects was the highest recorded during both baseline and compliance surveys, and largely due to increases at impact sites. Juveniles were present indicating the recovery was due to increased rainfall stimulating germination and/or reduced grazing pressure (Plains Lantern Bush is moderately palatable).

Bush Minuria, although relatively resistant to dry periods, it is moderately palatable, and normally found in the protection of woody shrubs such as Bladder Saltbush. As with other long-lived shrubs recorded at the Jessup sites, Bush Minuria abundance declined (or remained at very low levels) in 2020 and 2021 but increased in 2023, by at least 200% at all sites, and recorded further increases in 2024. As with Plains Lantern Bush and Bladder Saltbush (also moderately palatable), the recovery of Bush Minuria coincided with increased rainfall and widespread destocking.

In summary, the population abundance of the five most abundant and/or widespread long-lived shrubs declined during 2018/2019 to 2020, but have all increased since 2021/2022. At control sites, the declines were either similar or greater than at impact sites. This indicates that the declines were due to factors other than mining impacts. The population fluctuations in the long-lived shrubs are attributed to fluctuations in yearly and longer- term rainfall totals rather than mining impacts. Exceptionally dry conditions in 2018 and 2019 are likely to have caused widespread dieback and decline of long-lived shrubs. Samphire and Sea-heath are non-palatable, removing grazing as a cause of the decline experienced in these species. Grazing impact has declined across all the study sites since 2018 (refer Section 3.2.5) which removed grazing as a possible cause of reduced abundance of the more palatable long-lived shrubs (Bladder Saltbush, Bush Minuria and Plains Lantern Bush). Widespread recovery of shrub health and increased germination since 2020/2021 has coincided with average or above-average yearly rainfall totals for the region.

To provide data against which to assess potential impacts on vegetation downstream of the TSF, four flora sites, which included Jessup transects, were established in autumn 2018, located progressively downstream from the TSF embankment within Eliza Creek. A fifth site was established during baseline surveys, located furthest from the TSF on Eliza Creek. At all sites, the total number of long-lived woody perennials present in the Jessup transect, has increased since 2018. Ten of the most abundant long-lived woody perennials recorded at the Eliza Creek Jessup transects were separately analysed. All 10 species have shown yearly fluctuations, but have either recorded no long-term change in abundance, or an increasing abundance trend. The only exception was Dead Finish which has recorded a downward trend at Site 10, since 2021. Dead Finish occurs in dense clusters at Site 10, and fluctuating numbers may reflect differences in distinguishing individual species between survey periods. At the Jessup transects upstream from Site 10 (namely, closer to the TSF than Site 10), populations of Dead Finish have remained stable since 2018.

Western Myall is the dominant tree at Jessup Sites 17 and 18. Western Myall abundance has fluctuated yearly at these sites, but without displaying a downward trend. The population fluctuations are largely due to fluctuations in seedling abundance (including some seedlings likely germinating, but not surviving beyond a year). Regeneration of Western Myall has been widespread. In 2024 most regeneration was recorded at the Jessup Site 17 where there were nine juveniles. This is notable as Site 17 is less than 300 m from the TSF and the adult and juvenile Western Myall trees remain healthy with regular recruitment and/or growth of trees.

The Eliza Creek Jessup transects have shown an increase in total perennial species abundance, as well as no decline in individual species abundance. Hence, no impact from mining activities is considered evident at the Eliza Creek flora sites.

### 4.1.4 Plant health

During the survey, there was no dust layer noted on plants. This aligns with findings of the Dust Impact study (Jacobs 2020b) which recorded no significant decline in plant health or vigour at distances greater than 10 m from roads. No new impact on plant health due to salinity was recorded.

In 2024, qualitative observations of Bladder Saltbush noted that dieback/ leaf loss was much reduced compared to 2020 levels, and that almost all shrubs were heavily in fruit, perhaps the most since compliance monitoring began (pers obs. S Croft who has conducted all surveys since 2018).

At the Eliza Creek flora sites, qualitative observations noted that the only species with reduced vigour were Green Emubush (*Eremophila serrulata*) and Crimson Emubush (*Eremophila latrobei*). These species displayed leaf yellowing in approximately 25% of the population. No species death was noted and there appeared to be no decline in abundance as indicated by Jessup data.

In summary, 2024 survey results indicate that there are no current detectable impacts from mining on flora, i.e. no long-term decline in the number of native species present; no long-term decline in abundance of any species, no differential decline between control and impact sites in the abundance of individuals within a species; and no decline in plant health (e.g. due to potential raised dust settling, saline seepage)..

### 4.1.5 Tree health (canopy cover)

The canopy health of the dominant tree species at Eliza Creek sites (17, 18, 19 and 20) has been assessed since 2018 using both a GRS densitometer and visual estimates of canopy intactness. Canopy cover was also assessed at transects in the Eliza Creek sites to assess potential impacts on tree health due to seepage from the TSF or reduced water flows down the catchment. Comparing the total number of densitometer foliage records along a transect over time provides an indication of changes in total canopy cover. Potential changes in total canopy cover may be a combination of canopy expansion of existing trees; recruitment of trees and/or canopy decline of existing trees. At each Eliza Creek site, there are two nearby parallel transects. Along each 100 m transect, readings were taken every metre, hence the number of readings showing canopy cover equates to the percent canopy cover along the transect. Additionally, visual estimates were made (with no tool) of the entire canopy of individual trees, to assess the extent of foliage compared to the potential extent of foliage expected of a tree in good health (after Souter et al 2009).

#### 4.1.5.1 Western Myall trees

At sites 18, 19 and 20, the total number of Western Myall foliage records for each site has trended upwards since 2018. The increase in densitometer foliage records at each site is largely due to additional trees recorded along each transect. Visual estimates of tree canopy extent have remained stable for each site. For all transects combined there has been a net increase of 21 live Western Myall trees with a loss of two trees, but 23 new trees recorded since 2018. In 2024 four new Western Myall trees were recorded along the transects (one at Site 17, two at Site 18 and one at Site 19) and no deaths. The two Western Myall trees that have died since 2018 were trees with pre-existing very high levels of canopy loss prior to operation monitoring. In summary, since 2018, there has been an increase in Western Myall foliage recorded along the transects, and the very high levels of canopy intactness of existing trees has remained

constant. These results indicate that there has been no decline in Western Myall tree health collectively for each site, and there has been strong recruitment and/or growth of juvenile trees. As at 2024, mining related activities (impacts from TSF) have not impacted Western Myall abundance or health along the Eliza Creek canopy cover transects.

#### 4.1.5.2 River Red Gums

During the compliance monitoring (2018 to present), the canopy intactness levels of River Red Gums has varied considerably, both within individual trees, transects and between survey periods. However, the number of River Red Gum densitometer foliage records in 2024 was similar to the number of records in 2018. The records declined during and following the low rainfall years of 2018 and 2019/2020, followed by gradually increasing foliage trends. Well-below average rainfall was recorded in 2018 - 2020, followed by two years of average rainfall, but which included exceptional rainfall events in spring and summer.

Site 19 is 3 km from the TSF, and the first occurrence of River Red Gums downstream from the TSF. Site 20 is 4.6 km from the TSF. For both of these sites and transects, the number of foliage records have been relatively stable since 2022, and 2024 records are similar to those in 2018/2019. In 2024, the number of live River Red Gums present at Sites 19 and 20 was the same as in 2019.

Changes in the cover of River Red Gum canopies during operation monitoring is likely to reflect seasonal conditions, which in turn, will have varying impacts depending on unquantified variables such as age and size of tree (which will determine root depth and access to water). The impact of well above-average or well below-average rainfall on River Red Gums seems to be apparent within 12 months, with foliage shedding occurring in 2019 (low rainfall year) and increased foliage being recorded in 2021. Foliage records for transects at Site 19 and 20 in both 2023 and 2024 showed that River Red Gums had regained canopy losses in 2018-2020. However, there has been no recruitment of River Red Gums recorded along the transects.

To date, no potential impacts resulting from the construction and operation of the TSF to the dominant trees within Eliza Creek are evident.

### 4.1.6 Weed diversity and abundance

There were no new weeds recorded in 2024 and no overall increase in abundance or extent of weeds declared under legislation. Although not declared, Wards Weed was recorded along the Western Access Road for the first time. This introduction may be due to mine related activities. Further details are provided below.

#### 4.1.6.1 Weed species Declared or listed under legislation (*Landscape South Australia Act 2019*)

Declared weed species recorded during compliance/operational surveys were Bathurst Burr (*Xanthium spinosum*), Athel Pine (*Tamarix aphylla*) and Prickly Pear (*Opuntia* species). These species have been recorded during all operational surveys. Athel Pine and Prickly Pear species are also considered to be Weeds of National Significance (WoNS).

To date during operational monitoring, Athel Pine has only been recorded as clustered trees around Yeltacowie Homestead and the nearby dam. These trees are being actively controlled with numerous dead trees and/or cut trees present in 2023 and 2024. In 2024 it was noted that a few trees remain at the site. The Carrapateena station falls within the Kingoonya group of the South Australian Arid Land landscape board. Land managers are required to control Athel Pine within 100 m of watercourses and waterholes (up to 3 Athel Pine at Carrapateena are within 100 m of a watercourse), but land managers are encouraged to monitor success of control and carry out follow up control of all trees, as necessary. It is recommended that existing control efforts be consolidated by lopping or otherwise killing remaining trees and trees that have resprouted.

Up until 2023, Prickly Pear was documented from only one location (near the Yeltacowie homestead) within the Carrapateena operational area. This small population has been actively managed during operational monitoring and the population has been reduced to several square meters. In 2024, however, BHP environmental staff have reported additional occurrences of Prickly Pear. These are recommended as high priority for control.

In 2024, Bathurst Burr was recorded within the operational area only at previously recorded locations: Dawsons Dam, South Eliza Dam, and weed transects CWM01 (including Whittata Creek) and CWM02 both transects adjoining the Southern Access Road. No new populations, and no expansion of existing populations, were recorded. Plants were again recorded in the overflow area of South Eliza Dam, but in 2024 this area contained surface water due to pumping of waste treatment water into South Eliza Dam. The extra water has created and enhanced habitat for numerous bird species, but conversely has the potential to increase the spread of weeds.

In South Australia, Bathurst Burr is Declared under the Landscape South Australia Act 2019. In the SA Arid Lands, control is not enforced but landholders are encouraged to manage infestations (Government of South Australia (2021). Weed transect CWM02 occurs within Mineral Lease 6172 and CWM01 falls within the Southern Access Road and Radial Wellfield MPL 154. It is recommended that BHP work with the station owner to manage infestations at Dawson Dam and South Eliza Dam.

#### 4.1.6.2 Non-declared Weeds

***New Weeds***

No new species of weeds were recorded during the 2024 survey.

***Increases in abundance and/or new locations of existing weeds***

Six species were recorded at previously unreported locations. These species are either annuals or require moist habitats, and have been consistently and widely recorded during baseline and/or construction surveys. Annuals may persist in the soil seed bank and only germinate when conditions are favourable. Hence, some widespread annual weeds were recorded at new locations, and conversely some annual weeds were absent from previously recorded locations. Since monitoring began, there have been yearly fluctuations in the locations of annual herbs or grasses, including Smooth Mustard, Sow Thistle, Bitter Melon. These fluctuations reflect seasonal rainfall patterns rather than mining impacts. Their occurrence at any particular location is likely to vary from year to year and un-related to mining activities.

The annual species, Smooth Mustard was recorded in greater abundance at the designated impact flora site in dune habitat (Site 22), and at a flora site on Eliza Creek (Site 20) for the first time. Conversely, however, it was not recorded at several sites where previously recorded. Smooth Mustard is an annual species that has been consistently and widely recorded during baseline and construction surveys. Its occurrence at any particular location is likely to vary from year to year. Greater abundance of this weed at some locations is likely a reflection of rainfall received and also the time of survey, the October 2024 survey being approximately 4 months later than previous autumn surveys. Since operational monitoring began in 2018, the overall population of Smooth Mustard is not considered to have increased.

Two Wards Weed (*Carrichtera annua*) plants were recorded on the shoulder of the WAR approximately 5.5 km from the Stuart Highway. It has only previously been recorded within the Carrapateena operational area along the SAR as an isolated patch. This was in 2021 when the SAR was the main access to the mine site. The WAR was constructed/upgraded in 2022, specifically for vehicle access to the Carrapateena Mine site. Wards Weed therefore may have been introduced to the WAR as a result of mine-related activities. It is recommended that this small population be located in winter when it is actively growing and eradicated.

In 2024, Maltese thistle (*Centaurea melitensis*) was recorded for the first time along weed transect CWM01 adjoining the SAR. Maltese thistle has previously been recorded during baseline and compliance surveys in Eliza Creek and at Dawsons Dam. Its presence in 2024 in a SAR culvert and in Whittata Creek, is likely due to seeds being transported by water from the Whittata Creek complex, and not as a result of mine-related activities.

A few plants Mallow (*Malva parviflora*) were recorded at North Eliza Dam. This species has previously been recorded at South Eliza Dam, Anzac Dam and ephemeral watercourses along weed transects CWM01 and CWM02. Mallow is associated with high nutrient, moist soils and its presence at North Eliza Dam is likely due to the moist habitat, enhanced soil nutrients from stock grazing, and unrelated to mining activities. Scarlet Pimpernel (*Lysimackia arvenis*) was recorded for the first time at North Eliza Dam, but has

previously been regularly recorded at the Expo Village Effluent Irrigation area and along weed transects CWM001 (culvert area) and CWM06 (ephemeral drainage line). Its presence is strongly linked to wet habitats and its occurrences other than at the Effluent areas is unrelated to mining. Weeds associated with the Effluent Irrigation area rely on this moist environment and are unlikely to spread beyond the irrigated area. Trailing Verbena (*Verbena supina*) was recorded at North Eliza Dam for the first time. This species has previously been recorded at Anzac Dam. Its presence is due to presence of surface water rather than mining related activities.

***Non-declared weeds with potential to spread***

Couch grass was recorded near the SAR, associated with Whittata Creek. Couch is present in the wider region associated with dams, watercourses and settlements, with the nearest public database records being Roxby Downs, Stuart Creek Homestead Dam, Curdimurka railway siding and watercourses at Witchelina and Flinders Ranges (ALA 2024). Although drought tolerant, Couch grass prefers moist locations, and colonises sites subject to disturb ace such as grazing. Its origin at Whittata Creek is unknown, but because the occurrence along Whittata Creek was approximately 35 m from the SAR, it seems unlikely to have been transported in by mining vehicles. Couch grass however has the potential to spread aggressively along the creek, by rhizomes and stolons, and sensitive environmental control is recommended.

### 4.1.7 Landscape Function Analysis

The spring 2024 survey was the sixth assessment of Landscape Function at two sites prepared for rehabilitation in 2019 (Aerodrome and Ventia sites), and the third assessment at two sites (Midway Quarry and Tjungu) prepared for rehabilitation in 2022. All sites were devoid of plants when initially prepared for rehabilitation and were on sites that would have formerly supported Bladder Saltbush +/- Samphire low shrubland on stony tableland. The Point-Centred Quarter (PCQ) method has been used to complement the LFA survey, to additionally record plant density and diversity in the early stages of rehabilitation when plant density along the LFA transect line is sparse. PCQ monitoring began in 2020 for the Aerodrome and Ventia sites, and in 2023 for the Midway Quarry and Tjungu sites.

For the LFA established method, successful rehabilitation has occurred when various plant cover and soil parameters that contribute to capturing nutrients in the landscape, are equal to those measured in reference (analogue) habitats. By 2023, the Tjungu LFA site had already exceeded plant densities recorded at analogue sites, despite only being established in 2022. In 2024 mean patch density at the Tjungu site increased still further to 7 patches per $10m^2$ (compared with the analogue mean of 3 patches per $10m^2$). In 2024, the Tjungu vegetation patches comprised between 23% and 33% of the linear transects. The species composition was also comparable with reference Bladder Saltbush communities. Ten native species were recorded including 4 long lived perennials, which in turn included several plants of Bladder Saltbush. Further, plant density was relatively even along the transects, there being no major gaps with no vegetation patches. The rehabilitation success of this site correlates with the deep ripping that occurred, not only providing deep trenches to capture water and seed, but also to create high volume surface rock cover that also assists in trapping nutrients. This site is considered to have been successfully and sustainable restored and further monitoring is not considered necessary.

Since 2022, the Aerodrome LFA site has also reached and slightly exceeded mean vegetation patch densities recorded for the reference (analogue) sites, the Aerodrome LFA recording 3 to 4 patches per $10m^2$. In 2024, 9 short-lived perennials and 3 long-lived plants were recorded at the Aerodrome LFA. The long-lived species were recorded along the LFA for the first time in 2024. Unlike the Tjungu site however, the Aerodrome transects each comprised extensive lengths of the transect where no vegetation patches were present. The relative success of rehabilitation at the Aerodrome correlates with the depth of trenches prepared and volume of surface rock – trench depth and surface rock volume were less than Tjungu LFA, but greater than Ventia and Quarry LFA sites.

The Midway Quarry site since its establishment in 2022 has recorded increases in plant density in 2023 and 2024, but the patch density of one plant per $10m^2$ is below the analogue mean of 3 patches per 10m2. Trench ripping at the midway Quarry site was relatively shallow and very little surface rock was present. Only two species were recorded along the transects, both short-lived perennials. This site should be continued to be monitored for rehabilitation success using both the LFA and at least in the short-term, the PCQ method.

The Ventia site trenches were very shallow and in 2024 only one patch comprising a short-lived biennial was recorded along one transect. The other transect at this site had been graded and was being used as a temporary laydown area for adjoining road construction. It is recommended that these sites be prepared again for rehabilitation with deep ripping.

Of the species that were hand-seed to prepare the Tjungu site, only two were recorded in 2024: Pop Saltbush (*Atriplex holocarpa*) and Bladder Saltbush. These species were also present at other rehabilitation sites. Although all of the hand-seed species have been recorded within the Carrapateena Operation survey area, in the rehabilitation habitat (stony tableland) the hand-seeded species most likely to naturally occur are: Pop Saltbush, Grey Bluebush (*Maireana appressa*), Bladder Saltbush and Shrubby Twinleaf (*Roepera aurantiacum*). Within the Operation survey area, the remaining hand-seeded species are more commonly associated with major creek lines, floodouts/clay depressions and/or dunes.

### *Soil properties*

The LFA established method also reports on soil stability, infiltration and nutrients. Since the first LFA assessment at each site, the four rehabilitation sites have all recorded a soil stability index approaching the reference (analogue) mean. This is largely due to the heaver soil texture (high clay component) of the sites. However, the soil stability index declined slightly for all 4 sites in 2024, perhaps reflecting the flattening out of the trenches. Further improvement is expected however, as patch cover, litter cover, and deposited materials increase. For the soil infiltration index, in 2024, the indices recorded at the Aerodrome and Tjungu sites were approaching the analogue means. At the Ventia and Midway Quarry sites, the soil infiltration index has declined. This is likely due to the evening out of troughs reducing soil roughness, while vegetation and litter cover remaining low. Further improvement is still required at all sites to meet the analogue mean.

The nutrient index for each site has been highly variable between surveys, without showing a distinct trend. This index is heavily influenced by leaf litter which currently is highly patchy. The nutrient index the Aerodrome LFA has remained very close to the analogue mean, and at Tjungu is approaching the analogue mean, reflecting the high vegetative cover at these sites. At the Midway Quarry and Ventia sites,

the nutrient index was approximately 50% of the analogue site means, reflecting the sparse vegetative cover at these sites.

In summary, soil stability for all sites are approximately 70% of analogue means, soil infiltration indices are similar to the analogue mean at Tjungu and Aerodrome LFAs (and 50% of the analogue mean at Ventia and Midway Quarry LFA sites), and soil nutrient indices range from 50% (Ventia site) to 90% (Aerodrome site) of the analogue mean. Given the soil indices are based on dependent variables, which have different trajectories (e.g. vegetation cover is likely to increase whereas surface roughness is likely to decrease), longer term data is likely needed to determine trends.

Given the variability of results, the establishment of plants and patches may be a more effective early measure of improvement, whilst the SSA may provide more value of long term function over future years of monitoring (provided there is no drastic loss of function observed during monitoring or anecdotally).

***LFA summary and recommendations***

At the Tjungu site, rehabilitation vegetation is considered to be compliant and complete, the plant density and floristic composition resembling analogue sites. Further monitoring is not considered necessary.

At the Aerodrome site rehabilitation is compliant, but still ongoing. Overall patch density resembles analogue sites, but because of the unevenness of plant cover, rehabilitation is not yet complete and further monitoring is recommended for at least one more year.

At the Midway Quarry site, rehabilitation is compliant as patch density has increased each survey period. However, patch density is still sparse and ongoing monitoring is recommended for several more years.

At the Venetia site, one transect had been substantially altered by mechanical grading and no plants were present. At the other site only one plant was present. It is unlikely to substantially improve further and site preparation should be re-done with deep ripping.

OMC LUP4 is considered to be in-progress / compliant at Tjungu, Aerodrome and Midway Quarry sites, but not at Ventia.

### 4.1.8 Fauna

#### 4.1.8.1 Diversity and abundance

The 2024 spring fauna survey detected a total of 107 vertebrate species from the eight survey sites and opportunistically within the broader study area. Total species diversity (birds, mammals and reptiles) was generally within or above the range of baseline survey results. The capture rates for small mammals and reptiles combined (0.44) were above the previous spring compliance monitoring rates (~0.23, between 2018 and 2022) and within the range reported during baseline surveys (0.17 to 0.97). The high rate was largely attributable to the high number of reptile captures and warmer temperatures during the survey. The highest reptile diversity (above baseline and compliance) was also recorded for the 2024 survey, with 18 species detected (including the less common Eastern Striped Skink (*Ctenotus robustus*) captured again at Site 16 (Plate 4.1).

Whilst the site has previously experienced ongoing drought conditions and below average rainfall, above average rainfall events in summer of 2023 and winter of 2024, interspersed with periods of well below above average rainfall along with warmer temperatures during the spring survey likely influenced these results. Presence of water in all of the dams would have contributed to increased bird diversity, a winter rainfall event and presence of short-lived flora would have provided resources to the resident dunnart and reptiles species. For small mammals, rodent diversity and numbers were low and this is reflective of fluctuating rainfall throughout the preceding years. Regardless, there was evidence of all fauna breeding, in family groups or pairs, some small mammals had evidence of brood patches and one Stripe-faced Dunnart that appeared heavily pregnant was recorded via camera trap. In addition, a number of species were detected that were either a new record or species had not been detected since baseline / early compliance monitoring (e.g. juvenile Southern Four-toed Slider and several microbats). Overall, these results are positive and suggest that the reduced survey effort compared with baseline surveys has not influenced the capture rates or diversity, particularly for small mammals and reptiles. Hence the refinements to the trapping effort made during the course of the baseline survey work (2012 – 2017), and at the commencement of the compliance monitoring in 2018 to align with the requirements of the PEPR and mine lease conditions is sufficient. The presence of species that have not been recorded since the baseline monitoring and high bird and reptile diversity is also a positive sign for the overall condition of the Carrapateena site.

### *Mammals*

In terms of small mammal diversity, several species were not detected in 2024, however these species have historically been recorded in lower numbers (Forest's Mouse, Planigales), and have not been recorded during all previous surveys. In addition, no Plains Mouse were detected. Similar to previous years, small mammals are likely influenced by preceding climate. It is well known that there are varying responses to climate and trapping response for small mammals in arid areas (Read 1988). For example, Pseudomys species have been shown to respond to significant weather events 3-10 months after the event, with the variability in response dependent on both pre-existing population abundance and resource availability (Dickman et. al., 1999, cited in EBS 2017).

Of the small mammal captures, Stripe-faced Dunnarts were represented in greater numbers than Fat-tailed Dunnarts, aligning with trends observed during baseline and compliance monitoring prior to 2024. Stripe-faced Dunnarts are more influenced by weather and habitat conditions and may have breaks or fewer litters. Stripe-faced Dunnarts also prefer habitats with greater plant diversity and healthier (denser) understorey (Animalia 2018, OEH 2020). Stripe-faced Dunnarts were present in several age classes and larger numbers, suggesting conditions were suitable for that species, whereas Fat-tailed Dunnarts were present in much lower numbers and may not have commenced breeding. Fat-tailed Dunnarts are known to continue to breed for to up 6 months without breaks once the breeding season commences, hence smaller numbers may suggest drier conditions earlier in the season may have limited the opportunity for a continuous breeding cycle. Similarly, dunnarts are known to use daily torpor to thrive in adverse environmental conditions and exploit resource poor environments and they are known to adjust the breeding period depending on climatic conditions. There is no evidence to suggest mining is impacting small mammal presence across the site.

While the survey effort used for detection of microbats has not been consistent across compliance monitoring and when compared with baseline monitoring, a number of species were detected during the baseline monitoring and it is considered good practice to occasionally monitor for these species to confirm ongoing existence at the site. During the 2024 survey five microbat species were detected at two Flora Sites and one Opportunistic Site. These sites were surveyed because they had suitable roosting or feeding habitat. Two of these species have been regularly detected at site (White-stripe Free-tailed Bat, audible to the human ear, and the Lesser Long-eared Bat). The other three species had not been detected since baseline surveys; Gould's Wattled Bat, Inland Forest Bat and Inland Free-tailed Bat.

Comparisons between mean species diversity and capture rates between control and impact sites showed slightly higher diversity and capture rates for impact sites for the original treatment, and slightly higher diversity for control site for the updated treatment. For the updated treatment, mean captures were the same for control and impact sites. Regardless, both treatments indicated no statistically significant differences for control and impact means for diversity and captures. As suggested in 2023, the updated treatment provides more statistical rigour having an equal number of control sites (4) compared with impacts sites (4) and aligns more with delineation of control and impacts sites (previously related to dust contour monitoring, distance to infrastructure) in relation to the operations phase, now that the WAR has been completed, and traffic along the SAR is greatly reduced. The findings for fauna also align with the flora results. Regardless, significant mining related impacts to common fauna are not evident from the 2024 data or when making comparisons to previous baseline and compliance data.

***Birds***

Splendid Fairywrens were not detected in bird surveys between 2019 to 2022, however they were detected in the sand dune habitats and nearby during the autumn 2023 survey. Similarly, they were also recorded during baseline surveys with higher rainfall (e.g. 2012, 2014 and 2016) and during early compliance monitoring (2018). This species was also not detected in 2024. Whilst resident White-winged Fairywrens and Purple-backed (Variegated) Fairywrens have been generally detected every year during baseline and compliance monitoring, Splendid Fairywrens were not recorded every year, suggesting transient presence, or population fluctuations. Similarly, Rufous Fieldwren are not detected every year and were absent (2020) or limited detection (2021). However, this species was detected at most fauna sites in 2024 and regularly recorded on Song Meters.

Similar to spring 2022 water was present in all the dams, and the, which influenced the records for waterbirds / shorebirds across the site in water and non-water habitats. Water in the South Eliza temporary watersource also attracted many species and waterbirds were nesting and breeding at the site. One species, the Australian Pratincole had not been detected since baseline and was present at a number of sites. Three new species were detected; Pelican, Rufous Songlark and Red-necked Avocet. The total number of bird species was increased from 2023, and within the upper range of baseline, and is likely reflective of the presence of water across the site, preceding rainfall beneficial impacts on short-lived vegetation and Song Meter detection (extra survey effort) at some sites. Noting only 10 additional species were detected via Song Meter that were not detected via bird survey and Song Meters were also deployed in 2023.

### *EPBC listed species*

Only one EPBC listed threatened fauna was detected throughout the spring 2024 survey; Sharp-tailed Sandpiper (Vulnerable), also listed as Migratory. This species has been recorded at the site previously, most recently in 2021. In 2024, three individuals were detected at the South Eliza Wetland. Previously similar small numbers have been detected at the North Eliza Dam and the Tjungu Village Effluent Irrigation Area (which is no longer in use). One other EPBC Migratory species was also detected at the South Eliza Dam; Common Sandpiper, also previously detected on site at North Eliza Dam (in 2018). EPBC listed Plains Mouse were not detected (via trapping or camera), and there was limited evidence of surface activity around gilgais. This species has not been detected since 2017 (via standard fauna trapping) and is detected typically following a prolonged period of good rainfall. Similar to previous compliance surveys, whilst not detected at Carrapateena, Plains Mouse were detected during baited camera trapping at the South Gap offset site in 2024; however, only one Plains Mouse was detected (cameras deployed at 12 sites ongoing). The offset area, located southeast of Carrapateena on the banks of Lake Torrens, received 212 mm of rainfall, with most falling in July and November of 2024. This follows an ongoing decrease in numbers. The single South Gap detection was in June, hence none were detected during the timing of the spring survey at Carrapateena. Similarly, other small mammals were detected in low but stable rates, lower rates in Oct 2024 (<2), higher rates in July -August (1-8 detections per 100 trap nights). Whist Plains Mice were originally detected at Carrapateena via annual pitfall trapping, future consideration could be given to establishing a bait camera trap program, similar to South Gap to increase detection. In addition, review of rainfall conditions preceding the next annual survey should be considered, prior to deciding whether the annual 2025 survey should be in autumn or spring. One option may be to deploy cameras in autumn through to the physical trapping survey in spring. Autumn deployment of cameras would need to follow suitable sustained rainfall and could coincide with other monitoring that is not season dependent (e.g. LFA, weed monitoring).

### *Pest species*

Whilst evidence of pest species was noted (House Sparrows at camps, Rabbits at several locations), there was no major increase in presence of pest fauna species was observed as part of the survey, i.e. observations of rabbits, sparrow numbers and cats was maintained / less than previous and House Mice were detected in low numbers (captured at Site 1, and Site 16). However, it is noted that the rabbit warren at Site 15 remains active and requires management. No Feral Pigeons or foxes were detected. All of these species have been recorded previously, in low numbers and hence does not constitute an increase in pest species present, therefore the site is considered compliant against OMC criteria related to pests.

**Plate 4.1: The less common Eastern Striped Skink captured again at Site 16**

## 4.2 Compliance against Obligations

As indicated in Section 1.1.1 above, the approved PEPR for ML 6471 outlines a number of monitoring commitments required to demonstrate compliance against the mine lease 6471 conditions (Table 1.1) and the approved environmental outcomes (Table 1.2) for the Operation. Table 4.1 below provides a summary of compliance against the conditions and outcomes based on the results of the spring 2024 survey.

All mine lease conditions and outcomes are currently being met.

**Table 4.1: PEPR ML 6471 Compliance Reporting, spring 2024**

| Date | Monitoring Requirement/s | Achievement Value | Locations | Compliant / Non-Compliant | Evidence | Actions / Recommendations |
|---|---|---|---|---|---|---|
| October 2024 (spring) | ML 6471<br>Schedule 6, Condition 6, Condition 28.1<br>MPL 149<br>Schedule 6, Condition 10,<br>MLP 152 to 154<br>Schedule 6 Condition 6<br>MLP 156<br>Schedule 6 Condition 3<br><br>OMC WP1 / WP2<br>Annual (spring) survey | No introduction of<br>• new species of weeds declared or listed under relevant legislation<br>• plant pathogens<br>• pests (including feral animals) when compared to previously recorded weed species and introduced fauna.<br>No sustained increase in the abundance of existing weed or pest species in the land compared to previous survey records. | Weed monitoring transects (CWM01-CWM07, NWM01-NWM03)<br>Flora Sites 1- 7; 9 – 13; 15 - 22<br>Opportunistic and targeted observations across Operation area | Compliant | No new species of weeds declared or listed under relevant legislation were recorded at flora sites, weed transects, or elsewhere within the Operational area in October 2024.<br>Existing known Declared weeds are Bathurst Burr, Athel Pine and Prickly Pear. No new populations of Bathurst Burr recorded, although existing known populations remain high.<br>No increase in size of the known small populations of Athel Pine, which is being actively controlled.<br>No increase in the size of the existing documented small population of Prickly Pear, which is being actively controlled.<br>In 2024, new locations of existing weeds were recorded for 2 perennial species and 4 annual herbaceous species; annual species Maltese Thistle (*Centaurea melitensis)*, Mallow (*Malva parviflora*) and Scarlet Pimpernel (*Lysimachia arvensis*) (previously recorded at dams, effluent irrigation areas and/or watercourses). New 2024 locations include high moisture habitats and coincided with the non-occurrence of these species at some previously recorded sites. Hence, there was no net increase in these weeds. These locations are outside of mining lease activities and their occurrence is habitat related rather than due to mining activities. Smooth Mustard (*Sisymbrium erysimoides*), an annual has been abundant and regularly recorded within the operational area during baseline and compliance monitoring. Its occurrence at a new location coincided with its non-occurrence at some previously recorded locations and there was no net increase in the population across the operational area.<br>The perennial herb, Trailing Verbena (*Verbena supina*) was recorded in 2024 at North Eliza Dam for the first time. However, it was not recorded in 2024 at Anzac Dam where it has been previously recorded. Its preferred habitat is high moisture environments and its occurrence at North Eliza Dam is likely due to increased water in the dam, rather than to mining-related activities.<br>Wards Weed (*Carrichtera annua*) is not declared but has the potential to spread rapidly. Two plants were recorded along the WAR for the first time in 2024, and its presence is likely related to being introduced on tyres of mine-related vehicles. Its only previous occurrence within the operational area was on the Southern Access Road. This population has not been re-recorded, hence to date there has been no net or sustained increase in Wards Weed.<br>The population of Tree Tobacco (*Nicotiana glauca*) remains high at South Eliza dam, with potential to increase due to the disturbed and higher soil moisture habitat of the dam (rather than due to mining related activities).<br>An extensive population of Bitter Melon (*Citrullus lanatus*) was recorded in 2022 and 2023 along the Western Access Road shoulder. It is likely that the population increased due to soil disturbance during the WAR construction. However, in 2024, its population along the WAR at designated weed transects was much reduced.<br>In summary, to date there has been no net or sustained increases in the population of any weed species recorded.<br>House Sparrow numbers slightly reduced at the exploration camp, where worker occupancy was high at the time of survey. House Sparrow recorded previously during baseline.<br>Rabbit presence observed at more sites, presence is sustained. Cats only detected at one location (sand dunes). | Ongoing weed monitoring at flora sites 1-22 and weed transects CWM01 - CWM07, and opportunistic and targeted observations (camp, effluent irrigation areas, spill areas, dams).<br>Ongoing opportunistic observations, including revisiting sites where weeds have been identified in spring 2024.<br>Weed management by BHP in response to data reported here, in particular continued ongoing management of Bathurst Burr. Any new individuals to be controlled by environmentally sensitive methods, including manual grubbing and disposal of vegetative matter or spraying where appropriate and will not impact drainage lines / water habitats.<br>Continue control of Athel Pine (support station owner) and monitoring of Opuntia at homestead.<br>Control all newly located populations of Opuntia (as reported by BHP ecology staff).<br>Bitter Melon be environmentally controlled along the exposed shoulder of the WAR.<br>Wards Weed, if detected, to be environmentally controlled along the exposed shoulder of the WAR.<br>Ongoing monitoring of birds, including House Sparrows.<br>Monitoring of rabbit / cat population and control as required (e.g. active warren at Site 15). |

| Date | Monitoring Requirement/s | Achievement Value | Locations | Compliant / Non-Compliant | Evidence | Actions / Recommendations |
|---|---|---|---|---|---|---|
| October 2024 (spring) | ML 6741<br>Schedule 6 Condition 14<br>OMC AQ2<br>Annual (spring) survey | No adverse impacts on the diversity and abundance of native vegetation at monitoring sites directly attributed to dust deposition from mining operations or mine related activities when compared to baseline native vegetation conditions unless an SEB has been approved in accordance with the relevant legislation | Flora Sites 1-22 See Figure 9.3 of the PEPR. Figure 2.1 | Compliant at Monitoring Sites. | Specific dust transects established and surveyed in 2020 covering a range of habitats including sites downwind from spoil heap. No dust detected on all transects except those downwind of spoil heap. No death of vegetation noted in 2020 due to dust.<br>Previously existing flora survey sites (1-16, excluding 8 and 14, plus 17- 22) were monitored for native plant species diversity (RAM) and abundance (Jessup transects) in spring 2024 and data collected was compared with baseline data. Results indicated a trend in species diversity that correlates with seasonal conditions. While the diversity of long-lived drought-resistant species has remained stable since 2018, and in line with baseline data, short-lived species diversity has correlated with seasonal rainfall but has remained within the baseline range. Similar to autumn 2023, in spring 2024, the equal highest short-lived species diversity during compliance monitoring was recorded.<br>There is no clear difference in species diversity between control and impact sites.<br>No adverse impacts on the diversity and abundance of native vegetation at monitoring sites due to mining activities have been detected. | Ongoing vegetation monitoring at general flora sites and vegetation data comparison with baseline data continued.<br>Ongoing analysis of control vs impact sites against baseline monitoring data and compliance monitoring data during operation phase. |
| October 2024 (spring) | ML 6471<br>Schedule 6 Condition 17<br>OMC TSF6 / SWRF1<br>Annual survey | No adverse impact on the diversity and abundance of native vegetation and water dependent ecosystems attributed to tailing seepage when compared to baseline native vegetation conditions (unless an SEB has been approved).<br>No adverse impact on the diversity and abundance of native vegetation and water dependant ecosystems attributed to reduced surface water flows caused by mining operations when compared to baseline conditions (Appendix C5 Ecological Baseline) unless a significant environmental benefit has been approved in accordance with the relevant legislation.<br>Linked to Native Vegetation Outcome (Schedule 6 Condition 11) | Eliza Creek monitoring (Flora Sites 10, and 17-20 (which include Canopy Cover transects).<br>See Figure 9.3 of the PEPR (BHP 2024). | Non-compliant / ongoing / SEB to be paid | <u>Decant Dam seepage event</u><br>In spring, adverse impact on native vegetation immediately downstream of the TSF was recorded. In late 2022 / early 2023 saline seepage from the TSF extended beyond the approved impact zone. The area impacted by the saline seepage was surveyed in May 2023, and April 2024, and damage to native vegetation (death and dieback) was recorded over an area of approximately 0.4 ha beyond the approved impact zone. No impact on vegetation was noted at monitoring Site 17, 270 m downstream from the TSF and within 50 m of the impacted vegetation. The impact area was again surveyed In October 2024, when no further damage to Eliza Creek vegetation had been detected since April 2024, and no further extent of damage was anticipated. Refer separate report to BHP.<br><u>Regular monitoring sites</u><br>Eliza Creek monitoring results indicate no adverse impact on the diversity and abundance of native vegetation due to mining activities. Vegetation is monitored at Flora Sites 17-20 established in Eliza Creek at increasing distance from the proposed TSF dam wall, covering both Western Myall and Red Gum habitat. RAM, Jessup transects and Canopy Cover data is collected at all four sites, representing current (baseline) condition, species diversity, abundance and tree health prior to TSF construction. Monitoring at Flora Site 10 (furthest distance from TSF, in Eliza Creek), also includes Jessup and RAM (baseline 2012-2017; compliance 2018 until present).<br>Jessup transect results indicate no obvious trends in abundance of long-lived perennial species, RAM site results indicated no obvious trends in total flora species diversity; Canopy Cover transect results indicate no obvious trends in canopy cover of dominant species.<br>Tailings dam storage facility Stage 1 construction completed just prior to spring 2019 survey, and now operational. Eliza Creek has not flowed since pre TSF construction, there was however a controlled release from the decant dam in June 2019, with flow only recorded to 600m downstream of the TSF and no adverse impact on flora at the downstream monitoring sites has resulted from this controlled release.<br>Baseline vegetation condition data of all Eliza Creek monitoring sites saved within baseline database for future comparison. | Ongoing vegetation monitoring at Flora Sites 17-20 for RAM, Jessop transects and Canopy Cover (which reflects a leading indicator of tree health) to enable monitoring of potential impacts, and trends in diversity and abundance of native vegetation.<br>Adaptive management of monitoring program as required if leading indicators indicate potential impacts (e.g. canopy cover measures in close proximity to tailings dam wall).<br>Consideration of repeat of remote sensing vegetation cover estimates on a periodic basis, as a cost-effective way to track changes in vegetation cover downstream of the TSF embankment.<br>No further formal monitoring of Decant Dam seepage is considered necessary as no further extent of damage is considered likely. An SEB offset (required under the Native Vegetation Act 1991) will be paid as per the NVMP associated with the PEPR (Appendix C BHP 2024).<br>In formal monitoring is suggested at the same time as annual formal canopy cover survey of Site 17 to note any further decline or regeneration of the area and conduct a RAM if there is any evidence of increase in the area that is offset via SEB. |

| Date | Monitoring Requirement/s | Achievement Value | Locations | Compliant / Non-Compliant | Evidence | Actions / Recommendations |
|---|---|---|---|---|---|---|
| October 2024 (spring) | ML 6471<br>Schedule 2 Condition 28.2<br>MPL 152 Schedule 2 Condition 13.2<br>OMC EPBC1<br>Annual survey or opportunistic sighting | Any records of sightings and recordings of the Thick-billed Grasswren are provided to the BDBSA to enable effective monitoring and record keeping, as per the Recovery Plan Actions. | Bird monitoring Sites 1-22 (which overlap with Flora Sites 1-22, and include Fauna sites 1-6, 15, 16). See Figure 9.2, 9.3 of the PEPR (BHP 2024). Opportunistic observations across project area. | Compliant | EPBC1: No records of the Thick-billed Grasswren were reported during the spring 2024 survey at any of the 20 bird survey locations or opportunistically, including sites where Song Meters were deployed, so no records were provided to the BDBSA to facilitate effective population monitoring and record keeping. Song meters were deployed at 7 fauna sites (excluded site 3), South Eliza Dam, Eliza Creek (Site 10) and Site 7 in Bosworth creek. | Ongoing bird surveys across all flora sites 1-22 and opportunistically to establish trends with baseline and compliance data.<br>Report any future records of Thick- billed Grasswren to the BDBSA. |
| October 2024 (spring) | ML 6471<br>Schedule 2 Condition 28.2<br>MPL 152 Schedule 2 Condition 13.3<br>OMC EPBC 2<br>Annual survey or opportunistic sighting | Any records of sightings or captures of the Plains Mouse are provided to the BDBSA to enable effective monitoring and record keeping, as per the Recovery Plan Actions. | Fauna sites 1-6, 15, 16 for fauna trapping.<br>See 9.2 of the PEPR (BHP 2024). | Compliant | EPBC2: No records of the Plains Mouse were reported during the spring 2024 survey at any of the 8 established fauna trapping sites, so no records were provided to the BDBSA to facilitate effective monitoring and record keeping. | Ongoing pitfall trapping at 8 established fauna trapping sites to demonstrate species ongoing presence at site during periods of irruptive population growth and that refuge habitat continues to be effective despite mine operation.<br>Report any future records of Plains Mouse to the BDBSA. |
| October 2024 (spring) | ML 6471<br>Schedule 2 Condition 28.2<br>MPL 152 Schedule 2 Condition 13.4<br>OMC EPBC 3<br>Annual survey or opportunistic sighting | Any records of sightings or recordings of the Night Parrot are provided to the Night Parrot Recovery Team to enable effective monitoring and record keeping. | Bird monitoring sites 1-22 (which overlap with Flora Sites 1-22, and include Fauna sites 1-6, 15, 16).<br>See Figure 9.2 of the PEPR (BHP 2024). Opportunistic observations across project area. | Compliant | EPBC3: No records of the Night Parrot were reported during the spring 2024 survey at any of the 20 bird survey locations or opportunistically or via Song Meter, so no records were provided to the Night Parrot Recovery Team to facilitate effective monitoring and record keeping.<br>Noting two EPBC listed species were detected opportunistically at South Eliza Dam (Sharp-tailed Sandpiper and Common Sandpiper and results will be provided to the BDBSA as part of permit renewal process. | Ongoing bird surveys across all flora sites 1-22 and opportunistically to establish trends with construction now underway.<br>Report any future records of Night Parrot to the BDBSA. |
| October 2024 (spring) | ML 6471<br>Schedule 6 Condition 1, 5, 8, 9<br>OMC LUP4<br>Annual LFA monitoring | Rehabilitation has achieved, or is likely to achieve, a landscape function equivalent to that of adjacent analogue LFA sites. | Baseline (analogue) LFA data from sites CEF1-CEF7 (shown in Figure 9.3 of the Carrapateena PEPR BHP 2024).<br>Rehabilitation monitoring at four locations (Airport Laydown and Ventia Laydown, Midway Quarry, Tjungu). | Compliant | Baseline LFA data established from analogue sites.<br>Site rehabilitation monitoring continued in spring 2024. LFA sites established at four locations (LFAAL1, LFAVOL2, LFQUA3, LFATJU4) with two transects at each site.<br>LFA trends are established and show improvement at all sites. With the original airport site (deep ripped) and new Tjungu site (deep ripped and hand seeded), showing the best results.<br>Use of PCQ method and LFA Established Method enabled. | Continue LFA monitoring at rehabilitation sites.<br>Given demonstration of positive trends, plan to establish new analogue sites adjacent sites that are performing well (e.g. airport). Suggest Tjungu has reached analogue and no longer requires monitoring. |

## 4.3 Suitability of Data for Informing Compliance

### 4.3.1 Overview

The data collected during the spring 2024 survey is considered to provide meaningful data to determine compliance against the mine conditions and approved outcomes. The survey methods employed enabled comparison between impact and control sites, as well as comparison with baseline data. Construction / operational compliance monitoring data has now been collected since 2018. Results have been presented as text, tables and graphs, enabling demonstration of compliance against the established outcomes and measurement criteria, and representation of initial construction/operational compliance data trends.

### 4.3.2 RAM quadrats

The RAM data provided quantitative data on species diversity present within each of the Flora Survey sites assessed. Further details added to the data here regarding woody long-lived perennial species enables a more thorough examination of the difference between climate and/or grazing impacts against potential impacts from mining operations. Comparison with the range of species diversity values collected during the baseline survey period has enabled an easy visual indication of current site diversity. Well defined survey sites have meant the survey area has been accurately repeatable, providing consistent results. Long-lived perennial diversity has been very stable, while short-lived species diversity has shown a very strong correlation with yearly rainfall totals, indicating the survey method provides accurate and meaningful data. Since 2021, data has been further explored further by comparing species diversity for sites of similar habitat, regardless of distance to mining infrastructure. This was done to determine if there were any trends in species diversity emerging regardless of distance to mining infrastructure.

### 4.3.3 Jessup transects

The Jessup transects provided quantitative data on the number of adults and juveniles present for long-lived perennial shrubs. This provides information on the health and vitality of individuals within a population, for example, it indicates if recruitment is occurring, or whether the population is declining, increasing, or staying the same. Combined with qualitative observations made on plant health (including defoliation and/or presence of dust on foliage) this will help inform if there has been an adverse impact on the diversity and abundance of long-lived woody native vegetation directly attributed to dust deposition from mining operations or mining related activities when compared to baseline native vegetation conditions. Results from these surveys enables reporting against compliance conditions. In 2020, the number of species analysed increased from two (Bladder Saltbush and Plains Lantern Bush) to four species (additionally, Samphire and Sea-heath), in response to widespread foliage loss of the two dominant species (Bladder Saltbush and Samphire) at the Stony Tableland sites. In 2021, 2022, 2023 and 2024, the key three species were analysed in detail, providing insightful data on trends in population abundance in both palatable and non-palatable species, and species that are widespread across the lease. Plains Lantern Bush was not analysed due increased variability in the baseline and compliance data. In 2023 and 2024, the population trends during compliance monitoring of another species were also analysed, but in less detail; Bush Minuria (a daisy). Qualitative observations suggested high variability of this moderately palatable and moderately drought-resistant species between survey periods, including

apparent declines in 2019 and 2020. The results showed that the three most common and widespread species have continued to increase since 2020, following declines in 2019. Similarly, the Jessup data has been very effective in reflecting population changes of Bush Minuria due to climate.

Prior to the 2021 survey, at the Eliza Creek sites, analysis was confined to comparison of net perennial species diversity between recording periods, which had remained relatively stable between 2018 - 2020. In 2021, the analysis was expanded to compare trends in the abundance of individual perennial species, namely the nine most abundant species at Eliza Creek Jessup transects. This analysis was continued in 2022 and further expanded in 2023 and 2024 to include a total of 10 species. This has proven a valuable tool for determining potential trends in populations of individual species, rather than simply comparing total species diversity.

### 4.3.4 Canopy cover transects

The canopy cover transects record the presence of canopy foliage along a fixed 100 m transect. Within individual canopies, there may be from 1 to 10 or more recordings, depending on the width of the canopy. The technique is objective and does not rely on observer estimations of individual tree canopy intactness. By repeating the survey along a fixed transect, it is estimated that the technique can detect changes in both individual canopy "completeness" and canopy cover for the whole tree stand, where there is a change in foliage extent of as little as 20%. Tree stress or death is expected to show up in densitometer results.

The technique is considered suitable for informing whether there has been a change in the health of the dominant trees on Eliza Creek and is seen as a leading indicator of tree stress. Results from these surveys will therefore contribute to the reporting against compliance conditions related to impacts in Eliza Creek.

Since 2019 visual estimates of canopy cover are also undertaken to complement the densitometer canopy cover assessments. Visual estimates of individual tree canopies enable identification of individual tree canopy health and provide a time frame for potential canopy loss. Results to date show that the densitometer results are broadly in alignment with visual estimates.

Since 2021 additional trees have been recorded along the transects. These were trees whose canopy intercepted the canopy but had not done so previously and/or which now met the criteria for recording. By including new trees that meet the survey requirements as the trees along the transects mature, the transition in age classes and maturation of new recruits has been effectively demonstrated by the surveys of the canopy cover transects as part of the overall health of tree vegetation within Eliza Creek.

The canopy cover data is considered to provide an objective method of determining trends in canopy health across the whole of the transect, including documenting tree deaths and recruitment. The trial in 2019 of using remote sensing of aerial imagery to estimate vegetative cover in increments downstream from the TSF embankment is considered a useful additional tool to monitor vegetation health within Eliza Creek.

### 4.3.5 Weed transects

Weed transects represent a repeatable, temporal examination of weed diversity and abundance at the site and are not time consuming to conduct. They are aligned along roads and intersect drainage lines and dam outlets, which are considered to be the key sources and/or vectors of seed spread. As such, the weed transects represent a key method (when coupled with weed data from rangelands assessments and opportunistic observations) to directly address a number of mine conditions and outcomes.

### 4.3.6 LFA transects

LFA at two rehabilitation sites at the mine site commenced in 2019, and two more were introduced in 2022. In 2023, all sites were surveyed using the established LFA method (as opposed to the Bank and Trough method applicable only for the very early stages of assessment). Introduction of the PCQ Method (an extension of the Established Method) has proven very useful for reporting on the density of vegetation as it establishes within the rehabilitation sites, and especially when vegetation along the LFA transect has been absent or very sparse. The current methods are considered suitable to demonstrate change at the rehabilitation sites over time, as vegetation trends towards the 'baseline' / analogue condition. Current methods have already been successful in detecting notable differences in the success of the four sites, reflective of the different rehabilitation methods applied on the ground. For example, the deep cross ripped / handed seeded Tjungu site no longer requires monitoring and the deep ripped Aerodrome site only requires the LFA established method moving forward. This data is useful for future rehabilitation around the broader mining lease area and meeting OMC requirements.

### 4.3.7 Fauna surveys

Fauna trapping undertaken during spring 2024 was comparable to the effort undertaken in spring 2018-2023, on the basis that the most important data is species diversity rather than species abundance. Despite warmer conditions and a thunderstorm during mid spring, overall fauna diversity was comparable with previous baseline survey periods and with the spring/autumn 2018-2023 survey numbers. Dams were full, and there was an increase in bird diversity detection across Carrapateena that was likely related to water presence (South Eliza Dam), vegetation condition, as well as complementary methods for detection (e.g. Song Meter, also used in 2023). The overall capture rates increased from 2023, was above the compliance capture rate to date and well within the baseline range. For mammals, however diversity rates were at the lower end of baseline ranges, primarily given limited detection of rodents and no captures of Planigales. For reptiles, captures were high and the diversity was the highest to date, above compliance and baseline; 18 species detected. Fauna trapping represents the greatest opportunity to definitively record the EPBC listed Plains Mouse, and to demonstrate persistence of this species at the site throughout mining operations, which is an important outcome for BHP. As such, fauna trapping is still considered a requirement for informing impacts of the mining operation on conservation significant fauna. As suggested in the 2020 survey report, camera trapping at the designated fauna sites (outside of the fauna trapping project) may provide improved results, however this would need to align with preceding rainfall conditions. During the annual compliance surveys non-baited camera trapping has been used in 2021 - 2024 concurrently with open pitfall sites and a range of species detected (e.g. during 2024 species include Fat-tailed Dunnart, Stripe-faced Dunnart, Tessellated Gecko, Mulga Snake and small *Pseudomys sp*. likely

*P. hermannsburgensis*, given captured at the site two days prior). Baited camera trapping without opening pits similar to the South Gap EPBC offset program may detect Plains Mouse, particularly following suitable rainfall events. It is noted that Plains Mouse were again detected via baited camera traps at the South Gap in 2024, however in 2024, following substantially reduced rainfall, only one Plains Mouse was detected (June at one site). It is suggested that the population is declining as occurs naturally in response to climatic factors (e.g. lower rainfall) (Nature Conservation 2025).

Bird surveys continue to provide good indications of overall site species diversity, with numbers increasing from 2020-2023 and reflective of baseline conditions. Most of the historic sites are relatively homogeneous from a habitat perspective, but greater diversity observed at some sites appears to align with creek line sites, drainage lines and dune sites with taller and diverse vegetation. There are no historic records of any EPBC listed threatened birds at the site (apart from newly listed Blue-winged Parrot, Southern Whiteface and Sharp-tailed Sandpiper), but regardless, the mine conditions require reporting of future records of EPBC listed species. This would not be possible without some level of bird survey. In some years State-listed species are also detected, however no State-listed species were detected in 2024. A number of waterbirds and shorebirds were detected at dams and the South Eliza temporary wetland during the survey, including Sharp-tailed Sandpiper (EPBC Vulnerable and Migratory) and Common Sandpiper (EPBC Migratory), both species have been recorded in the Carrapateena dams previously. Many resident birds were breeding, and different types of bird families were well represented. Resident White-wing Fairy Wrens, Purple-backed Fairywrens and Rufous Fieldwrens were present across the site at multiple locations, however the nomadic Splendid Fairywrens were not detected. New bird records for the site included Pelican (although dead, not far from the TSF), Rufous Songlark and Red-necked Avocet. Australian Pratincoles were also present at a number of sites and these had not been detected at the site since baseline surveys. The bird survey results are in compliance with the OMC and provide a positive story at Carrapateena for balancing mining and the environment in arid conditions.

Opportunistic reptile observations provide a good return on investment, and are considered an important part of the overall fauna survey program to inform diversity data. As per active fauna trapping, opportunistic reptile observations are considered suitable for informing overall impacts of the mining operation on fauna diversity. Both reptile and mammal diversity was in the range of baseline surveys, with reptile diversity increased from previous years. In 2024, the bulk of the reptile diversity was from trap captures, given the warmer day time temperatures, this data contributes to the 'capture rate' as a snapshot measure of abundance. Of the reptiles that were detected, several species had juveniles present (e.g. Earless Dragons, Bynoe's Gecko, Southern Four-toed Slider). Of note, the Four-toed Slider (a juvenile) has not been detected baseline and not previously recorded during compliance monitoring. In addition, during the 2021 spring survey the Eastern Stripe Skink was detected at Site 16, not previously recorded since baseline and this species was detected again in 2024 at Site 16.

Feral mice were detected in low numbers at two fauna sites (control Site 1 and impact Site 16), no cats were detected, aside from tracks in the dunes of Site 21. Rabbits were detected at several locations and a warren remains active near Site 15. Hence ongoing feral animal control is required.

## 4.4 Recommendations for future surveys and data analysis

Construction / operational compliance monitoring has been conducted since autumn 2018, involving two surveys in 2018, and annual surveys thereafter. Hence there have been eight complete fauna and flora surveys, and additionally, a separate dust impact survey and separate Eliza Creek flora and canopy cover survey. There have been two autumn and seven spring surveys. The period 2018 to 2024 has covered extreme low rainfall years (2018 and 2019 when yearly rainfall totals for the year were in the 10% decile), average rainfall years and well above average seasonal rainfall events. This compares well with the baseline survey duration and climate patterns, namely 2012 to 2017 when rainfall totals varied from below average to well above average. During the compliance monitoring period to date, there has been no evidence of impact from mining activity on any of the PEPR Leading Indicators that relate to fauna and flora outcome measurement criteria. Fauna and flora species diversity has been within the baseline range, there have been no new declared weeds or increase in abundance of declared or listed weeds and no long-term population trends evident in existing weeds. The health of Eliza Creek vegetation has remained stable. All short-term changes to date in flora and fauna diversity, perennial plant population abundances, and canopy health at Eliza Creek transects have been attributed to variation in seasonal and/or yearly rainfall.

The compliance OMC require annual monitoring to occur at the sites. However, the formal fauna trapping surveys could be conducted every two years and supplemented annually with other techniques such as camera trapping, Song Meter deployment and bird surveys. It is recommended that as a minimum, bird surveys, cameras (baited, if not trapping) Song Meters continue to be used annually, which require less survey effort. If bird surveys are conducted without fauna trapping, the program could occur in late autumn or early spring and target EPBC listed species such as Blue-winged Parrot, previously detected at the site during autumn surveys.

It is recommended that all sites surveyed in 2024 be re-surveyed in either autumn or spring 2025, using the same survey techniques (without fauna trapping if conducted in autumn 2025 and with fauna trapping if conducted in spring 2025). It is recommended that the seasonal timing of the survey remain flexible. In the arid zone, flora diversity, and often fauna diversity, reflects rainfall events, rather than a specific season. Mean monthly rainfall for the nearest long-term weather station, Woomera indicates highest rainfall means occur between November and March rather than winter; but can be extremely variable year to year. Hence for compliance monitoring, comparison of data across the operation for sites undergoing the same climatic conditions, as well as comparison of baseline and previous compliance monitoring ranges for a range a climatic and grazing conditions is good practice, rather than a focus on comparisons to baseline data alone.

The spring 2024 survey was conducted in October 2024, when conditions were very warm and there was an extreme wind event and thunderstorms. Reptile diversity and abundance was high, bird diversity was high and mammal diversity and abundance was within the baseline range. For the small mammals, rodents were in low numbers, but this is reflective of the climate in the months preceding the survey (i.e. fluctuating rainfall, below average). Rodents have also historically been detected in lower numbers in the baseline and compliance surveys, with the exception of higher rainfall years (e.g. 2012, 2014, 2017 and 2022). Flora diversity was very high due to the diversity of short-lived species. It is recommended that surveys be conducted in either September/October or late March to April, when daily temperatures are not extreme and compliant with animal ethics requirements. The preference for an autumn or spring survey should be determined by seasonal conditions in the previous six months, namely consideration

should be given to conducting the survey in response to particular climatic conditions (i.e., good rainfall) in order to maximise the chance of demonstrating compliance against some conditions (in particular, the presence of Plains Mouse).

Baseline data in Eliza Creek commenced in 2018 and includes conducting eight surveys of on ground canopy cover data recording. This has provided an indication of the inherent variability in the data, and the dynamic response of Red Gum canopies to seasonal conditions. At Eliza Creek medium to longer term trends in plant health are of major concern, rather than seasonal changes. Given that monitoring has been established since 2018, and additional reporting of individual tree health has been established, yearly surveys of Eliza Creek are considered sufficient. It is recommended that additional remote sensing reporting be continued, to supplement on-ground data.

Further details regarding future recommendations are provided below.

### 4.4.1 RAM quadrats

RAM sites represent a key measure of flora species diversity, abundance (as per Crown Separation Ratio categories) and grazing impact and should continue across the site, annually, as per the outcome measurement criteria for the mine lease (OMC SWRF1, TSF6, AQ2). To date, the construction / operational phase monitoring data results have indicated species diversity has remained within the baseline range. This survey technique used during compliance monitoring reports upon both long-lived and short-lived species diversity, the latter largely influenced by weather events.

Flora Sites 21 and 22, were established on dunes in autumn 2018 to monitor this previously un-surveyed dune habitat within the Operation area. This monitoring should continue annually to address potential impacts from the WAR on dune habitat to address the agreed outcomes for OMCs WP1 and WP2. Given that Jessup transects are not undertaken at these sites, consider which current OMCs these dune sites are addressing.

The Jessup transects monitor populations only of long-lived perennial shrubs and trees. Despite the longevity of the species monitored, compliance monitoring has shown relatively large fluctuations in populations that correlate with large variations in yearly rainfall totals. Some species monitored have relatively small populations. Annual monitoring is considered necessary for early detection of changes in populations that may result in the potential loss of a species at a site.

For all sites excluding site 21 and 22, Jessup monitoring should continue annually to address the agreed outcomes for the Operation (OMC SWRF1, TSF6, AQ2).

### 4.4.2 Data analysis of RAM quadrats and Jessup transects

To date compliance monitoring has categorised sites as either control or impact sites, defined as sites either greater than 2 km or less than 2 km, respectively from mining infrastructure. The 2 km criteria was based on a literature review of the likely potential distance of dust and/or noise impact upon vegetation and dust impact modelling. All sites along Eliza Creek, however, were deemed to be potential impact sites, regardless of distance downstream from the TSF. During compliance monitoring, however, the WAR has been developed, the Northern Wellfield Supply Road (Khamsin Road) receives greater usage, and the SAR is no longer widely used. The 2023 reporting (Jacobs 2023) recommended a review of the classification of

sites as impact or control. In particular, recommended that impact Sites 4 and 6 be changed from impact to control. This recommendation has been implemented in the current report.

In addition to analysing results collectively for control sites and collectively for impact sites, past and current reporting analysis has included plant species abundance and diversity trends at a site level, by habitat, and at a landscape level for the whole Operational Area. Do date there are not emerging trends related to mining, and there is climate related variation for some species. It is recommended that these analyses are scaled back and only undertaken if leading indicators are triggered to detect potential trends in abundance and diversity that may otherwise be masked, and/or to detect trends due to impacts that may operate at different scales.

### 4.4.3 Canopy cover transects

Canopy cover assessment should continue, given transects have been assessed in Eliza Creek on nine occasions since 2018. This has provided an indication of variability in the data – both actual variation in tree canopy health (due to long term change and/or seasonal variability) and inherent variability or "noise" in the method. The numbering of individual trees and installation of permanent posts along each transects has increased the precision of the transect alignment each survey. This has reduced the inherent "noise" in the data. The continued use of the densitometer rather than relying purely on visual estimates of crown intactness, is strongly recommended. The canopy cover transects are 100 m long, providing a sufficient number of densitometer canopy readings to provide precision and accuracy in quantifying canopy cover for the transect as a whole. The method is relatively objective as it does not rely on "eyeball" estimates of whole canopy intactness where there is often variation between observers' estimates. For assessment of individual tree canopy intactness, "eyeball" assessments (no tools) of canopy intactness provide data on population trends – detecting loss of trees or tree gain along the transect and perhaps more accurate estimates of individual canopy intactness than provided by a densitometer which provides only a few foliage recordings per canopy.

The densitometer method, and visual estimates of individual canopy intactness, therefore are complementary, and both methods should be used to assess tree health at each survey. It is recommended than annual surveys are sufficient.

Continuation of the Eliza Creek canopy cover data is expected to detect potential tree stress and death overtime and will contribute to addressing the agreed outcomes for the Operation (OMC SWRF1, TSF6, AQ2).

In addition to the formal canopy cover monitoring, it is recommended as good practice to visit the Decant Dam impact area that is upstream from Site 17 in Eliza Creek and briefly document status (photos and description). While the impact is being offset with an SEB, future decline and / or regeneration of the area should be briefly documented and further assessment (e.g. RAM) undertaken if required.

### 4.4.4 Weed transects

The 2021 survey increased the number of weed transects surveyed to also include Northern Wellfield locations, and a weed transect towards the western end of the newly constructed WAR. These were re-surveyed in 2022, 2023 and 2024. The location of weed transects is considered to be a good

representation of sites across the mineral leases that capture locations for potential spread of weeds due to mining related activities. There are three weed transects along the Western Access Road including alongside the Gatehouse, near the administration and spoil heap area, and along minor access roads. Targeted locations, where weed populations are considered most likely on site (particularly dams, effluent irrigation areas, and the villages) were also re-surveyed recording the general location and densities of all weeds present. Weed transects CWM01 and CWM02 are located along the SAR, which now receives very little mining-related vehicle traffic. However, the transects are still within current mineral leases, and include populations of the declared weed, Bathurst Burr, plus several non-declared weeds that favour high moisture habitats. For this reason, it is recommended that these two transects continue.

The weed transects and targeted survey locations are considered a very efficient way of detecting new weeds or an increase (or decline) in existing weed populations, as evidenced by the post-construction data. Collection of weed data should continue as per the spring 2024 survey at assigned transects and opportunistically around the site to address the agreed outcomes for the Operation (Outcome measurement criteria WP1, WP2) and Mineral Lease condition 6 (sixth schedule) and MPL 156 conditions. Populations of Bathurst Burr should be revisited and monitored to determine success of control efforts.

### 4.4.5 LFA

The LFA data collected presents a simple means to graphically show changes in indices, and to also compare the indices with previously collected data from analogue sites considered broadly representative of natural conditions across the mine lease. The establishment of the Midway Quarry and Tjungu sites in 2023 provided a greater opportunity to monitor rehabilitation success as well as variation in techniques (e.g., deep cross ripping, plus hand seeding). Continued data collection will enable opportunities for ongoing data analysis, and a determination of when recorded indices approach or reach the range of the analogue data.

The LFA data collected (and PCQ data) indicates that the Tjungu site has successfully rehabilitated to a level comparable with, or even exceeding reference habitat. Likewise, plant and soil parameter data at aerodrome site shows that this site is approaching reference site means. The LFA established and PCQ data at the Midway Quarry shows the site is beginning restoration and LFA indices have improved annually since 2022, when the site was established. In contrast, the LFA data at the Ventia site recorded no successful restoration in 2024, and the PCQ data recorded only the very initial stages of habitat restoration along one transect. In addition, one Ventia transect has been decommissioned, as the transect had been compromised.

It is recommended that LFA is not needed at the Tjungu site because it is successfully rehabilitated. It is also recommended that the Ventia site be prepared for restoration again by deep ripping of trenches. LFA and PCQ should continue at the Midway Quarry site in 2025. At the Aerodrome site, only the LFA established method should continue, given the plant density, the PCQ is no longer required.

### 4.4.6 Fauna surveys

Similar to 2018 -2023, single pitfall trapping lines provided suitable capture of small mammals and reptiles during the 2024 survey. The most common mammal species that have been captured across all baseline surveys were still detected, with all small mammal captures made in pitfall traps. It is recommended that

pitfall trapping is retained in order to detect presence or absence of Plains Mouse as per PEPR condition EPBC2, in addition to continuing to monitor habitat condition (flora monitoring). As suggested following the spring 2022 survey, increased rainfall in the region (spring and summer) resulted in an autumn survey in 2023 instead of spring survey, however Plains Mouse were not detected. Similarly, Plains Mouse were not detected in 2024. As per 4.3.7 above, Plains Mouse has been detected via baited camera trap at the South Gap offset area, but in low numbers since mid- 2022, so detection at Carrapateena may still occur in the future, but more likely following periods of above average rainfall.

To increase the chance of detection of Plains Mouse at Carrapateena, particularly at control sites 1 and 2, options may include:

- increasing the number of lines and pits open at fauna sites during the next survey
- setting up targeted baited Elliot traps at good quality gilgais, at the established fauna sites. E.g. 5 baited Elliot traps at 10 sites, 100m apart, for a standard four night survey
- setting up baited camera traps similar to South Gap (noting there would be greater success at sites where predators (e.g. cats) are under control. Flora site 12 is noted to have good areas of gilgais. These could be set up away from fauna trap lines, if trapping occurs concurrently.
- as per above consider whether bi-annual survey should be undertaken moving forward (i.e. consider during PEPR update).

As mentioned in Jacobs (2022, 2023), some pits within lines were decreasing in integrity and it is noted that the site environmental team have undertaken activities to replace pit bases and or patch holes. Initially pit bases were replaced by using silicon to attach a plastic mesh base, whilst these were suitable for dunnarts and native mice in the short-term, they may not withstand presence of Planigales or House Mice or increased numbers of small mammals (as occurred in 2022), given the tendency for these species to chew holes in the bases, hence regular maintenance / checking is still required. As per 3.3.6 above, replacement metal bases have been installed in the pitfall traps for the majority of the lines. These bases were highly successful and even facilitated capture of the elusive Dwarf Skink (Plate 4.2). The bases drain well, do not get too hot (remain at least 2-5 degrees lower than ambient temperature) and are also easy to see the trapped fauna (given 60 cm deep). As per previous surveys, the lids of the semi-permanent pits need to be pushed down correctly before tech screws are applied to ensure there are no gaps that enable small mammals or reptiles to get through and be trapped outside of a survey period. The site environmental team have ordered more pit bases for the remaining sites and these will be installed by the site environmental team prior to the 2025 annual survey or during the 2025 survey, given ease of installation.

Results for single pit line trapping continues to be comparable to baseline results and in general, mid-late spring is a suitable time to undertake an annual survey. For 2025, spring is probably ideal given the dry preceding summer of 2024/2025, an autumn survey would only be an option if there was heavy steady rainfall in later summer and early autumn, to maximise the chance of demonstrating compliance with the PEPR conditions. Double pit lines for a subset of impact and all control sites, and opening 7 traps, may also maximise detection, however this would require extra effort and may increase the length of the survey. Fauna trapping should continue at the mine site until such time as it can be clearly demonstrated that conservation significant species (in particular) persist alongside the operational mine, but this should be considered and discussed following the next PEPR update. Noting that two EPBC listed species were

detected in spring 2024 opportunistically, rather than via formal trapping. Camera trapping outside the survey period, given the success at South Gap offset area, using alternate, less labour-intensive methods (without baits) or more labour intensive (with baits) may also be an option, i.e. aligning cameras with short lengths of fauna fence line to direct fauna into view. However, given the presence of cats at the site, regular checks would be required to avoid increasing predation of small mammals at trapping sites.

Whilst reptile diversity is interesting and provides a good indicator for overall site conditions, it does not specifically relate to PEPR conditions, and therefore use of funnel traps could be ceased in the future and reptile diversity could be collected opportunistically and via pitfall captures alone, particularly during the spring surveys when reptiles are more active. However, setting and checking funnel traps requires minimal additional effort compared with additional pitfall lines and provides opportunity to trap snakes where present, it is suggested that funnel trapping be retained at the current time.

The bird surveys at fauna sites, flora sites and water points currently provide valuable data regarding overall avifauna diversity at the sites, and birds are expected to respond to mine impacts such as noise and traffic if levels are unacceptable to them. In addition, pest bird species are also monitored e.g. House Sparrows still present (low numbers). For this reason, bird surveys should be continued during operational compliance monitoring until data patterns are clear, and to meet PEPR conditions related to Thick-billed Grasswren and Night Parrot records (EPBC1 and EPBC 3) as well as conditions related to pests (WP1, WP2). Survey at water points (particularly pre-dawn and post dusk) as well as spotlighting / night call detection is also an important survey technique to detect whether the Night Parrot is present at the site. A value-add for 2023/2024 included deployment of Song Meters to detect nocturnal, dawn and dusk species at both chenopod shrubland sites and representative creekline sites (e.g. Eliza Creek Site 10, Bosworth Creek Site 7). Noting that threatened species were detected via Song Meter in autumn 2023 (e.g. Blue-winged Parrot). In 2024 Song Meter results included detection of one common dusk species; Owlet Night Jar (*Aegotheles cristatus*). This species was also detected in 2023 via Song Meter, but had not been detected during bird surveys. No other nocturnal / dusk bird species were detected. Five diurnal microbat species were also detected on Song Meters that can be deployed to capture both bird and bat call data. Detection via acoustic methods is far more efficient than trapping or spotlighting for microbat fauna and useful to regularly compare against baseline data.


**Plate 4.2: Dwarf Skink, stubbie holder refuge, new metal bases and temperature data-logger**

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# Appendices

# Appendix A. Photologs spring 2024

# Appendix A1. Photolog, Rangeland Flora Sites

| CAR001 | |
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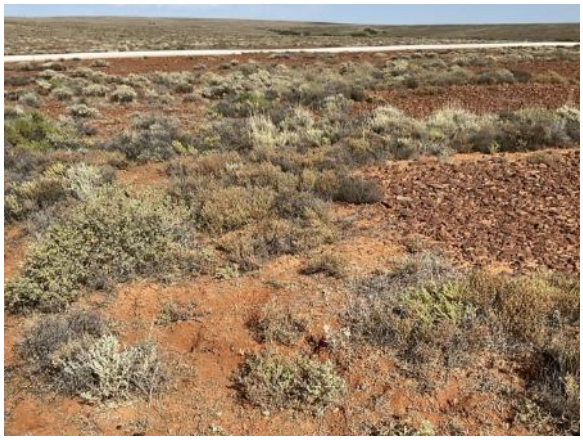
|  |  |
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| CAR002 | |
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| Appendix Plate A1.5: Facing north | Appendix Plate A1.6: Facing east |
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| Appendix Plate A1.7: Facing west | Appendix Plate A1.8: Facing south |

| CAR003 | |
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| Appendix Plate A1.9: Facing north | Appendix Plate A1.10: Facing east |
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| Appendix Plate A1.11: Facing west | Appendix Plate A1.12: Facing south |

| CAR004 | |
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| Appendix Plate A1.13:Facing north | Appendix Plate A1.14: Facing east |
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| Appendix Plate A1.15: Facing west | Appendix Plate A1.16: Facing south |

| CAR005 | |
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| Appendix Plate A1.17: Facing north | Appendix Plate A1.18: Facing east |
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| Appendix Plate A1.19: Facing west | Appendix Plate A1.20: Facing south |

| CAR006 | |
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| Appendix Plate A1.21: Facing north | Appendix Plate A1.22: Facing east |
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| Appendix Plate A1.23: Facing west | Appendix Plate A1.24: Facing south |

| CAR007 | |
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| Appendix Plate A1.25: Facing north | Appendix Plate A1.26: Facing east |
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| Appendix Plate A1.27: Facing west | Appendix Plate A1.28: Facing south |

| CAR009 | |
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| Appendix Plate A1.29: Facing north | Appendix Plate A1.30: Facing east |
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| Appendix Plate A1.31: Facing west | Appendix Plate A1.32: Facing south |

| CAR010 | |
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| Appendix Plate A1.33: Facing north | Appendix Plate A1.34: Facing east |
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| Appendix Plate A1.35: Facing west | Appendix Plate A1.36: Facing south |

| CAR011 | |
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| Appendix Plate A1.37: Facing north | Appendix Plate A1.38: Facing east |
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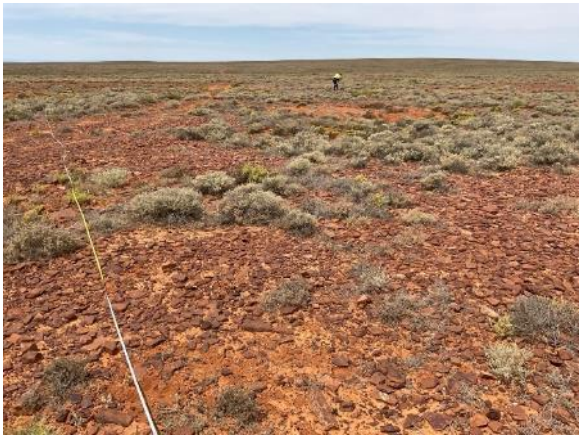
|  |  |
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| Appendix Plate A1.43: Facing west | Appendix Plate A1.44: Facing south |

| CAR013 | |
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| Appendix Plate A1.45:Facing north | Appendix Plate A1.46: Facing east |
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| Appendix Plate A1.47: Facing west | Appendix Plate A1.48: Facing south |

| CAR015 | |
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| Appendix Plate A1.49: Facing north | Appendix Plate A1.50: Facing east |
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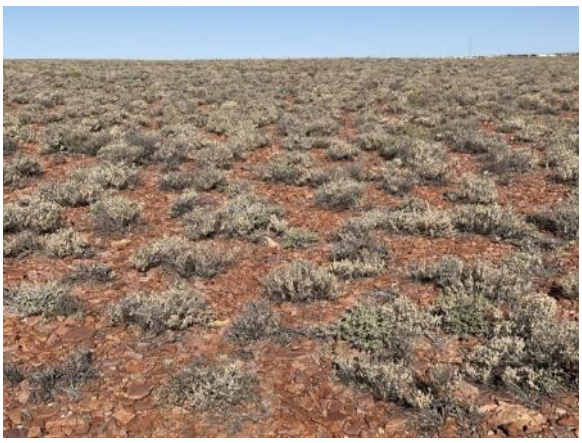
|  |  |
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| Appendix Plate A1.55: Facing west | Appendix Plate A1.56: Facing south |

| CAR017 | |
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| Appendix Plate A1.57: Facing north | Appendix Plate A1.58: Facing east |
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| Appendix Plate A1.59: Facing west | Appendix Plate A1.60: Facing south |

| CAR018 | |
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| Appendix Plate A1.61: Facing north | Appendix Plate A1.62: Facing east |
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| Appendix Plate A1.63: Facing west | Appendix Plate A1.64: Facing south |

| CAR019 | |
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| Appendix Plate A1.65: Facing north | Appendix Plate A1.66: Facing east |
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| Appendix Plate A1.67: Facing west | Appendix Plate A1.68: Facing south |

| CAR020 | |
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| Appendix PlateA1.69: Facing north | Appendix Plate A1.70: Facing east |
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| Appendix Plate A1.71: Facing west | Appendix Plate A1.72: Facing south |

| CAR021 | |
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| Appendix Plate A1.73: Facing north | Appendix Plate A1.74: Facing east |
|  |  |
| Appendix Plate A1.75: Facing west | Appendix Plate A1.76: Facing south |

| CAR022 | |
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| Appendix Plate A1.77: Facing north | Appendix Plate A1.78: Facing east |
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# Appendix A2. Photolog, Jessup Transects

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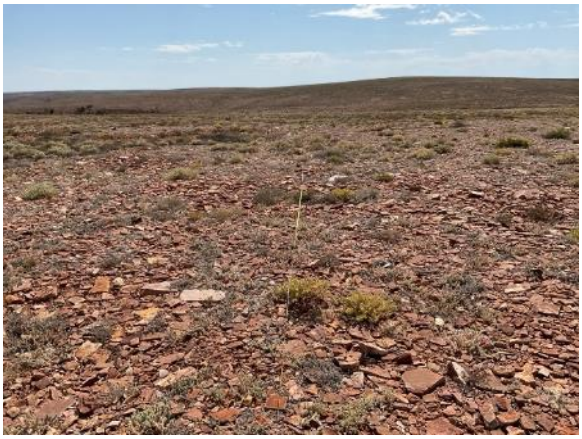
|  |  |
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| Appendix Plate A2.3: CAR003 | Appendix Plate A2.4: CAR004 |

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| Appendix Plate A2.5: CAR005 | Appendix Plate A2.6: CAR006 |

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| Appendix Plate A2.7: CAR007 | Appendix Plate A2.8: CAR009 |

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| Appendix Plate A2.9: CAR010 | Appendix Plate A2.10: CAR011 |

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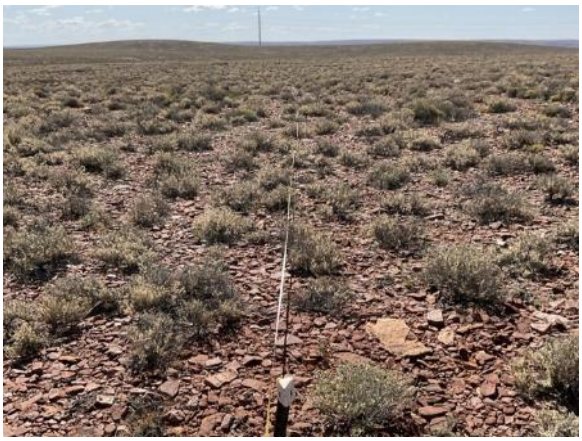
| Appendix Plate A2.11: CAR012 | Appendix Plate A2.12: CAR013 |

| | |
|---|---|
|  |  |
| Appendix Plate A2.13: CAR015 | Appendix Plate A2.14: CAR016 |

| | |
|---|---|
|  |  |
| Appendix Plate A2.15: CAR017 | Appendix Plate A2.16: CAR018 |

| | |
|---|---|
|  |  |
| Appendix Plate A2.17: CAR019 | Appendix Plate A2.18: CAR020 |

# Appendix A3. Photolog, Canopy Cover Transects Eliza Creek

| CAR017 | |
|---|---|
|  |  |
| Appendix Plate A3.1: Transect A | Appendix Plate A3.2: Transect B |

| CAR018 | |
|---|---|
|  |  |
| Appendix Plate A3.3: Transect A | Appendix Plate A3.4: Transect B |

| CAR019 | |
|---|---|
|  |  |
| Appendix Plate A3.5: Transect A | Appendix Plate A3.6: Transect B |

| | |
|---|---|
|  |  |
| Appendix Plate A3.7: Transect A | Appendix Plate A3.8: Transect B |

# Appendix A4. Photolog, Weed Survey

| CWM01 0m | |
|---|---|
|  |  |
| **Appendix Plate A4.1:**<br>**Western side of road, facing north** | **Appendix Plate A4.2:**<br>**Western side of road, facing south** |
|  |  |
| **Appendix Plate A4.3:**<br>**Eastern side of road, facing north** | **Appendix Plate A4.4:**<br>**Eastern side of road, facing south** |

| CWM01 250m | |
|---|---|
|  |  |
| Appendix Plate A4.5:<br>Western side of road, facing north | Appendix Plate A4.6:<br>Western side of road, facing south |
|  |  |
| Appendix Plate A4.7:<br>Eastern side of road, facing north | Appendix Plate A4.8:<br>Eastern side of road, facing south |

| CWM01 500m | |
|---|---|
|  |  |
| Appendix Plate A4.9:<br>Western side of road, facing north | Appendix Plate A4.10:<br>Western side of road, facing south |
|  |  |
| Appendix Plate A4.11:<br>Eastern side of road, facing north | Appendix Plate A4.12:<br>Eastern side of road, facing south |

| CWM01 750m | |
|---|---|
|  |  |
| Appendix Plate A4.13:<br>Western side of road, facing north | Appendix Plate A4.14:<br>Western side of road, facing south |
|  |  |
| Appendix Plate A4.15:<br>Eastern side of road, facing north | Appendix Plate A4.16:<br>Eastern side of road, facing south |

| CWM01 1000m | |
|---|---|
|  |  |
| Appendix Plate A4.17:<br>Western side of road, facing north | Appendix Plate A4.18:<br>Western side of road, facing south |
|  |  |
| Appendix Plate A4.19:<br>Eastern side of road, facing north | Appendix Plate A4.20:<br>Eastern side of road, facing south |

| CWM02 0m | |
|---|---|
|  |  |
| Appendix Plate A4.21:<br>Northern side of road, facing east | Appendix Plate A4.22:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.23:<br>Southern side of road, facing east | Appendix Plate A4.24:<br>Southern side of road, facing west |

| CWM02 250m | |
|---|---|
|  |  |
| Appendix Plate A4.25:<br>Northern side of road, facing east | Appendix Plate A4.26:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.27:<br>Southern side of road, facing east | Appendix Plate A4.28:<br>Southern side of road, facing west |

| CWM02 500m | |
|---|---|
|  |  |
| Appendix Plate A4.29:<br>Eastern side of road, facing north | Appendix Plate A4.30:<br>Eastern side of road, facing south |
|  |  |
| Appendix Plate A4.31:<br>Western side of road, facing north | Appendix Plate A4.32:<br>Western side of road, facing south |

| CWM02 750m | |
|---|---|
|  |  |
| Appendix Plate A4.33:<br>Eastern side of road, facing north | Appendix Plate A4.34:<br>Eastern side of road, facing south |
|  |  |
| Appendix Plate A4.35:<br>Western side of road, facing north | Appendix Plate A4.36:<br>Western side of road, facing south |

| CWM02 1000m | |
|---|---|
|  |  |
| Appendix Plate A4.37:<br>Eastern side of road, facing north | Appendix Plate A4.38:<br>Eastern side of road, facing south |
|  |  |
| Appendix Plate A4.39:<br>Western side of road, facing north | Appendix Plate A4.40:<br>Western side of road, facing south |

| CWM03 0m | |
|---|---|
|  |  |
| Appendix Plate A4.41:<br>Northern side of road, facing east | Appendix Plate A4.42:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.43:<br>Southern side of road, facing east | Appendix Plate A4.44:<br>Southern side of road, facing west |

| CWM03 250m | |
|---|---|
|  |  |
| Appendix Plate A4.45:<br>Northern side of road, facing east | Appendix Plate A4.46:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.47:<br>Southern side of road, facing east | Appendix Plate A4.48:<br>Southern side of road, facing west |

| CWM03 500m | |
|---|---|
|  | Missing image |
| **Appendix Plate A4.49:**<br>**Northern side of road, facing east** | **Appendix Plate A4.50:**<br>**Northern side of road, facing west** |
|  |  |
| **Appendix Plate A4.51:**<br>**Southern side of road, facing east** | **Appendix Plate A4.52:**<br>**Southern side of road, facing west** |

| CWM03 750m | |
|---|---|
|  |  |
| Appendix Plate A4.53:<br>Northern side of road, facing east | Appendix Plate A4.54:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.55:<br>Southern side of road, facing east | Appendix Plate A4.56:<br>Southern side of road, facing west |

| CWM03 1000m | |
|---|---|
|  |  |
| Appendix Plate A4.57:<br>Northern side of road, facing east | Appendix Plate A4.58:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.59:<br>Southern side of road, facing east | Appendix Plate A4.60:<br>Southern side of road, facing west |

| CWM04 0m | |
|---|---|
|  |  |
| Appendix Plate A4.61:<br>Eastern side of road, facing north | Appendix Plate A4.62:<br>Eastern side of road, facing south |
|  |  |
| Appendix Plate A4.63:<br>Western side of road, facing north | Appendix Plate A4.64:<br>Western side of road, facing south |

| CWM04 250m | |
|---|---|
|  |  |
| Appendix Plate A4.65:<br>Eastern side of road, facing north | Appendix Plate A4.66:<br>Eastern side of road, facing south |
|  |  |
| Appendix Plate A4.67:<br>Western side of road, facing north | Appendix Plate A4.68:<br>Western side of road, facing south |

| CWM04 500m | |
|---|---|
|  |  |
| Appendix Plate A4.69:<br>Eastern side of road, facing north | Appendix Plate A4.70:<br>Eastern side of road, facing south |
|  |  |
| Appendix Plate A4.71:<br>Western side of road, facing north | Appendix Plate A4.72:<br>Western side of road, facing south |

| CWM04 750m | |
|---|---|
|  |  |
| Appendix Plate A4.73:<br>Eastern side of road, facing north | Appendix Plate A4.74:<br>Eastern side of road, facing south |
|  |  |
| Appendix Plate A4.75:<br>Western side of road, facing north | Appendix Plate A4.76:<br>Western side of road, facing south |

| CWM04 1000m | |
|---|---|
|  |  |
| Appendix Plate A4.77:<br>Eastern side of road, facing north | Appendix Plate A4.78:<br>Eastern side of road, facing south |
|  |  |
| Appendix Plate A4.79:<br>Western side of road, facing north | Appendix Plate A4.80:<br>Western side of road, facing south |

| CWM05 0m | |
|---|---|
|  |  |
| Appendix Plate A4.81:<br>Northern side of road, facing east | Appendix Plate A4.82:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.83:<br>Southern side of road, facing east | Appendix Plate A4.84:<br>Southern side of road, facing west |

| CWM05 250m | |
|---|---|
|  |  |
| Appendix Plate A4.85:<br>Northern side of road, facing east | Appendix Plate A4.86:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.87:<br>Southern side of road, facing east | Appendix Plate A4.88:<br>Southern side of road, facing west |

| CWM05 500m | |
|---|---|
|  |  |
| Appendix Plate A4.89:<br>Northern side of road, facing east | Appendix Plate A4.90: CWM05 500m<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.91:<br>Southern side of road, facing east | Appendix Plate A4.92:<br>Southern side of road, facing west |

| CWM05 750m | |
|---|---|
|  |  |
| Appendix Plate A4.93:<br>Northern side of road, facing east | Appendix Plate A4.94:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.95:<br>Southern side of road, facing east | Appendix Plate A4.96:<br>Southern side of road, facing west |

| CWM05 1000m | |
|---|---|
|  |  |
| Appendix Plate A4.97:<br>Northern side of road, facing east | Appendix Plate A4.98:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.99:<br>Southern side of road, facing east | Appendix Plate A4.100:<br>Southern side of road, facing west |

| CWM06 0m | |
|---|---|
|  |  |
| Appendix Plate A4.101:<br>Northern side of road, facing east | Appendix Plate A4.102:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.103:<br>Southern side of road, facing east | Appendix Plate A4.104:<br>Southern side of road, facing west |

| CWM06 250m | |
|---|---|
|  |  |
| Appendix Plate A4.105:<br>Northern side of road, facing east | Appendix Plate A4.106:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.107:<br>Southern side of road, facing east | Appendix Plate A4.108:<br>Southern side of road, facing west |

| CWM06 500m | |
|---|---|
|  |  |
| Appendix Plate A4.109:<br>Northern side of road, facing east | Appendix Plate A4.110:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.111:<br>Southern side of road, facing east | Appendix Plate A4.112:<br>Southern side of road, facing west |

| CWM06 750m | |
|---|---|
|  |  |
| Appendix Plate A4.113:<br>Northern side of road, facing east | Appendix Plate A4.114:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.115:<br>Southern side of road, facing east | Appendix Plate A4.116:<br>Southern side of road, facing west |

| CWM06 1000m | |
|---|---|
|  |  |
| Appendix Plate A4.117:<br>Northern side of road, facing east | Appendix Plate A4.118:<br>Northern side of road, facing west |
|  |  |
| Appendix Plate A4.119:<br>Southern side of road, facing east | Appendix Plate A4.120:<br>Southern side of road, facing west |

| CWM07 0m | |
|---|---|
|  |  |
| Appendix Plate A4.121: Facing north | Appendix Plate A4.122: Facing south |

| CWM07 250m | |
|---|---|
|  |  |
| Appendix Plate A4.123: Facing north | Appendix Plate A4.124: Facing south |

| CWM07 500m | |
|---|---|
|  |  |
| Appendix Plate A4.125: Facing north | Appendix Plate A4.126: Facing south |

| CWM07 750m | |
|---|---|
|  |  |
| Appendix Plate A4.127: Facing north | Appendix Plate A4.128: Facing south |

| CWM07 1000m | |
|---|---|
|  |  |
| Appendix Plate A4.129: Facing north | Appendix Plate A4.130: Facing south |

| NWM01 0m | |
|---|---|
|  |  |
| Appendix Plate A4.131: Facing east | Appendix Plate A4.132: Facing west |

| NWM01 250m | |
|---|---|
|  |  |
| Appendix Plate A4.133: Facing east | Appendix Plate A4.134: Facing west |

| NWM01 500m | |
|---|---|
|  |  |
| Appendix Plate A4.135: Facing east | Appendix Plate A4.136: Facing west |

| NWM01 750m | |
|---|---|
|  |  |
| Appendix Plate A4.137: Facing east | Appendix Plate A4.138: Facing west |

| NWM01 1000m | |
|---|---|
|  |  |
| Appendix Plate A4.139: Facing east | Appendix Plate A4.140: Facing west |

| NWM02 0m | |
|---|---|
|  |  |
| Appendix Plate A4.141: Facing east | Appendix Plate A4.142: Facing west |

| NWM02 250m | |
|---|---|
|  |  |
| Appendix Plate A4.143: Facing east | Appendix Plate A4.144: Facing west |

| NWM02 500m | |
|---|---|
|  |  |
| Appendix Plate A4.145: Facing east | Appendix Plate A4.146: Facing west |

| NWM02 750m | |
|---|---|
|  |  |
| Appendix Plate A4.147: Facing east | Appendix Plate A4.148: Facing west |

| NWM02 1000m | |
|---|---|
|  |  |
| Appendix Plate A4.149: Facing east | Appendix Plate A4.150: Facing west |

| NWM03 0m | |
|---|---|
|  |  |
| Appendix Plate A4.151: Facing north | Appendix Plate A4.152: Facing south |

| NWM03 250m | |
|---|---|
|  |  |
| Appendix Plate A4.153: Facing north | Appendix Plate A4.154: Facing south |

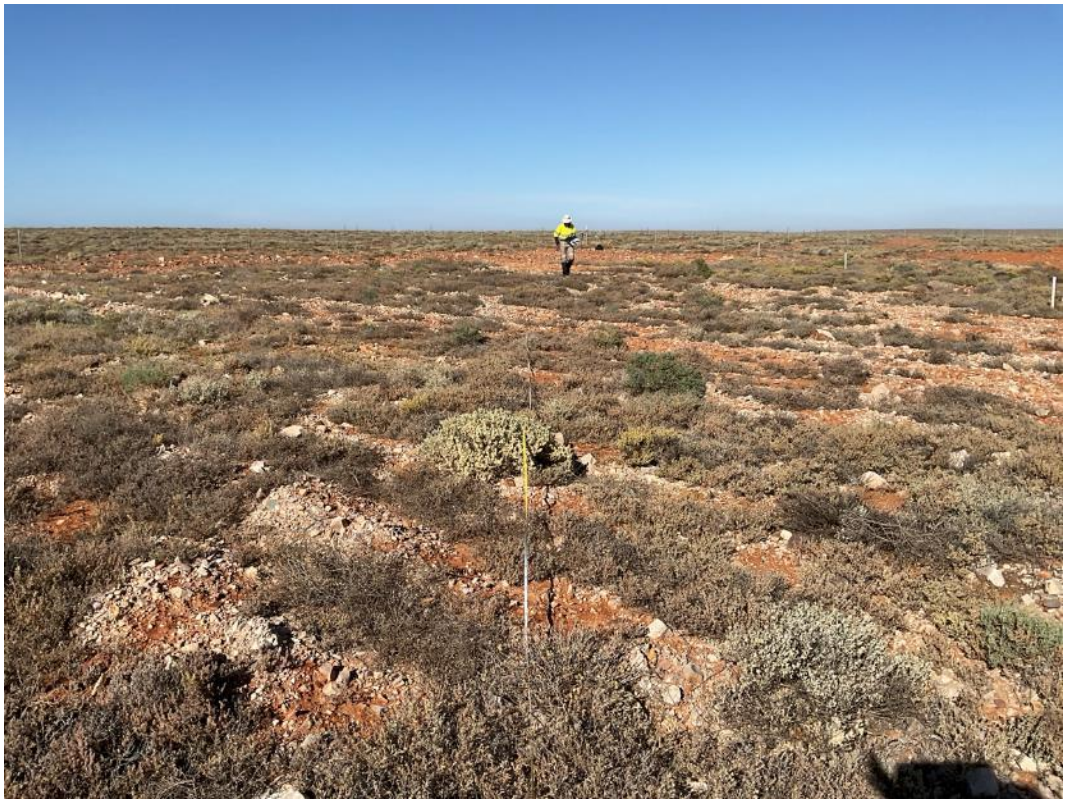
| NWM03 500m | |
|---|---|
|  |  |
| Appendix Plate A4.155: Facing north | Appendix Plate A4.156: Facing south |

| NWM03 750m | |
|---|---|
|  |  |
| Appendix Plate A4.157: Facing north | Appendix Plate A4.158: Facing south |

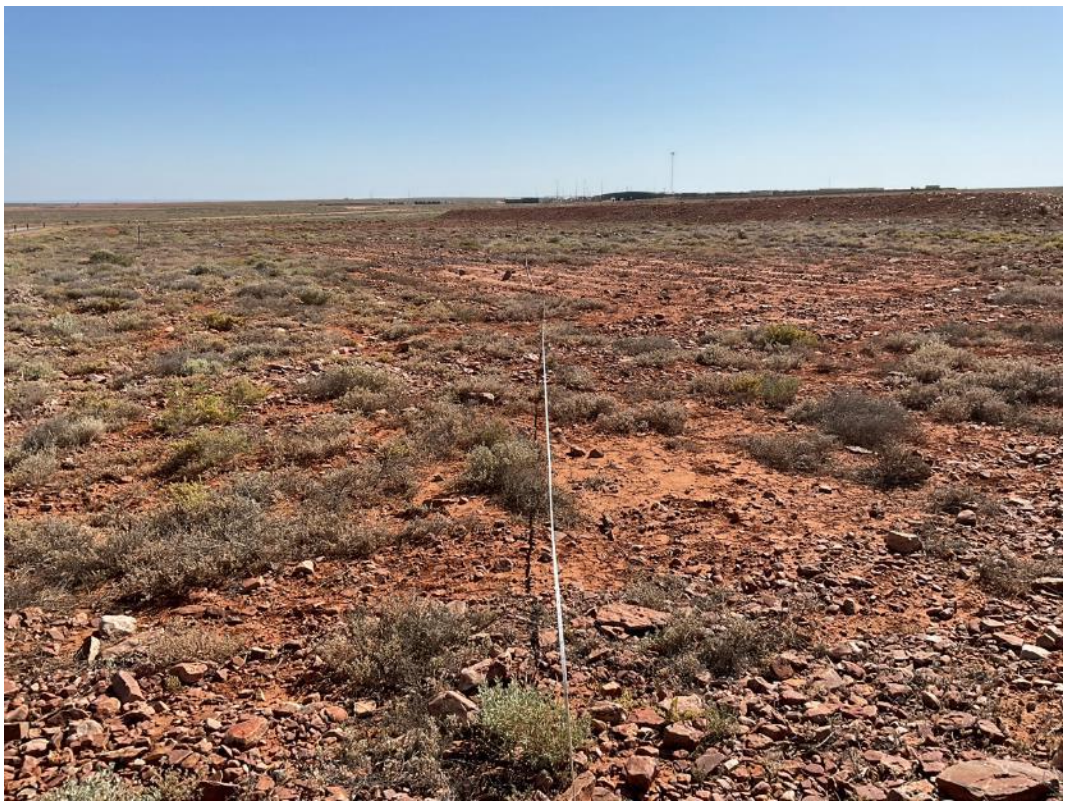
| NWM03 1000m | |
|---|---|
|  |  |
| Appendix Plate A4.159: Facing north | Appendix Plate A4.160: Facing south |

# Appendix A5. Photolog, LFA Sites

**Appendix Plate A5.1: LFA Site Aerodrome, transect 1A, start facing north (2024)**



**Appendix Plate A5.2: LFA Site Aerodrome, transect 1A, end facing south (2024)**



Appendix Plate A5.3: LFA Site Aerodrome, transect 1B, start facing northwest (2024)

Appendix Plate A5.4: LFA Site Aerodrome, transect 1B, send facing southeast (2024)

**Appendix Plate A5.5: LFA Site Ventia, transect 2A, start facing north, transect decomissioned (2024)**

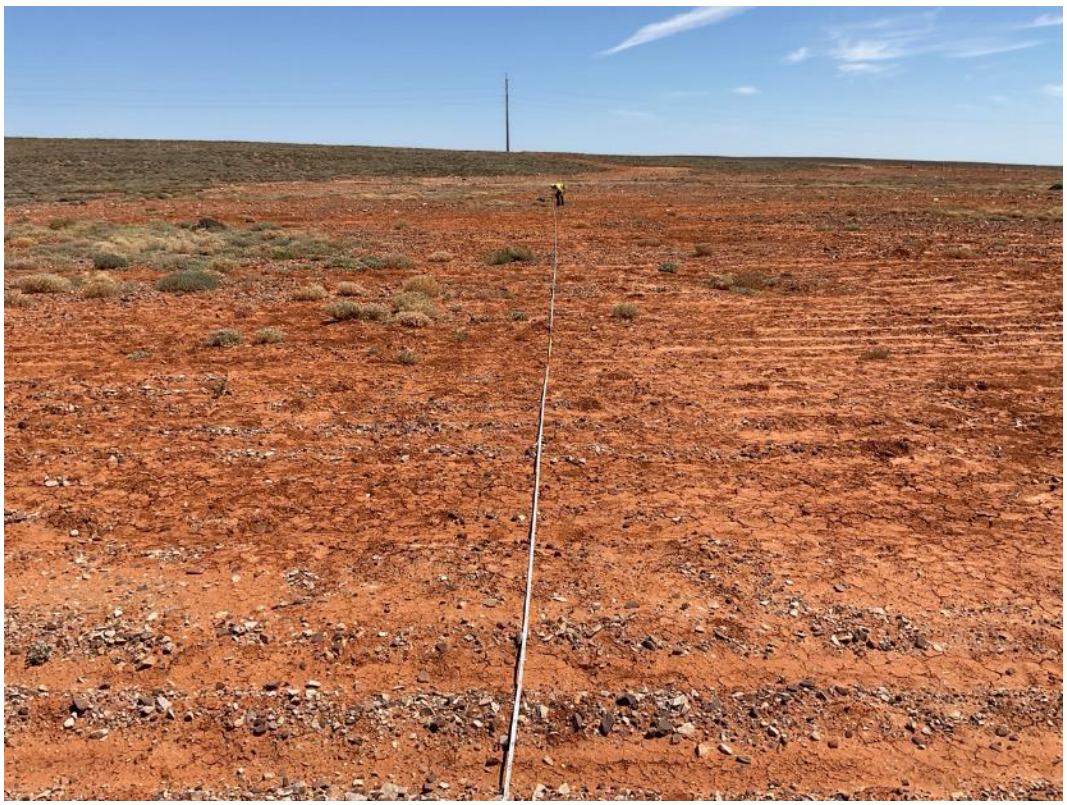
**Appendix Plate A5.6: LFA Site Ventia, transect 2B, start facing north (2024)**

**Appendix Plate A5.7: LFA Site Ventia, transect 2B, end facing south (2024)**

**Appendix Plate A5.8: LFA Site Ventia, transect 2B, vegetation patch off transect (2024)**

**Appendix Plate A5.9: LFA Site Midway Quarry, transect 3A, start facing end (2024)**

**Appendix Plate A5.10: LFA Site Midway Quarry, transect 3A, dense patch off transect (2024)**



**Appendix Plate A5.11: LFA Site Midway Quarry, transect 3A, end facing start (2024)**

**Appendix Plate A5.12: LFA Site Midway Quarry, transect 3B, start facing end (2024)**

**Appendix Plate A5.13: LFA Site Midway Quarry, transect 3B, end facing start (2024)**

**Appendix Plate A5.14: LFA Site Tjungu, transect 4A, start facing end (2024)**

**Appendix Plate A5.15: LFA Site Tjungu, transect 4A, end facing start (2024)**

**Appendix Plate A5.16: LFA Site Tjungu, transect 4A, off transect diversity (2024)**

**Appendix Plate A5.17: LFA Site Tjungu, transect 4B, start facing end (2024)**

**Appendix Plate A5.18: LFA Site Tjungu, transect 4A, end facing start (2024)**

# Appendix B. Rangeland (RAM) Data

## Appendix B1. Cumulative species list

The following is a cumulative list of flora species recorded at RAM sites (Flora Sites 1 – 22), spring 2024, including life span status, and the number of sites at which they were recorded.

**Table B1.1: Cumulative flora list (RAM sites) for Carrapateena, spring 2024**

| Family | Scientific Name | Common Name | Number of Records | |
|---|---|---|---|---|
| | | | Long-lived | Short-lived |
| MALVACEAE | *Abutilon halophilum* | Plains Lantern-bush | 11 | |
| MALVACEAE | *Abutilon otocarpum* | Desert Lantern-bush | 4 | |
| FABACEAE | *Acacia aneura* | Mulga | 1 | |
| FABACEAE | *Acacia ligulata* | Umbrella Bush | 2 | |
| FABACEAE | *Acacia oswaldii* | Umbrella Wattle | 1 | |
| FABACEAE | *Acacia papyrocarpa/ Acacia* sp. *Blyth*[1] | Western Myall | 7 | |
| FABACEAE | *Acacia ramulosa* var. | Horse Mulga | 1 | |
| FABACEAE | *Acacia tetragonophylla* | Dead Finish | 4 | |
| SAPINDACEAE | *Alectryon oleifolius* ssp. *canescens* | Bullock Bush | 1 | |
| AMARANTHACEAE | *Alternanthera denticulata* | Lesser Joyweed | | 1 |
| ANACAMPSEROTACEAE | *Anacampseros australiana* | Australian Anacampseros | | 5 |
| POACEAE | *Aristida contorta* | Curly Wire-grass | | 1 |
| POACEAE | *Aristida holathera* var. | Tall Kerosene Grass | | 2 |
| ASPARAGACEAE | *Arthropodium fimbriatum* | Nodding Vanilla-lily | | 2 |
| POACEAE | *Astrebla pectinata* | Barley Mitchell-grass | 8 | |
| AMARANTHACEAE | *Atriplex fissivalvis* | Gibber Saltbush | | 2 |
| AMARANTHACEAE | *Atriplex holocarpa* | Pop Saltbush | | 10 |
| AMARANTHACEAE | *Atriplex velutinella* | Sandhill Saltbush | | 2 |
| AMARANTHACEAE | *Atriplex vesicaria* | Bladder Saltbush | 16 | |
| NYCTAGINACEAE | *Boerhavia* sp. | Tar-vine | | 1 |
| ASTERACEAE | *Brachyscome ciliaris* var. | Variable Daisy | | 3 |
| ASPHODELACEAE | *Bulbine semibarbata* | Small Leek-lily | | 9 |
| ASTERACEAE | *Calotis hispidula* | Hairy Burr-daisy | | 7 |
| ASTERACEAE | *Centaurea melitensis** | Malta Thistle | | 1 |
| ASTERACEAE | *Centipeda crateriformis ssp.* | Sneezeweed | | 2 |
| PTERIDACEAE | *Cheilanthes lasiophylla* | Woolly Cloak-fern | | 1 |
| AMARANTHACEAE | *Chenopodium curvispicatum* | Cottony Goosefoot | 3 | |
| AMARANTHACEAE | *Chenopodium desertorum* ssp. | Desert Goosefoot | 3 | |
| ASTERACEAE | *Chrysocephalum pterochaetum* | Shrub Everlasting | | 1 |
| CONVOLVULACEAE | *Convolvulus remotus* | Grassy Bindweed | | 1 |
| AMARYLLIDACEAE | *Crinum flaccidum* | Murray Lily | | 4 |
| FABACEAE | *Crotalaria eremaea* ssp. | Loose-flowered Rattle-pod | | 1 |
| FABACEAE | *Cullen cinereum* | Annual Scurf-pea | | 5 |
| FABACEAE | *Cullen pallidum* | White Scurf-pea | | 2 |
| POACEAE | *Dactyloctenium radulans* | Button-grass | | 1 |
| APIACEAE | *Daucus glochidiatus* | Native Carrot | | 5 |
| POACEAE | *Digitaria brownii* | Cotton Panic-grass | 4 | |
| AMARANTHACEAE | *Dissocarpus biflorus* var. | Two-horn Saltbush | | 4 |
| AMARANTHACEAE | *Dissocarpus paradoxus* | Ball Bindyi | | 8 |
| SAPINDACEAE | *Dodonaea lobulata* | Lobed-leaf Hop-bush | 5 | |
| SAPINDACEAE | *Dodonaea viscosa* ssp. *angustissima* | Narrow-leaf Hop-bush | 3 | |
| POLYGONACEAE | *Duma florulenta* | Lignum | 3 | |
| AMARANTHACEAE | *Einadia nutans* ssp. | Climbing Saltbush | 6 | |
| AMARANTHACEAE | *Enchylaena tomentosa* var. *tomentosa* | Ruby Saltbush | 9 | |
| POACEAE | *Enneapogon avenaceus* | Common Bottle-washers | | 8 |
| POACEAE | *Enteropogon acicularis* | Umbrella Grass | | 1 |
| POACEAE | *Eragrostis australasica* | Cane-grass | 1 | |
| POACEAE | *Eragrostis setifolia* | Bristly Love-grass | 13 | |
| SCROPHULARIACEAE | *Eremophila glabra* ssp. *glabra* | Tar Bush | 1 | |
| SCROPHULARIACEAE | *Eremophila latrobei* ssp. *glabra* | Crimson Emubush | 3 | |

| Family | Scientific Name | Common Name | Number of Records | |
|---|---|---|---|---|
| | | | Long-lived | Short-lived |
| SCROPHULARIACEAE | *Eremophila oppositifolia* ssp. *oppositifolia* | Opposite-leaved Emubush | 2 | |
| SCROPHULARIACEAE | *Eremophila serrulata* | Green Emubush | 5 | |
| MYRTACEAE | *Eucalyptus camaldulensis* ssp. *arida* | Northern River Red Gum | 3 | |
| POACEAE | *Eulalia aurea* | Silky Brown-top | 4 | |
| EUPHORBIACEAE | *Euphorbia drummondii group* | Spurge | | 2 |
| EUPHORBIACEAE | *Euphorbia stevenii* | Bottletree Spurge | | 6 |
| EUPHORBIACEAE | *Euphorbia tannensis* ssp. *eremophila* | Desert Spurge | | 7 |
| SANTALACEAE | *Exocarpos aphyllus* | Leafless Cherry | 4 | |
| FRANKENIACEAE | *Frankenia serpyllifolia* | Thyme Sea-heath | 13 | |
| FRANKENIACEAE | *Frankenia subteres* | Frankenia | 1 | |
| ASTERACEAE | *Glossocardia bidens* | Native Cobbler's-pegs | | 1 |
| ASTERACEAE | *Gnephosis arachnoidea* | Spidery Button-flower | | 8 |
| GOODENIACEAE | *Goodenia fascicularis* | Silky Goodenia | | 2 |
| AIZOACEAE | *Gunniopsis quadrifida* | Sturt's Pigface | | 1 |
| MALVACEAE | *Hibiscus krichauffianus* | Velvet-leaf Hibiscus | | 1 |
| POACEAE | *Iseilema membranaceum* | Small Flinders-grass | | 1 |
| BRASSICACEAE | *Lepidium phlebopetalum* | Veined Peppercress | | 12 |
| FABACEAE | *Lotus cruentus* | Red-flower Lotus | | 5 |
| SOLANACEAE | *Lycium australe* | Australian Boxthorn | 1 | |
| PHYLLANTHACEAE | *Lysiandra fuernrohrii* | Sand Spurge | 1 | |
| AMARANTHACEAE | *Maireana aphylla* | Cotton-bush | 12 | |
| AMARANTHACEAE | *Maireana appressa* | Pale-fruit Bluebush | 12 | |
| AMARANTHACEAE | *Maireana astrotricha* | Low Bluebush | 1 | |
| AMARANTHACEAE | *Maireana astrotricha* | Low Bluebush | 1 | |
| AMARANTHACEAE | *Maireana eriantha* | Woolly Bluebush | 4 | |
| AMARANTHACEAE | *Maireana georgei* | Satiny Bluebush | 1 | |
| AMARANTHACEAE | *Maireana pyramidata* | Black Bluebush | 3 | |
| AMARANTHACEAE | *Maireana spongiocarpa* | Spongy-fruit Bluebush | 8 | |
| AMARANTHACEAE | *Maireana turbinata* | Top-fruit Bluebush | 2 | |
| MALVACEAE | *Malvastrum americanum var. americanum* | Malvastrum | | 5 |
| MARSILEACEAE | *Marsilea drummondii* | Common Nardoo | | 3 |
| ASTERACEAE | *Minuria cunninghamii* | Bush Minuria | 13 | |
| SCROPHULARIACEAE | *Myoporum montanum* | Native Myrtle | 6 | |
| SOLANACEAE | *Nicotiana velutina* | Velvet Tobacco | | 4 |
| AMARANTHACEAE | *Osteocarpum dipterocarpum* | Two-wing Bonefruit | | 5 |
| POACEAE | *Panicum decompositum* var. *decompositum* | Native Millet | | 2 |
| POACEAE | *Paractaenum novae-hollandiae* ssp. *reversum* | Barbed-wire Grass | | 1 |
| THYMELAEACEAE | *Pimelea microcephala* ssp. *microcephala* | Shrubby Riceflower | 2 | |
| THYMELAEACEAE | *Pimelea simplex* | Desert Riceflower | | 1 |
| PLANTAGINACEAE | *Plantago drummondii* | Dark Plantain | | 4 |
| ASTERACEAE | *Pluchea rubelliflora* | Winged Plains-bush | | 3 |
| ASTERACEAE | *Podolepis davisiana* | Button Podolepis | | 3 |
| ASTERACEAE | *Podolepis* sp. | Copper-wire Daisy | | 1 |
| ASTERACEAE | *Polycalymma stuartii* | Poached-egg Daisy | | 2 |
| PORTULACACEAE | *Portulaca oleracea* | Common Purslane | | 2 |
| ASTERACEAE | *Pterocaulon sphacelatum* | Apple-bush | | 3 |
| AMARANTHACEAE | *Ptilotus nobilis* | Yellow-tails | | 1 |
| AMARANTHACEAE | *Ptilotus obovatus* | Silver Mulla Mulla | 7 | |
| AMARANTHACEAE | *Rhagodia spinescens* | Spiny Saltbush | 6 | |
| ASTERACEAE | *Rhodanthe floribunda* | White Everlasting | | 2 |
| ASTERACEAE | *Rhodanthe* sp. | Everlasting | | 1 |
| ASTERACEAE | *Rhodanthe stricta* | Slender Everlasting | | 8 |
| ZYGOPHYLLACEAE | *Roepera eremaea* | Climbing Twinleaf | | 1 |
| ZYGOPHYLLACEAE | *Roepera howittii* | Clasping Twinleaf | | 2 |
| ZYGOPHYLLACEAE | *Roepera* sp. | Twinleaf | | 1 |
| ACANTHACEAE | *Rostellularia adscendens* ssp. | Pink Tongues | | 5 |
| AMARANTHACEAE | *Salsola australis* | Buckbush | | 6 |
| SANTALACEAE | *Santalum lanceolatum* | Plumbush | 5 | |
| GOODENIACEAE | *Scaevola spinescens* | Spiny Fanflower | 4 | |
| AMARANTHACEAE | *Sclerolaena brachyptera* | Short-wing Bindyi | | 10 |
| AMARANTHACEAE | *Sclerolaena diacantha* | Grey Bindyi | | 2 |

| Family | Scientific Name | Common Name | Number of Records | |
|---|---|---|---|---|
| | | | Long-lived | Short-lived |
| AMARANTHACEAE | *Sclerolaena divaricata* | Tangled Bindyi | | 15 |
| AMARANTHACEAE | *Sclerolaena intricata* | Tangled Bindyi | | 11 |
| AMARANTHACEAE | *Sclerolaena patenticuspis* | Spear-fruit Bindyi | | 3 |
| AMARANTHACEAE | *Sclerolaena* sp. | Bindyi | | 1 |
| AMARANTHACEAE | *Sclerolaena ventricosa* | Salt Bindyi | | 6 |
| FABACEAE | *Senna artemisioides ssp. helmsii* | Blunt-leaf Senna | 5 | |
| FABACEAE | *Senna artemisioides ssp. oligophylla* | Limestone Senna | 1 | |
| FABACEAE | *Senna artemisioides* ssp. *X artemisioides* | Silver Senna | 5 | |
| FABACEAE | *Senna artemisioides* ssp. *X sturtii* | Grey Senna | 3 | |
| POACEAE | *Setaria constricata* | Knotty-butt Paspalidium | 1 | |
| MALVACEAE | *Sida ammophila* | Sand Sida | | 2 |
| MALVACEAE | *Sida corrugata* var. | Corrugated Sida | | 5 |
| MALVACEAE | *Sida fibulifera* | Pin Sida | | 8 |
| MALVACEAE | *Sida intricata* | Twiggy Sida | 10 | |
| MALVACEAE | *Sida petrophila* | Rock Sida | 6 | |
| BRASSICACEAE | *Sisymbrium erysimoides** | Smooth Mustard | | 3 |
| SOLANACEAE | *Solanum lithophilum* | Velvet Potato-bush | | 3 |
| SOLANACEAE | *Solanum quadriloculatum* | Plains Nightshade | | 5 |
| ASTERACEAE | *Sonchus oleraceus** | Common Sow-thistle | | 2 |
| POACEAE | *Sporobolus actinocladus* | Ray Grass | | 14 |
| CELASTRACEAE | *Stackhousia* sp. | Candles | | 2 |
| FABACEAE | *Swainsona* sp. | Swainson-pea | | 1 |
| AMARANTHACEAE | *Tecticornia medullosa* | Samphire | 13 | |
| AMARANTHACEAE | *Tecticornia pergranulata* ssp. *divaricata* | Black-seed Samphire | 2 | |
| AMARANTHACEAE | *Tecticornia tenuis* | Slender Samphire | 4 | |
| LAMIACEAE | *Teucrium racemosum* | Grey Germander | | 2 |
| POACEAE | *Themeda triandra* | Kangaroo Grass | 2 | |
| ASPARAGACEAE | *Thysanotus baueri* | Mallee Fringe-lily | | 1 |
| ASPARAGACEAE | *Thysanotus* sp. | Fringe-lily | | 1 |
| AIZOACEAE | *Trianthema triquetrum* | Red Spinach | | 2 |
| BORAGINACEAE | *Trichodesma zeylanicum* var. *zeylanicum* | Camel Bush | | 2 |
| ASTERACEAE | *Vittadinia gracilis* | Woolly New Holland Daisy | | 1 |
| CAMPANULACEAE | *Wahlenbergia* sp. | Native Bluebell | | 3 |
| COLCHICACEAE | *Wurmbea australis* | Inland Nancy | | 1 |
| POACEAE | *Zygochloa paradoxa* | Sandhill Cane-grass | 2 | |

[1]*Acacia sp. Blyth Range* is a poorly known entity, formerly known as *Acacia affin. papyrocarpa*. It is most common in the vicinity of Lake Torrens, NW edge of Flinders Ranges and near Bltyh Range in WA. Factsheet - Acacia sp. Blyth Range (W.V.Fitzgerald s.n. 1898) [affin. papyrocarpa] "Further field and laboratory studies are needed to determine the status of this taxon. It is clearly related to *A. papyrocarpa,* but differs most obviously in having rather rigid, often subterete, ±pungent phyllodes and minutely appressed hairy pods." In the Carrapateena operational area, the taxon of the trees is still under review.

# Appendix B2. Site specific descriptive statistics, grazing impact

**Table B2.1: Plant diversity, life span, grazing impact, life stages and cover/abundance per RAM Site**

| RAM Site | Scientific Name | Common Name | Long-lived[1] | CSR[2] | Age Class[3] | Grazing Level % of Total Population | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intact | Modified | Over-utilised |
| Flora Site 1 / CAR001 | *Abutilon halophilum* | Plains Lantern-bush | Y | 4 | Mixed | >50 | <50 | 0 |
| | *Astrebla pectinata* | Barley Mitchell-grass | Y | 4 | Mixed | <50 | >50 | 0 |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 5 | Mixed | >50 | <50 | 0 |
| | *Bulbine semibarbata* | Small Leek-lily | N | 1 | | | | |
| | *Dissocarpus paradoxus* | Ball Bindyi | N | 3 | | | | |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 2 | Mixed | <50 | >50 | 0 |
| | *Euphorbia tannensis* ssp. *eremophila* | Desert Spurge | N | 1 | | | | |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 1 | Adult | >50 | 0 | 0 |
| | *Goodenia fascicularis* | Silky Goodenia | N | 1 | | | | |
| | *Maireana aphylla* | Cotton-bush | Y | 1 | Adult | >50 | 0 | 0 |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 1 | Adult | >50 | <50 | 0 |
| | *Maireana spongiocarpa* | Spongy-fruit Bluebush | Y | 2 | Adult | <50 | >50 | 0 |
| | *Malvastrum americanum* var. | Malvastrum | N | 1 | | | | |
| | *Minuria cunninghamii* | Bush Minuria | Y | 2 | Adult | 0 | >50 | <50 |
| | *Nicotiana velutina* | Velvet Tobacco | N | 1 | | | | |
| | *Portulaca oleracea* | Common Purslane | N | 1 | | | | |
| | *Rhodanthe floribunda* | White Everlasting | N | 1 | | | | |
| | *Roepera howittii* | Clasping Twinleaf | N | 1 | | | | |
| | *Sclerolaena brachyptera* | Short-wing Bindyi | N | 4 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 4 | | | | |
| | *Sclerolaena intricata* | Tangled Bindyi | N | 3 | | | | |
| | *Sida intricata* | Twiggy Sida | Y | 2 | Adult | 0 | 0 | 0 |
| | *Sporobolus actinocladus* | Ray Grass | N | 4 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 3 | Mixed | >50 | 0 | 0 |
| | **Site 1 Totals: 24 (long-lived = 11, short-lived = 13)** | | | | | | | |
| Flora Site 2 / CAR002 | *Abutilon halophilum* | Plains Lantern-bush | Y | 3 | Adult | >50 | 0 | 0 |
| | *Anacampseros australiana* | Australian Anacampseros | N | 1 | | | | |
| | *Astrebla pectinata* | Barley Mitchell-grass | Y | 2 | Adult | <50 | >50 | <50 |
| | *Atriplex holocarpa* | Pop Saltbush | N | 2 | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 4 | Mixed | >50 | <50 | 0 |
| | *Brachyscome ciliaris* var. | Variable Daisy | N | 1 | | | | |
| | *Calotis hispidula* | Hairy Burr-daisy | N | 1 | | | | |
| | *Cullen cinereum* | Annual Scurf-pea | N | 2 | | | | |
| | *Daucus glochidiatus* | Native Carrot | N | 1 | | | | |
| | *Dissocarpus paradoxus* | Ball Bindyi | N | 2 | | | | |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 3 | Adult | 0 | 0 | >50 |
| | *Euphorbia tannensis* ssp. *eremophila* | Desert Spurge | N | 1 | | | | |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 3 | Adult | >50 | 0 | 0 |
| | *Lepidium phlebopetalum* | Veined Peppercress | N | 1 | | | | |
| | *Maireana spongiocarpa* | Spongy-fruit Bluebush | Y | 3 | Adult | >50 | 0 | 0 |
| | *Plantago drummondii* | Dark Plantain | N | 1 | | | | |
| | *Ptilotus nobilis* | Yellow-tails | N | 1 | | | | |
| | *Rhodanthe* sp. | Everlasting | N | 1 | | | | |
| | *Salsola australis* | Buckbush | N | 3 | | | | |
| | *Sclerolaena brachyptera* | Short-wing Bindyi | N | 4/5 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 4 | | | | |
| | *Sclerolaena intricata* | Tangled Bindyi | N | 4 | | | | |
| | *Sclerolaena ventricosa* | Salt Bindyi | N | 3 | | | | |
| | *Sporobolus actinocladus* | Ray Grass | N | 3 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 3 | Adult | >50 | 0 | 0 |
| | *Thysanotus baueri* | Mallee Fringe-lily | N | 1 | | | | |
| | *Trianthema triquetrum* | Red Spinach | N | 2 | | | | |
| | *Wahlenbergia sp.* | Native Bluebell | N | 1 | | | | |
| | **Site 2 Totals: 28 (long-lived = 7, short-lived = 21)** | | | | | | | |

| RAM Site | Scientific Name | Common Name | Long-lived[1] | CSR[2] | Age Class[3] | Grazing Level % of Total Population | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intact | Modified | Over-utilised |
| Flora Site 3 / CAR003 | *Abutilon halophilum* | Plains Lantern-bush | Y | 3 | Adult | >50 | 0 | 0 |
| | *Anacampseros australiana* | Australian Anacampseros | N | 3 | | | | |
| | *Arthropodium fimbriatum* | Nodding Vanilla-lily | N | 1 | | | | |
| | *Astrebla pectinata* | Barley Mitchell-grass | Y | 2 | Adult | >50 | <50 | 0 |
| | *Atriplex fissivalvis* | Gibber Saltbush | N | 2 | | | | |
| | *Atriplex holocarpa* | Pop Saltbush | N | 2 | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 4 | Mixed | >50 | <50 | 0 |
| | *Brachyscome ciliaris var.* | Variable Daisy | N | 1 | | | | |
| | *Bulbine semibarbata* | Small Leek-lily | N | 3 | | | | |
| | *Calotis hispidula* | Hairy Burr-daisy | N | 1 | | | | |
| | *Centipeda crateriformis* | | N | 1 | | | | |
| | *Cullen cinereum* | Annual Scurf-pea | N | 1 | | | | |
| | *Daucus glochidiatus* | Native Carrot | N | 3 | | | | |
| | *Dissocarpus paradoxus* | Ball Bindyi | N | 3 | | | | |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 2 | Adult | 0 | >50 | 0 |
| | *Euphorbia stevenii* | Bottletree Spurge | N | 1 | | | | |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Lepidium phlebopetalum* | Veined Peppercress | N | 1 | | | | |
| | *Lotus cruentus* | Red-flower Lotus | N | 1 | | | | |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 3 | Adult | <50 | >50 | 0 |
| | *Maireana eriantha* | Woolly Bluebush | Y | 1 | Mixed | 0 | >50 | 0 |
| | *Minuria cunninghamii* | Bush Minuria | Y | 2/4 | Mixed | >50 | 0 | 0 |
| | *Plantago drummondii* | Dark Plantain | N | 3 | | | | |
| | *Podolepis davisiana* | Button Podolepis | N | 1 | | | | |
| | *Portulaca oleracea* | Common Purslane | N | 3 | | | | |
| | *Rhodanthe stricta* | Slender Everlasting | N | 3 | | | | |
| | *Salsola australis* | Buckbush | N | 3 | | | | |
| | *Sclerolaena brachyptera* | Short-wing Bindyi | N | 2 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 3 | | | | |
| | *Sclerolaena intricata* | Tangled Bindyi | N | 2/4 | | | | |
| | *Sclerolaena ventricosa* | Salt Bindyi | N | 2 | | | | |
| | *Sida fibulifera* | Pin Sida | N | 2 | | | | |
| | *Sida intricata* | Twiggy Sida | Y | 2 | Adult | 0 | >50 | 0 |
| | *Sporobolus actinocladus* | Ray Grass | N | 2/3 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 5 | Mixed | >50 | 0 | 0 |
| | *Tecticornia tenuis* | Slender Samphire | Y | 1 | Mixed | >50 | 0 | 0 |
| | *Wahlenbergia* sp. | Native Bluebell | N | 1 | | | | |
| | **Site 3 Totals: 37 (long-lived = 11, short-lived = 26)** | | | | | | | |
| Flora Site 4 / CAR004 | *Abutilon halophilum* | Plains Lantern-bush | Y | 1 | Adult | >50 | >50 | 0 |
| | *Atriplex holocarpa* | Pop Saltbush | N | 2 | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 5 | Mixed | >50 | 0 | 0 |
| | *Brachyscome ciliaris* var. | Variable Daisy | N | 3 | | | | |
| | *Bulbine semibarbata* | Small Leek-lily | N | 2 | | | | |
| | *Calotis hispidula* | Hairy Burr-daisy | N | 1 | | | | |
| | *Convolvulus remotus* | Grassy Bindweed | N | 1 | | | | |
| | *Daucus glochidiatus* | Native Carrot | N | 3 | | | | |
| | *Dissocarpus biflorus* var. | Two-horn Saltbush | N | 1 | | | | |
| | *Dissocarpus paradoxus* | Ball Bindyi | N | 1 | | | | |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 3 | Adult | <50 | >50 | <50 |
| | *Euphorbia stevenii* | Bottletree Spurge | N | 1 | | | | |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 3 | Adult | >50 | 0 | 0 |
| | *Lepdiium phlebopetalum* | Phebalium | N | 3 | | | | |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 3 | Adult | <50 | >50 | 0 |
| | *Minuria cunninghamii* | Bush Minuria | Y | 1 | Adult | 0 | >50 | 0 |
| | *Osteocarpum dipterocarpum* | Two-wing Bonefruit | N | 3 | | | | |
| | *Rhodanthe stricta* | Slender Everlasting | N | 3 | | | | |
| | *Sclerolaena brachyptera* | Short-wing Bindyi | N | 2 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 2/4 | | | | |
| | *Sclerolaena ventricosa* | Salt Bindyi | N | 4 | | | | |
| | *Sida fibulifera* | Pin Sida | N | 3 | | | | |
| | *Sida intricata* | Twiggy Sida | Y | 3 | Adult | 0 | >50 | <50 |

| RAM Site | Scientific Name | Common Name | Long-lived[1] | CSR[2] | Age Class[3] | Grazing Level % of Total Population | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intact | Modified | Over-utilised |
| | *Sporobolus actinocladus* | Ray Grass | N | 2/4 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Tecticornia tenuis* | Slender Samphire | Y | 2 | Mixed | >50 | 0 | 0 |
| | **Site 4 Totals: 26 (long-lived = 9, short-lived = 17)** | | | | | | | |
| Flora Site 5 / CAR005 | *Abutilon halophilum* | Plains Lantern-bush | Y | 4 | Mixed | >50 | <50 | 0 |
| | *Anacampseros australiana* | Australian Anacampseros | N | 2 | | | | |
| | *Atriplex holocarpa* | Pop Saltbush | N | 3 | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 5 | Mixed | >50 | <50 | 0 |
| | *Bulbine semibarbata* | Small Leek-lily | N | 2 | | | | |
| | *Dissocarpus paradoxus* | Ball Bindyi | N | 1 | | | | |
| | *Enneapogon avenaceus* | Common Bottle-washers | N | 2 | | | | |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 2 | Adult | >50 | <50 | 0 |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 4 | Adult | >50 | 0 | 0 |
| | *Gnephosis arachnoidea* | Spidery Button-flower | N | 3 | | | | |
| | *Lepidium phlebopetalum* | Veined Peppercress | N | 3 | | | | |
| | *Maireana aphylla* | Cotton-bush | Y | 3 | Adult | >50 | <50 | 0 |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 2 | Adult | <50 | >50 | 0 |
| | *Maireana turbinata* | Top-fruit Bluebush | Y | 2 | Adult | 0 | >50 | 0 |
| | *Minuria cunninghamii* | Bush Minuria | Y | 2 | Adult | <50 | >50 | <50 |
| | *Osteocarpum dipterocarpum* | Two-wing Bonefruit | N | 3 | | | | |
| | *Roepera sp.* | Twinleaf | N | 1 | | | | |
| | *Sclerolaena brachyptera* | Short-wing Bindyi | N | 2 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 3 | | | | |
| | *Sclerolaena intricata* | Tangled Bindyi | N | 1 | | | | |
| | *Sclerolaena ventricosa* | Salt Bindyi | N | 2 | | | | |
| | *Sida fibulifera* | Pin Sida | N | 2 | | | | |
| | *Sporobolus actinocladus* | Ray Grass | N | 4 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 4 | Mixed | >50 | 0 | 0 |
| | **Site 5 Totals: 24 (long-lived = 9, short-lived = 15)** | | | | | | | |
| Flora Site 6 / CAR006 | *Astrebla pectinata* | Barley Mitchell-grass | Y | 1 | Adult | 0 | >50 | 0 |
| | *Atriplex holocarpa* | Pop Saltbush | N | 2 | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 5 | Mixed | >50 | <50 | 0 |
| | *Bulbine semibarbata* | Small Leek-lily | N | 3 | | | | |
| | *Cullen cinereum* | Annual Scurf-pea | N | 1 | | | | |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 2/4 | Adult | <50 | >50 | 0 |
| | *Euphorbia stevenii* | Bottletree Spurge | N | 2/4 | | | | |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 2 | Adult | >50 | 0 | 0 |
| | *Gnephosis arachnoidea* | Spidery Button-flower | N | 3 | | | | |
| | *Maireana aphylla* | Cotton-bush | Y | 1 | Adult | >50 | 0 | 0 |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 1 | Adult | 0 | >50 | >50 |
| | *Minuria cunninghamii* | Bush Minuria | Y | 4 | Adult | <50 | >50 | <50 |
| | *Osteocarpum dipterocarpum* | Two-wing Bonefruit | N | 1 | | | | |
| | *Podolepis davisiana* | Button Podolepis | N | 3 | | | | |
| | *Rhodanthe stricta* | Slender Everlasting | N | 1 | | | | |
| | *Sclerolaena brachyptera* | Short-wing Bindyi | N | 2 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 2 | | | | |
| | *Sclerolaena intricata* | Tangled Bindyi | N | 2 | | | | |
| | *Sclerolaena ventricosa* | Salt Bindyi | N | 2/4 | | | | |
| | *Sida fibulifera* | Pin Sida | N | 3 | | | | |
| | *Sida intricata* | Twiggy Sida | Y | 1 | Adult | 0 | >50 | 0 |
| | *Sporobolus actinocladus* | Ray Grass | N | 3/4 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 2/4 | Mixed | >50 | 0 | 0 |
| | *Wahlenbergia* sp. | Native Bluebell | N | 1 | | | | |
| | **Site 6 Totals: 24 (long-lived = 9, short-lived =15)** | | | | | | | |
| Flora Site 7 / CAR007 | *Abutilon halophilum* | Plains Lantern-bush | Y | 1 | Mixed | >50 | 0 | 0 |
| | *Aristida contorta* | Curly Wire-grass | N | 2 | | | | |
| | *Astrebla pectinata* | Barley Mitchell-grass | Y | 1 | Adult | 0 | <50 | >50 |
| | *Atriplex holocarpa* | Pop Saltbush | N | 3 | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 5 | Mixed | >50 | <50 | 0 |
| | *Calotis hispidula* | Hairy Burr-daisy | N | 2 | | | | |

| RAM Site | Scientific Name | Common Name | Long-lived[1] | CSR[2] | Age Class[3] | Grazing Level % of Total Population | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intact | Modified | Over-utilised |
| | *Dodonaea viscosa* ssp. *angustissima* | Narrow-leaf Hop-bush | Y | 1 | Adult | >50 | 0 | 0 |
| | *Enneapogon avenaceus* | Common Bottle-washers | N | 4 | | | | |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Frankenia subteres* | | Y | 1 | Mixed | >50 | 0 | 0 |
| | *Gnephosis arachnoidea* | Spidery Button-flower | N | 4 | | | | |
| | *Gunniopsis quadrifida* | Sturt's Pigface | N | 1 | | | | |
| | *Lotus cruentus* | Red-flower Lotus | N | 1 | | | | |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Maireana astrotricha* | Low Bluebush | Y | 1 | Mixed | >50 | <50 | <50 |
| | *Maireana georgei* | Satiny Bluebush | Y | 2 | Mixed | 0 | >50 | <50 |
| | *Maireana pyramidata* | Black Bluebush | Y | 2 | Adult | >50 | <50 | 0 |
| | *Maireana spongiocarpa* | Spongy-fruit Bluebush | Y | 2 | Mixed | 0 | >50 | 0 |
| | *Malvastrum americanum* var. | Malvastrum | N | 1 | | | | |
| | *Minuria cunninghamii* | Bush Minuria | Y | 4 | Adult | 0 | >50 | <50 |
| | *Myoporum montanum* | Native Myrtle | Y | 1 | Adult | >50 | 0 | 0 |
| | *Osteocarpum dipterocarpum* | Two-wing Bonefruit | N | 4 | | | | |
| | *Pimelea simplex* | Pimelea | N | 3 | | | | |
| | *Pterocaulon sphacelatum* | Apple-bush | N | 1 | | | | |
| | *Ptilotus obovatus* | Silver Mulla Mulla | Y | 2 | Mixed | >50 | <50 | 0 |
| | *Sclerolaena intricata* | Tangled Bindyi | N | 4 | | | | |
| | *Sclerolaena patenticuspis* | Spear-fruit Bindyi | N | 2 | | | | |
| | *Sida intricata* | Twiggy Sida | Y | 2 | Mixed | >50 | <50 | <50 |
| | *Sida petrophila* | Rock Sida | Y | 1 | Mixed | <50 | >50 | 0 |
| | *Solanum quadriloculatum* | Plains Nightshade | N | 1 | | | | |
| | *Sporobolus actinocladus* | Ray Grass | N | 3 | | | | |
| | *Stackhousia* sp. | Candles | N | 2 | | | | |
| | *Tecticornia pergranulata ssp. divaricata* | Black-seed Samphire | Y | 5 | Mixed | >50 | 0 | 0 |
| | *Tecticornia tenuis* | Slender Samphire | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Thysanotus* sp. | Fringe-lily | N | 1 | | | | |
| | **Site 7 Totals: 35 (long-lived = 18, short-lived = 17)** | | | | | | | |
| Flora Site 9 / CAR009 | *Abutilon halophilum* | Plains Lantern-bush | Y | 3 | Mixed | >50 | <50 | 0 |
| | *Acacia papyrocarpa* | Western Myall | Y | 6 | Mixed | >50 | 0 | 0 |
| | *Astrebla pectinata* | Barley Mitchell-grass | Y | 2 | Mixed | 0 | <50 | >50 |
| | *Atriplex fissivalvis* | Gibber Saltbush | N | 2 | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 4 | Mixed | >50 | <50 | 0 |
| | *Calotis hispidula* | Hairy Burr-daisy | N | 2 | | | | |
| | *Centipeda* sp. | Sneezeweed | N | 1 | | | | |
| | *Cullen cinereum* | Annual Scurf-pea | N | 1 | | | | |
| | *Dactyloctenium radulans* | Button-grass | N | 1 | | | | |
| | *Dissocarpus paradoxus* | Ball Bindyi | N | 3 | | | | |
| | *Enchylaena tomentosa* | Ruby Saltbush | Y | 2 | Mixed | >50 | <50 | 0 |
| | *Enneapogon avenaceus* | Common Bottle-washers | N | 2 | | | | |
| | *Eremophila glabra* ssp. | Tar Bush | Y | 1 | Adult | >50 | 0 | 0 |
| | *Eremophila oppositifolia* ssp. | Opposite-leaved Emubush | Y | 1 | Adult | 0 | 0 | >50 |
| | *Euphorbia tannensis ssp. eremophila* | Desert Spurge | N | 1 | | | | |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 3 | Mixed | <50 | >50 | 0 |
| | *Gnephosis arachnoidea* | Spidery Button-flower | N | 2 | | | | |
| | *Lotus cruentus* | Red-flower Lotus | N | 1 | | | | |
| | *Maireana aphylla* | Cotton-bush | Y | 1 | Adult | <50 | >50 | 0 |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Maireana eriantha* | Woolly Bluebush | Y | 2 | Mixed | >50 | <50 | 0 |
| | *Maireana spongiocarpa* | Spongy-fruit Bluebush | Y | 2 | Adult | >50 | <50 | 0 |
| | *Minuria cunninghamii* | Bush Minuria | Y | 2 | Mixed | 0 | >50 | <50 |
| | *Myoporum montanum* | Native Myrtle | Y | 2 | Young | >50 | 0 | 0 |
| | *Panicum decompositum* var. *decompositum* | Native Millet | N | 1 | | | | |
| | *Ptilotus obovatus* | Silver Mulla Mulla | Y | 2 | Mixed | >50 | <50 | 0 |
| | *Rhodanthe stricta* | Slender Everlasting | N | 3 | | | | |
| | *Rostellularia adscendens* | Pink Tongues | N | 2 | | | | |

| RAM Site | Scientific Name | Common Name | Long-lived[1] | CSR[2] | Age Class[3] | Grazing Level % of Total Population | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intact | Modified | Over-utilised |
| | *Salsola australis* | Buckbush | N | 1 | | | | |
| | *Sclerolaena brachyptera* | Short-wing Bindyi | N | 4 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 4 | | | | |
| | *Sclerolaena intricata* | Tangled Bindyi | N | 4 | | | | |
| | *Sida corrugata* | Corrugated Sida | N | 1 | | | | |
| | *Sida intricata* | Twiggy Sida | Y | 2 | Adult | 0 | 0 | 0 |
| | *Solanum quadriloculatum* | Plains Nightshade | N | 2 | | | | |
| | *Sporobolus actinocladus* | Ray Grass | N | 4 | | | | |
| | *Swainsona* sp. | Swainson-pea | N | 1 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Tecticornia pergranulata* ssp. *divaricata* | Black-seed Samphire | Y | 5 | Mixed | >50 | <50 | 0 |
| | *Tecticornia tenuis* | Slender Samphire | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Vittadinia gracilis* | Woolly New Holland Daisy | N | 1 | | | | |
| | **Site 9 Totals: 41 (long-lived = 19, short-lived = 22)** | | | | | | | |
| Flora Site 10 / CAR010 | *Abutilon otocarpum* | Desert Lantern-bush | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Acacia papyrocarpa* | Western Myall | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Acacia tetragonophylla* | Dead Finish | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Alternanthera denticulata* | Lesser Joyweed | N | 1 | | | | |
| | *Chenopodium desertorum* ssp. | Desert Goosefoot | Y | 1 | Adult | >50 | <50 | 0 |
| | *Chrysocephalum pterochaetum* | Shrub Everlasting | N | 3 | | | | |
| | *Daucus glochidiatus* | Native Carrot | N | 3 | | | | |
| | *Digitaria brownii* | Cotton Panic-grass | Y | 2 | Adult | 0 | >50 | 0 |
| | *Dodonaea lobulata* | Lobed-leaf Hop-bush | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Duma florulenta* | Lignum | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Einadia nutans* ssp. | Climbing Saltbush | Y | 1 | Adult | >50 | <50 | 0 |
| | *Enchylaena tomentosa* | Ruby Saltbush | Y | 4 | Mixed | >50 | <50 | 0 |
| | *Enteropogon acicularis* | Umbrella Grass | N | 2 | | | | |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 1 | Adult | <50 | <50 | >50 |
| | *Eremophila serrulata* | Green Emubush | Y | 1 | Mixed | >50 | 0 | 0 |
| | *Eucalyptus camaldulensis* ssp. *arida* | Northern River Red Gum | Y | 2/4 | Mixed | >50 | 0 | 0 |
| | *Exocarpos aphyllus* | Leafless Cherry | Y | 1 | Adult | >50 | 0 | 0 |
| | *Iseilema membranaceum* | Small Flinders-grass | N | 2 | | | | |
| | *Lepidium phlebopetalum* | Veined Peppercress | N | 3 | | | | |
| | *Maireana aphylla* | Cotton-bush | Y | 1 | Adult | 0 | >50 | 0 |
| | *Malvastrum americanum* var. | Malvastrum | N | 1 | | | | |
| | *Marsilea drummondii* | Common Nardoo | N | 1 | | | | |
| | *Myoporum montanum* | Native Myrtle | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Pluchea rubelliflora* | | N | 3 | | | | |
| | *Pterocaulon sphacelatum* | Apple-bush | N | 3 | | | | |
| | *Ptilotus obovatus* | Silver Mulla Mulla | Y | 4 | Mixed | >50 | <50 | 0 |
| | *Rhagodia spinescens* | Spiny Saltbush | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Rhodanthe stricta* | Slender Everlasting | N | 1 | | | | |
| | *Rostellularia adscendens* ssp. | Pink Tongues | N | 3 | | | | |
| | *Santalum lanceolatum* | Plumbush | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Scaevola spinescens* | Spiny Fanflower | Y | 3 | Mixed | >50 | <50 | 0 |
| | *Senna artemisioides* ssp. *helmsii* | Blunt-leaf Senna | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Senna artemisioides* ssp. *X artemisioides* | Silver Senna | Y | 3 | Adult | >50 | 0 | 0 |
| | *Sida petrophila* | Rock Sida | Y | 4 | Mixed | 0 | >50 | 0 |
| | *Stackhousia* sp. | Candles | N | 1 | | | | |
| | *Themeda triandra* | Kangaroo Grass | Y | 2/4 | Mixed | 0 | >50 | 0 |
| | **Site 10 Totals: 36 (long-lived = 23, short-lived = 13)** | | | | | | | |
| Flora Site / CAR011 | *Abutilon halophilum* | Plains Lantern-bush | Y | 5 | Mixed | >50 | 0 | 0 |
| | *Acacia papyrocarpa* | Western Myall | Y | 4 | Mixed | >50 | <50 | 0 |
| | *Anacampseros australiana* | Australian Anacampseros | N | 3 | | | | |
| | *Arthropodium fimbriatum* | Nodding Vanilla-lily | N | 1 | | | | |
| | *Astrebla pectinata* | Barley Mitchell-grass | Y | 4 | Mixed | >50 | <50 | 0 |
| | *Atriplex holocarpa* | Pop Saltbush | N | 2 | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 5 | Mixed | >50 | >50 | <50 |

| RAM Site | Scientific Name | Common Name | Long-lived[1] | CSR[2] | Age Class[3] | Grazing Level % of Total Population | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intact | Modified | Over-utilised |
| | *Bulbine semibarbata* | Small Leek-lily | N | 3 | | | | |
| | *Enchylaena tomentosa* | Ruby Saltbush | Y | 2 | Mixed | >50 | <50 | 0 |
| | *Eragrostis australasica* | Cane-grass | Y | 1 | Mixed | 0 | 0 | >50 |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 3 | Mixed | 0 | >50 | 0 |
| | *Eremophila serrulata* | Green Emubush | Y | 1 | Adult | >50 | 0 | 0 |
| | *Euphorbia tannensis* ssp. *eremophila* | Desert Spurge | N | 1 | | | | |
| | *Exocarpos aphyllus* | Leafless Cherry | Y | 1 | Adult | >50 | <50 | 0 |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Gnephosis arachnoidea* | Spidery Button-flower | N | 2 | | | | |
| | *Lepidium phlebopetalum* | Veined Peppercress | N | 1 | | | | |
| | *Maireana aphylla* | Cotton-bush | Y | 2 | Adult | 0 | >50 | 0 |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 3 | Mixed | >50 | <50 | 0 |
| | *Maireana eriantha* | Woolly Bluebush | Y | 3 | Mixed | >50 | <50 | 0 |
| | *Maireana spongiocarpa* | Spongy-fruit Bluebush | Y | 3 | Mixed | 0 | >50 | 0 |
| | *Minuria cunninghamii* | Bush Minuria | Y | 4 | Mixed | 0 | <50 | >50 |
| | *Podolepis* sp. | Copper-wire Daisy | N | 1 | | | | |
| | *Rhagodia spinescens* | Spiny Saltbush | Y | 2 | Mixed | >50 | <50 | 0 |
| | *Rhodanthe stricta* | Slender Everlasting | N | 3 | | | | |
| | *Sclerolaena diacantha* | Grey Bindyi | N | 5 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 5 | | | | |
| | *Sclerolaena intricata* | Tangled Bindyi | N | 5 | | | | |
| | *Sclerolaena patenticuspis* | Spear-fruit Bindyi | N | 4 | | | | |
| | *Sida corrugata* | Rock Sida | N | 1 | | | | |
| | *Sida intricata* | Twiggy Sida | Y | 1 | Adult | >50 | 0 | 0 |
| | *Sporobolus actinocladus* | Ray Grass | N | 5 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 5 | Mixed | >50 | 0 | 0 |
| | **Site 11 Totals: 33 (long-lived = 18, short-lived = 15)** | | | | | | | |
| Flora Site 12/ CAR012 | *Atriplex holocarpa* | Pop Saltbush | N | 4 | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 5 | Mixed | <50 | >50 | <50 |
| | *Bulbine semibarbata* | Small Leek-lily | N | 3 | | | | |
| | *Calotis hispidula* | Hairy Burr-daisy | N | 3 | | | | |
| | *Dissocarpus biflorus* var. | Two-horn Saltbush | N | 3 | | | | |
| | *Dissocarpus paradoxus* | Ball Bindyi | N | 3 | | | | |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 2/4 | Mixed | 0 | >50 | <50 |
| | *Euphorbia stevenii* | Bottletree Spurge | N | 3 | | | | |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 3 | Adult | >50 | <50 | 0 |
| | *Lepidium phlebopetalum* | Veined Peppercress | N | 3 | | | | |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 1 | Adult | >50 | 0 | 0 |
| | *Minuria cunninghamii* | Bush Minuria | Y | 2/4 | Adult | 0 | >50 | <50 |
| | *Plantago drummondii* | Dark Plantain | N | 1 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 5 | | | | |
| | *Sclerolaena intricata* | Tangled Bindyi | N | 4 | | | | |
| | *Sclerolaena patenticuspis* | Spear-fruit Bindyi | N | 4 | | | | |
| | *Sida fibulifera* | Pin Sida | N | 3 | | | | |
| | *Sida intricata* | Twiggy Sida | Y | 4 | Mixed | 0 | >50 | <50 |
| | *Sporobolus actinocladus* | Ray Grass | N | 4 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 4 | Mixed | >50 | 0 | 0 |
| | **Site 12 Totals: 20 (long-lived = 7, short-lived = 13)** | | | | | | | |
| Flora Site 13 / CAR013 | *Abutilon halophilum* | Plains Lantern-bush | Y | 4 | Adult | <50 | >50 | 0 |
| | *Atriplex holocarpa* | Pop Saltbush | N | 5 | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 5 | Mixed | >50 | <50 | 0 |
| | *Dissocarpus biflorus* var. | Two-horn Saltbush | N | 3 | | | | |
| | *Dissocarpus paradoxus* | Ball Bindyi | N | 3 | | | | |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 3 | Mixed | 0 | <50 | >50 |
| | *Euphorbia stevenii* | Bottletree Spurge | N | 3 | | | | |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Maireana aphylla* | Cotton-bush | Y | 1 | Adult | 0 | >0 | 0 |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 3 | Adult | >50 | >50 | 0 |
| | *Maireana spongiocarpa* | Spongy-fruit Bluebush | Y | 3 | Adult | 0 | <50 | >50 |
| | *Minuria cunninghamii* | Bush Minuria | Y | 3 | Adult | 0 | >50 | <50 |

| RAM Site | Scientific Name | Common Name | Long-lived[1] | CSR[2] | Age Class[3] | Grazing Level % of Total Population | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intact | Modified | Over-utilised |
| | *Nicotiana velutina* | Velvet Tobacco | N | 1 | | | | |
| | *Rhodanthe floribunda* | White Everlasting | N | 1 | | | | |
| | *Rhodanthe stricta* | Slender Everlasting | N | 1 | | | | |
| | *Sclerolaena brachyptera* | Short-wing Bindyi | N | 3 | | | | |
| | *Sclerolaena diacantha* | Grey Bindyi | N | 4 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 4 | | | | |
| | *Sclerolaena intricata* | Tangled Bindyi | N | 4 | | | | |
| | *Sida fibulifera* | Pin Sida | N | 3 | | | | |
| | *Sida intricata* | Twiggy Sida | Y | 3 | Mixed | 0 | >50 | <50 |
| | *Solanum quadriloculatum* | Plains Nightshade | N | 1 | | | | |
| | *Sporobolus actinocladus* | Ray Grass | N | 3 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 4 | Mixed | >50 | 0 | 0 |
| | **Site 13 Totals: 24 (long-lived = 10, short-lived = 14)** | | | | | | | |
| Site 15 / CAR015 | *Atriplex holocarpa* | Pop Saltbush | N | 2 | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Bulbine semibarbata* | Small Leek-lily | N | 3 | | | | |
| | *Calotis hispidula* | Hairy Burr-daisy | N | 1 | | | | |
| | *Dissocarpus biflorus* var. | Two-horn Saltbush | N | 3 | | | | |
| | *Enneapogon avenaceus* | Common Bottle-washers | N | 3 | | | | |
| | *Euphorbia tannensis* ssp. *eremophila* | Desert Spurge | N | 1 | | | | |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 2 | Adult | >50 | 0 | 0 |
| | *Gnephosis arachnoidea* | Spidery Button-flower | N | 3 | | | | |
| | *Lepidium phlebopetalum* | Veined Peppercress | N | 3 | | | | |
| | *Lotus cruentus* | Red-flower Lotus | N | 1 | | | | |
| | *Maireana aphylla* | Cotton-bush | Y | 2 | Adult | >50 | 0 | 0 |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 1 | Adult | 0 | >50 | 0 |
| | *Maireana turbinata* | Top-fruit Bluebush | Y | 1 | Adult | 0 | 0 | >50 |
| | *Minuria cunninghamii* | Bush Minuria | Y | 1 | Mixed | 0 | >50 | 0 |
| | *Plantago drummondii* | Dark Plantain | N | 1 | | | | |
| | *Rhodanthe stricta* | Slender Everlasting | N | 1 | | | | |
| | *Salsola australis* | Buckbush | N | 3 | | | | |
| | *Sclerolaena brachyptera* | Short-wing Bindyi | N | 2 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 5 | | | | |
| | *Sclerolaena ventricosa* | Salt Bindyi | N | 4 | | | | |
| | *Sida fibulifera* | Pin Sida | N | 3 | | | | |
| | *Sida intricata* | Twiggy Sida | Y | 2 | Adult | 0 | >50 | <50 |
| | *Sporobolus actinocladus* | Ray Grass | N | 1 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 2 | Adult | >50 | 0 | 0 |
| | **Site 15 Totals: 25 (long-lived = 8, short-lived = 17)** | | | | | | | |
| Flora Site 16 / CAR016 | *Abutilon halophilum* | Plains Lantern-bush | Y | 4 | Mixed | <50 | >50 | 0 |
| | *Astrebla pectinata* | Barley Mitchell-grass | Y | 3 | Mixed | >50 | >50 | <50 |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 5 | Mixed | | | |
| | *Bulbine semibarbata* | Small Leek-lily | N | 1 | | | | |
| | *Cullen cinereum* | Annual Scurf-pea | N | 2 | | | | |
| | *Enneapogon avenaceus* | Common Bottle-washers | N | 1 | | 0 | >50 | <50 |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 3 | Adult | | | |
| | *Euphorbia stevenii* | Bottletree Spurge | N | 1 | | >50 | 0 | 0 |
| | *Frankenia serpyllifolia* | Thyme Sea-heath | Y | 3 | Adult | | | |
| | *Goodenia fascicularis* | Silky Goodenia | N | 1 | | | | |
| | *Lepidium phlebopetalum* | Veined Peppercress | N | 1 | | | | |
| | *Lotus cruentus* | Red-flower Lotus | N | 1 | | >50 | <50 | 0 |
| | *Maireana appressa* | Pale-fruit Bluebush | Y | 1 | Adult | >50 | 0 | 0 |
| | *Maireana eriantha* | Woolly Bluebush | Y | 2 | Adult | <50 | 0 | >50 |
| | *Minuria cunninghamii* | Bush Minuria | Y | 3 | Adult | <50 | >50 | 0 |
| | *Osteocarpum dipterocarpum* | Two-wing Bonefruit | N | 1 | | | | |
| | *Panicum decompositum* var. *decompositum* | Native Millet | N | 1 | | | | |
| | *Podolepis davisiana* | Button Podolepis | N | 1 | | | | |
| | *Sclerolaena brachyptera* | Short-wing Bindyi | N | 4 | | | | |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 3 | | | | |

| RAM Site | Scientific Name | Common Name | Long-lived[1] | CSR[2] | Age Class[3] | Grazing Level % of Total Population | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intact | Modified | Over-utilised |
| | *Sclerolaena intricata* | Tangled Bindyi | N | 2 | | | | |
| | *Sida fibulifera* | Pin Sida | N | 2 | | | | |
| | *Sporobolus actinocladus* | Ray Grass | N | 4 | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 3 | Adult | >50 | 0 | 0 |
| | **Site 16 Totals: 24 (long-lived = 9, short-lived =15)** | | | | | | | |
| Flora Site 17 / CAR017 | *Abutilon halophilum* | Plains Lantern-bush | Y | 3 | Adult | >50 | 0 | 0 |
| | *Acacia papyrocarpa* | Western Myall | Y | 6 | Mixed | >50 | 0 | 0 |
| | *Acacia tetragonophylla* | Dead Finish | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Anacampseros australiana* | Australian Anacampseros | N | | | | | |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 5 | Mixed | >50 | <50 | 0 |
| | *Chenopodium desertorum* ssp. | Desert Goosefoot | Y | 1 | Adult | >50 | 0 | 0 |
| | *Crinum flaccidum* | Murray Lily | N | | | | | |
| | *Dodonaea lobulata* | Lobed-leaf Hop-bush | Y | 5 | Mixed | >50 | <50 | 0 |
| | *Einadia nutans* ssp. | Climbing Saltbush | Y | 3 | Adult | >50 | >50 | 0 |
| | *Enchylaena tomentosa* var. *tomentosa* | Ruby Saltbush | Y | 4 | Mixed | >50 | <50 | 0 |
| | *Eremophila latrobei* ssp. *glabra* | Crimson Emubush | Y | 4 | Adult | >50 | 0 | 0 |
| | *Eremophila serrulata* | Green Emubush | Y | 3 | Adult | >50 | 0 | 0 |
| | *Eulalia aurea* | Silky Brown-top | Y | | | >50 | >50 | <50 |
| | *Exocarpos aphyllus* | Leafless Cherry | Y | 1 | Adult | >50 | 0 | 0 |
| | *Gnephosis arachnoidea* | Spidery Button-flower | N | | | | | |
| | *Lepidium phlebopetalum* | Veined Peppercress | N | | | | | |
| | *Maireana aphylla* | Cotton-bush | Y | 3 | Mixed | 0 | >50 | <50 |
| | *Maireana spongiocarpa* | Spongy-fruit Bluebush | Y | 3 | Adult | 0 | >50 | <50 |
| | *Ptilotus obovatus* | Silver Mulla Mulla | Y | 5 | Mixed | >50 | 0 | 0 |
| | *Rhagodia spinescens* | Spiny Saltbush | Y | 1 | Adult | >50 | <50 | 0 |
| | *Rostellularia adscendens* | Pink Tongues | N | | | | | |
| | *Santalum lanceolatum* | Plumbush | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Scaevola spinescens* | Spiny Fanflower | Y | 3 | Mixed | <50 | >50 | 0 |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | | | | | |
| | *Senna artemisioides* ssp. *helmsii* | Blunt-leaf Senna | Y | 3 | Adult | >50 | 0 | 0 |
| | *Senna artemisioides* ssp. *oligophylla* | Limestone Senna | Y | 3 | Adult | >50 | 0 | 0 |
| | *Senna artemisioides* ssp. *X artemisioides* | Silver Senna | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Sida petrophila* | Rock Sida | Y | 3 | Mixed | 0 | >50 | 0 |
| | *Solanum quadriloculatum* | Plains Nightshade | N | | | | | |
| | *Tecticornia medullosa* | Samphire | Y | 2 | Adult | >50 | 0 | 0 |
| | **Site 17 Totals: 30 (long-lived = 23 / short-lived = 7)** | | | | | | | |
| Flora Site 18 / CAR018 | *Abutilon otocarpum* | Desert Lantern-bush | Y | 2 | Adult | >50 | 0 | 0 |
| | *Acacia aneura* | Mulga | Y | 1 | Adult | <50 | >50 | 0 |
| | *Acacia papyrocarpa* | Western Myall | Y | 5 | Mixed | >50 | <50 | 0 |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 4 | Mixed | >50 | <50 | 0 |
| | *Boerhavia* sp. | Tar-vine | N | 3 | | | | |
| | *Cheilanthes lasiophylla* | Woolly Cloak-fern | N | 1 | | | | |
| | *Chenopodium curvispicatum* | Cottony Goosefoot | Y | 3 | Adult | >50 | 0 | 0 |
| | *Chenopodium desertorum* ssp. | Desert Goosefoot | Y | 2 | Adult | >50 | <50 | 0 |
| | *Crinum flaccidum* | Murray Lily | N | 1 | | | | |
| | *Digitaria brownii* | Cotton Panic-grass | Y | 4 | Adult | 0 | >50 | 0 |
| | *Dodonaea lobulata* | Lobed-leaf Hop-bush | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Enchylaena tomentosa* | Ruby Saltbush | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Eremophila latrobei* ssp. *glabra* | Crimson Emubush | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Eremophila oppositifolia* ssp. | Opposite-leaved Emubush | Y | 1 | Adult | 0 | 0 | >50 |
| | *Eulalia aurea* | Silky Brown-top | Y | 4 | Adult | >50 | <50 | <50 |
| | *Exocarpos aphyllus* | Leafless Cherry | Y | 1 | Adult | >50 | 0 | 0 |
| | *Gnephosis arachnoidea* | Spidery Button-flower | N | 3 | | | | |
| | *Lepidium phlebopetalum* | Veined Peppercress | N | 2 | | | | |
| | *Maireana aphylla* | Cotton-bush | Y | 1 | Adult | >50 | <50 | 0 |
| | *Maireana spongiocarpa* | Spongy-fruit Bluebush | Y | 2/4 | Mixed | >50 | <50 | 0 |
| | *Myoporum montanum* | Native Myrtle | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Ptilotus obovatus* | Silver Mulla Mulla | Y | 4 | Mixed | >50 | 0 | 0 |

| RAM Site | Scientific Name | Common Name | Long-lived[1] | CSR[2] | Age Class[3] | Grazing Level % of Total Population | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intact | Modified | Over-utilised |
| | *Rhagodia spinescens* | Spiny Saltbush | Y | 2 | Adult | >50 | 0 | 0 |
| | *Rostellularia adscendens* ssp. | Pink Tongues | N | 1 | | | | |
| | *Santalum lanceolatum* | Plumbush | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Scaevola spinescens* | Spiny Fanflower | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 1 | | | | |
| | *Senna artemisioides* ssp. *helmsii* | Blunt-leaf Senna | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Senna artemisioides* ssp. *X artemisioides* | Silver Senna | Y | 3 | Adult | >50 | 0 | 0 |
| | *Senna artemisioides* ssp. *X sturtii* | Grey Senna | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Sida corrugata* | Corrugated Sida | N | 3 | | | | |
| | *Sida petrophila* | Rock Sida | Y | 3 | Adult | >50 | 0 | 0 |
| | *Solanum lithophilum* | Velvet Potato-bush | N | 3 | | | | |
| | *Sonchus oleraceus** | Common Sow-thistle | N | 1 | | | | |
| | *Sporobolus actinocladus* | Ray Grass | N | 2/4 | | | | |
| | *Teucrium racemosum* | Grey Germander | Y | 2 | Adult | >50 | 0 | 0 |
| | *Wurmbea australis* | Inland Nancy | N | 1 | | | | |
| | **Site 18 Totals: 36 (long-lived =24, short-lived = 12)** | | | | | | | |
| Flora Site 19 / CAR019 | *Abutilon otocarpum* | Desert Lantern-bush | Y | 2 | Adult | >50 | 0 | 0 |
| | *Acacia papyrocarpa* | Western Myall | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Acacia tetragonophylla* | Dead Finish | Y | 4 | Adult | >50 | 0 | 0 |
| | *Atriplex vesicaria* | Bladder Saltbush | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Chenopodium curvispicatum* | Cottony Goosefoot | Y | 1 | Adult | >50 | 0 | 0 |
| | *Crinum flaccidum* | Murray Lily | N | 1 | | | | |
| | *Digitaria brownii* | Cotton Panic-grass | Y | 1 | Adult | 0 | 0 | 0 |
| | *Dodonaea lobulata* | Lobed-leaf Hop-bush | Y | 4/5 | Mixed | >50 | 0 | 0 |
| | *Duma florulenta* | Lignum | Y | 2 | Adult | >50 | 0 | 0 |
| | *Einadia nutans* ssp. | Climbing Saltbush | Y | 2/4 | Mixed | >50 | 0 | 0 |
| | *Enchylaena tomentosa* | Ruby Saltbush | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Enneapogon avenaceus* | Common Bottle-washers | N | 3 | | | | |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 2/4 | Adult | 0 | >50 | <50 |
| | *Eremophila serrulata* | Green Emubush | Y | 1 | Adult | >50 | 0 | 0 |
| | *Eucalyptus camaldulensis* ssp. *arida* | Northern River Red Gum | Y | 2/4 | Mixed | >50 | 0 | 0 |
| | *Eulalia aurea* | Silky Brown-top | Y | 2/4 | | >50 | >50 | <50 |
| | *Maireana aphylla* | Cotton-bush | Y | 3 | Adult | >50 | <50 | 0 |
| | *Malvastrum americanum* var. | Malvastrum | N | 3 | | | | |
| | *Marsilea drummondii* | Common Nardoo | N | 3 | | | | |
| | *Myoporum montanum* | Native Myrtle | Y | 2/4 | Mixed | >50 | 0 | 0 |
| | *Pluchea rubelliflora* | | N | 2/4 | | | | |
| | *Pterocaulon sphacelatum* | Apple-bush | N | 3 | | | | |
| | *Ptilotus obovatus* | Silver Mulla Mulla | Y | 4 | Adult | >50 | 0 | 0 |
| | *Santalum lanceolatum* | Plumbush | Y | 2/4 | Mixed | >50 | 0 | 0 |
| | *Scaevola spinescens* | Spiny Fanflower | Y | 2 | Mixed | >50 | <50 | 0 |
| | *Sclerolaena divaricata* | Tangled Bindyi | N | 1 | | | | |
| | *Senna artemisioides* ssp. *helmsii* | Blunt-leaf Senna | Y | 2/4 | Mixed | >50 | 0 | 0 |
| | *Senna artemisioides* ssp. *X artemisioides* | Silver Senna | Y | 2 | Adult | >50 | 0 | 0 |
| | *Senna artemisioides* ssp. *X sturtii* | Grey Senna | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Sida corrugata* var. | Corrugated Sida | N | 2 | | | | |
| | *Sida petrophila* | Rock Sida | Y | 2 | Adult | >50 | 0 | 0 |
| | *Solanum lithophilum* | Velvet Potato-bush | N | 2 | | | | |
| | *Sonchus oleraceus** | Common Sow-thistle | N | 1 | | | | |
| | *Teucrium racemosum* | Grey Germander | N | 1 | | | | |
| | *Trianthema triquetrum* | Red Spinach | N | 1 | | | | |
| | **Site 19 Totals: 36 (long-lived = 23, short-lived = 13)** | | | | | | | |

| RAM Site | Scientific Name | Common Name | Long-lived[1] | CSR[2] | Age Class[3] | Grazing Level % of Total Population | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intact | Modified | Over-utilised |
| Flora Site 20 / CAR020 | *Abutilon otocarpum* | Desert Lantern-bush | Y | 2 | Adult | >50 | 0 | 0 |
| | *Acacia papyrocarpa* | Western Myall | Y | 3 | Adult | >50 | <50 | 0 |
| | *Acacia tetragonophylla* | Dead Finish | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Centaurea melitensis** | Malta Thistle | N | 2 | | | | |
| | *Chenopodium curvispicatum* | Cottony Goosefoot | Y | 1 | Adult | >50 | 0 | 0 |
| | *Crinum flaccidum* | Murray Lily | N | 1 | | | | |
| | *Daucus glochidiatus* | Native Carrot | N | 2 | | | | |
| | *Digitaria brownii* | Cotton Panic-grass | Y | 4 | Adult | <50 | <50 | 0 |
| | *Dodonaea lobulata* | Lobed-leaf Hop-bush | Y | 4 | Mixed | >50 | >50 | <50 |
| | *Duma florulenta* | Lignum | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Einadia nutans* ssp. | Climbing Saltbush | Y | 2 | Mixed | >50 | 0 | 0 |
| | *Enchylaena tomentosa* | Ruby Saltbush | Y | 2/4 | Adult | >50 | 0 | 0 |
| | *Enneapogon avenaceus* | Common Bottle-washers | N | 1 | | | | |
| | *Eragrostis setifolia* | Bristly Love-grass | Y | 1 | Adult | >50 | >50 | 0 |
| | *Eremophila latrobei* ssp. *glabra* | Crimson Emubush | Y | 1 | Mixed | >50 | 0 | 0 |
| | *Eremophila serrulata* | Green Emubush | Y | 2 | Adult | >50 | 0 | 0 |
| | *Eucalyptus camaldulensis* ssp. *arida* | Northern River Red Gum | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Eulalia aurea* | Silky Brown-top | Y | 4 | Adult | <50 | >50 | 0 |
| | *Euphorbia tannensis* ssp. *eremophila* | Desert Spurge | N | 1 | | | | |
| | *Glossocardia bidens* | Native Cobbler's-pegs | N | 1 | | | | |
| | *Lepidium phlebopetalum* | Veined Peppercress | N | 3 | | | | |
| | *Malvastrum americanum* var. | Malvastrum | N | 3 | | | | |
| | *Marsilea drummondii* | Common Nardoo | N | 1 | | | | |
| | *Minuria cunninghamii* | Bush Minuria | Y | 1 | Adult | 0 | >50 | 0 |
| | *Myoporum montanum* | Native Myrtle | Y | 2/4 | Mixed | >50 | 0 | 0 |
| | *Pluchea rubelliflora* | | N | 4 | | | | |
| | *Ptilotus obovatus* | Silver Mulla Mulla | Y | 2/4 | Mixed | >50 | 0 | 0 |
| | *Rhagodia spinescens* | Spiny Saltbush | Y | 1 | Adult | >50 | >50 | 0 |
| | *Rostellularia adscendens* ssp. | Pink Tongues | N | 3 | | | | |
| | *Santalum lanceolatum* | Plumbush | Y | 2 | Mixed | >50 | <50 | 0 |
| | *Senna artemisioides* ssp. *helmsii* | Blunt-leaf Senna | Y | 3 | Mixed | >50 | 0 | 0 |
| | *Senna artemisioides* ssp. *X artemisioides* | Silver Senna | Y | 1 | Adult | >50 | 0 | 0 |
| | *Senna artemisioides* ssp. *X sturtii* | Grey Senna | Y | 1 | Adult | >50 | 0 | 0 |
| | *Setaria constricta* | Knotty-butt Paspalidium | Y | 2 | Adult | < 50 | > 50 | 0 |
| | *Sida corrugata* var. | Corrugated Sida | N | 1 | | | | |
| | *Sida petrophila* | Rock Sida | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Sisymbrium erysimoides** | Smooth Mustard | N | 1 | | | | |
| | *Solanum lithophilum* | Velvet Potato-bush | N | 1 | | | | |
| | *Teucrium racemosum* | Grey Germander | N | 2 | | | | |
| | *Themeda triandra* | Kangaroo Grass | Y | 1 | Adult | 0 | >50 | 0 |
| | *Trichodesma zeylanicum* var. | Camel Bush | N | 1 | | | | |
| | **Site 20 Totals: 41 (long-lived = 25, short-lived = 16)** | | | | | | | |
| Flora Site / CAR021 | *Acacia ligulata* | Umbrella Bush | Y | 4 | Mixed | >50 | 0 | 0 |
| | *Acacia oswaldii* | Umbrella Wattle | Y | 1 | Adult | 0 | >50 | 0 |
| | *Alectryon oleifolius* ssp. *canescens* | Bullock Bush | Y | 1 | Adult | 0 | >50 | 0 |
| | *Aristida holathera* var. | #N/A | N | | | | | |
| | *Atriplex velutinella* | Sandhill Saltbush | N | | | | | |
| | *Cullen pallidum* | White Scurf-pea | N | | | | | |
| | *Dodonaea viscosa* ssp. *angustissima* | Narrow-leaf Hop-bush | Y | 1 | Mixed | <50 | >50 | 0 |
| | *Einadia nutans* ssp. | Climbing Saltbush | Y | 1 | Adult | >50 | 0 | 0 |
| | *Enchylaena tomentosa* | Ruby Saltbush | Y | 3 | Adult | >50 | <50 | 0 |
| | *Enneapogon avenaceus* | Common Bottle-washers | N | | | | | |
| | *Euphorbia drummondii group* | Spurge | N | | | | | |
| | *Lycium australe* | Australian Boxthorn | Y | 1 | Adult | >50 | 0 | 0 |
| | *Maireana pyramidata* | Black Bluebush | Y | 1 | Adult | 0 | >50 | 0 |
| | *Nicotiana velutina* | Velvet Tobacco | N | | | | | |

| RAM Site | Scientific Name | Common Name | Long-lived[1] | CSR[2] | Age Class[3] | Grazing Level % of Total Population | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intact | Modified | Over-utilised |
| | *Lysiandra fuernrohrii* | Sand Spurge | Y | 3/4 | Mixed | >50 | 0 | 0 |
| | *Pimelea microcephala* ssp. *microcephala* | Shrubby Riceflower | Y | 1 | Adult | >50 | 0 | 0 |
| | *Polycalymma stuartii* | Poached-egg Daisy | N | | | | | |
| | *Roepera eremaea* | Climbing Twinleaf | N | | | | | |
| | *Salsola australis* | Buckbush | N | | | | | |
| | *Sida ammophila* | Sand Sida | N | | | | | |
| | *Sisymbrium erysimoides** | Smooth Mustard | N | 2/4 | | | | |
| | *Zygochloa paradoxa* | Sandhill Cane-grass | Y | 2 | Mixed | >50 | 0 | 0 |
| | **Site 21 Totals: 21 (long-lived = 11, short-lived = 11)** | | | | | | | |
| Site 22 / CAR022 | *Acacia ligulata* | Umbrella Bush | Y | 4/5 | Mixed | 0 | >50 | 0 |
| | *Acacia ramulosa* var. | Horse Mulga | Y | 1 | Adult | | | |
| | *Aristida holathera* var. *holathera* | Tall Kerosene Grass | N | | | | | |
| | *Atriplex velutinella* | Sandhill Saltbush | N | | | | | |
| | *Crotalaria eremaea* ssp. | Loose-flowered Rattle-pod | N | | | | | |
| | *Cullen pallidum* | White Scurf-pea | N | | | >50 | <50 | 0 |
| | *Dodonaea viscosa* ssp. *angustissima* | Narrow-leaf Hop-bush | Y | 1 | Adult | >50 | 0 | 0 |
| | *Einadia nutans* ssp. | Climbing Saltbush | Y | 1 | Adult | >50 | <50 | 0 |
| | *Enchylaena tomentosa* | Ruby Saltbush | Y | 3 | Adult | | | |
| | *Euphorbia drummondii group* | Spurge | N | | | | | |
| | *Hibiscus krichauffianus* | Velvet-leaf Hibiscus | N | | | >50 | <50 | 0 |
| | *Maireana pyramidata* | Black Bluebush | Y | 1 | Adult | | | |
| | *Nicotiana velutina* | Velvet Tobacco | N | | | | | |
| | *Paractaenum novae-hollandiae* ssp. *reversum* | Barbed-wire Grass | N | | | >50 | 0 | 0 |
| | *Pimelea microcephala* ssp. *microcephala* | Shrubby Riceflower | Y | 1 | Adult | | | |
| | *Polycalymma stuartii* | Poached-egg Daisy | N | | | >50 | 0 | 0 |
| | *Rhagodia spinescens* | Spiny Saltbush | Y | 1 | Adult | | | |
| | *Roepera howittii* | Clasping Twinleaf | N | | | | | |
| | *Salsola australis* | Buckbush | N | | | | | |
| | *Sida ammophila* | Sand Sida | N | | | | | |
| | *Sisymbrium erysimoides** | Smooth Mustard | N | 4/5 | | | | |
| | *Trichodesma zeylanicum var.* | Camel Bush | N | | | >50 | 0 | 0 |
| | *Zygochloa paradoxa* | Sandhill Cane-grass | Y | 4 | Adult | 0 | >50 | 0 |
| | **Site 22 Totals: 23 (long-lived = 9, short-lived = 14)** | | | | | | | |

* Non-native

[1] Long lived woody perennials – refer Appendix C

[2] CSR ratio (Source = DENR (2011). Pastoral Lease Assessment Manual. Pastoral Land Management Group

| CLASS | TERM | CSR | FIELD CRITERIA |
|---|---|---|---|
| 1 | Present | < 12 plants | < 12 plants within 200 m radius |
| 2 | Isolated Clumps | >20 spaces | Isolated clumps of two to five woody plants 200 m further apart |
| 3 | Isolated Plants | >20 spaces | Isolated plants |
| 4 | Very Sparse | 6-20 spaces | Well spaced, crowns well separated |
| 5 | Sparse | 1-5 spaces | Clearly spaced, crowns clearly separated |
| 6 | Mid dense | 0-0.9 spaces | Crowns touching to slight separation |
| 7 | Closed or dense | 0 | Crowns touching to overlapping |

[3] Age Classes: Recorded for Long-lived perennials only; M = Adults and Juveniles present; A = Adults only present; J = Juveniles only present

# Appendix C. Flora life span classification

**Table B2.1: Long-lived Woody Species Perennial Classification**

| Family | Scientific Name | Common Name | Long-lived woody? Yes (Y) No (N) |
|---|---|---|---|
| MALVACEAE | *Abutilon halophilum* | Plains Lantern-bush | Y |
| MALVACEAE | *Abutilon leucopetalum* | Desert Lantern-bush | Y |
| MALVACEAE | *Abutilon otocarpum* | Desert Lantern | Y |
| MALVACEAE | *Abutilon* sp. | Lantern-bush | Y |
| FABACEAE | *Acacia aneura* var. | Mulga | Y |
| FABACEAE | *Acacia papyrocarpa* | Western Myall | Y |
| FABACEAE | *Acacia tetragonophylla* | Dead Finish | Y |
| FABACEAE | *Acacia victoriae* ssp. | Elegant Wattle | Y |
| SAPINDACEAE | *Alectryon oleifolius* ssp. *canescens* | Bullock Bush | Y |
| AMARANTHACEAE | *Alternanthera denticulata* | Lesser Joyweed | N |
| AMARANTHACEAE | *Alternanthera nodiflora* | Common Joyweed | N |
| LORANTHACEAE | *Amyema maidenii* ssp. *maidenii* | Pale-leaf Mistletoe | Y |
| LORANTHACEAE | *Amyema quandang* var. *quandang* | Grey Mistletoe | Y |
| ANACAMPSEROTACEAE | *Anacampseros australiana* | Australian Anacampseros | N |
| ASTERACEAE | *Anemocarpa podolepidium* | Rock Everlasting | N |
| ASTERACEAE | *Angianthus* sp. | Cup-flower | N |
| BRASSICACEAE | *Arabidella glaucescens* | Bluish Cress | N |
| BRASSICACEAE | *Arabidella* sp. | Native Cress | N |
| POACEAE | *Aristida anthoxanthoides* | Yellow Three-awn | N |
| POACEAE | *Aristida contorta* | Curly Wire-grass | N |
| POACEAE | *Aristida holathera* var. *holathera* | Tall Kerosene Grass | N |
| POACEAE | *Aristida nitidula* | Brush Three-awn | N |
| POACEAE | *Aristida* sp. | Three-awn/Wire-grass | N |
| POACEAE | *Astrebla pectinata* | Barley Mitchell-grass | Y |
| POACEAE | *Astrebla* sp. | Mitchell-grass | Y |
| AMARANTHACEAE | *Atriplex fissivalvis* | Gibber Saltbush | N |
| AMARANTHACEAE | *Atriplex holocarpa* | Pop Saltbush | N |
| AMARANTHACEAE | *Atriplex lindleyi* ssp. | Baldoo | N |
| AMARANTHACEAE | *Atriplex lindleyi* ssp. *conduplicata* | Baldoo | N |
| AMARANTHACEAE | *Atriplex lindleyi* ssp. *inflata* | Corky Saltbush | N |
| AMARANTHACEAE | *Atriplex lindleyi* ssp. *lindleyi* | Baldoo | N |
| AMARANTHACEAE | *Atriplex* sp. | Saltbush | N |
| AMARANTHACEAE | *Atriplex spongiosa* | Pop Saltbush | N |
| AMARANTHACEAE | *Atriplex turbinata* | A Saltbush | N |
| AMARANTHACEAE | *Atriplex velutinella* | Sandhill Saltbush | N |
| AMARANTHACEAE | *Atriplex vesicaria* | Bladder Saltbush | Y |
| POACEAE | *Austrostipa nitida* | Balcarra Spear-grass | N |
| POACEAE | *Austrostipa scabra* ssp. | Rough Spear-grass | N |
| POACEAE | *Austrostipa* sp. | Spear-grass | N |
| POACEAE | *Austrostipa trichophylla* | Spear-grass | N |
| ASTERACEAE | *Bidens pilosa* | Cobblers Pegs | N |
| ASTERACEAE | *Blennospora drummondii* | Dwarf Button-flower | N |
| NYCTAGINACEAE | *Boerhavia dominii* | Tar-vine | N |
| NYCTAGINACEAE | *Boerhavia* sp. | Tar-vine | N |
| ASTERACEAE | *Brachyscome ciliaris* var. | Variable Daisy | N |
| ASTERACEAE | *Brachyscome ciliaris* var. *lanuginosa* | Woolly Variable Daisy | N |
| ASTERACEAE | *Brachyscome* sp. | Native Daisy | N |
| ASPHODELACEAE | *Bulbine semibarbata* | Small Leek-lily | N |
| ASPHODELACEAE | *Bulbine* sp. | Bulbine-lily | N |
| MONTIACEAE | *Calandrinia* sp. | Purslane/Parakeelya | N |
| MONTIACEAE | *Calandrinia volubilis* | Twining Purslane | N |
| ASTERACEAE | *Calotis hispidula* | Hairy Burr-daisy | N |
| ASTERACEAE | *Calotis* sp. | Burr-daisy | N |
| AIZOACEAE | *Carpobrotus rossii* | Native Pigface | Y |
| ASTERACEAE | *Centipeda cunninghamii* | Common Sneezeweed | N |
| ASTERACEAE | *Centipeda thespidioides* | Desert Sneezeweed | N |
| AMARANTHACEAE | *Chenopodium desertorum* ssp. | Desert Goosefoot | Y |

| Family | Scientific Name | Common Name | Long-lived woody? Yes (Y) No (N) |
|---|---|---|---|
| AMARANTHACEAE | *Chenopodium* sp. | Goosefoot | N |
| POACEAE | *Chloris pectinata* | Comb Windmill Grass | N |
| POACEAE | *Chloris* sp. | Windmill Grass/Chloris | N |
| ASTERACEAE | *Chrysocephalum pterochaetum* | Shrub Everlasting | N |
| ASTERACEAE | *Chrysocephalum* sp. | Everlasting | N |
| COMPOSITAE | *Compositae* sp. | Daisy Family | N |
| CONVOLVULACEAE | *Convolvulaceae* sp. | Bindweed Family | N |
| CONVOLVULACEAE | *Convolvulus angustissimus* ssp. | Narrow-leaf Bindweed | N |
| CONVOLVULACEAE | *Convolvulus erubescens complex* | Bindweed | N |
| CONVOLVULACEAE | *Convolvulus remotus* | Grassy Bindweed | N |
| CONVOLVULACEAE | *Convolvulus* sp. | Bindweed | N |
| ASTERACEAE | *Craspedia* sp. | Buttons | N |
| CRASSULACEAE | *Crassula* sp. | Crassula/Stonecrop | N |
| AMARYLLIDACEAE | *Crinum flaccidum* | Murray Lily | N |
| FABACEAE | *Crotalaria eremaea* ssp. | Loose-flowered Rattle-pod | N |
| FABACEAE | *Cullen australasicum* | Tall Scurf-pea | N |
| FABACEAE | *Cullen cinereum* | Annual Scurf-pea | N |
| FABACEAE | *Cullen graveolens* | Native Lucerne | N |
| FABACEAE | *Cullen pallidum* | Woolly Scurf-pea | N |
| FABACEAE | *Cullen* sp. | Scurf-pea | N |
| CONVOLVULACEAE | *Cuscuta* sp. | Dodder | N |
| POACEAE | *Cymbopogon ambiguus* | Lemon-grass | Y |
| APOCYNACEAE | *Cynanchum viminale* ssp. *australe* | Caustic Bush | Y |
| CYPERACEAE | *Cyperus rigidellus* | Dwarf Flat-sedge | N |
| CYPERACEAE | *Cyperus* sp. | Flat-sedge | N |
| POACEAE | *Dactyloctenium radulans* | Button-grass | N |
| APIACEAE | *Daucus glochidiatus* | Native Carrot | N |
| POACEAE | *Dichanthium sericeum* ssp. | Silky Blue-grass | Y |
| POACEAE | *Digitaria brownii* | Cotton Panic-grass | Y |
| POACEAE | *Digitaria divaricatissima* var. *divaricatissima* | Finger Panic-grass | Y |
| POACEAE | *Digitaria* sp. | Summer-grass | Y |
| AMARANTHACEAE | *Dissocarpus biflorus* var. | Two-horn Saltbush | N |
| AMARANTHACEAE | *Dissocarpus paradoxus* | Ball Bindii | N |
| SAPINDACEAE | *Dodonaea lobulata* | Lobed-leaf Hop-bush | Y |
| SAPINDACEAE | *Dodonaea viscosa* ssp. *angustissima* | Narrow-leaf Hop-bush | Y |
| POLYGONACEAE | *Duma florulenta* | Lignum | Y |
| AMARANTHACEAE | *Dysphania cristata* | Crested Goosefoot | N |
| AMARANTHACEAE | *Dysphania pumilio* | Clammy Goosefoot | N |
| POLYGONACEAE | *Duma florulenta* | Lignum | Y |
| AMARANTHACEAE | *Einadia nutans* ssp. *nutans* | Climbing Saltbush | Y |
| CYPERACEAE | *Eleocharis pallens* | Pale Spike-rush | N |
| AMARANTHACEAE | *Enchylaena tomentosa* var. | Ruby Saltbush | Y |
| POACEAE | *Enneapogon avenaceus* | Common Bottle-washers | N |
| POACEAE | *Enneapogon cylindricus* | Jointed Bottle-washers | N |
| POACEAE | *Enneapogon polyphyllus* | Leafy Bottle-washers | N |
| POACEAE | *Enneapogon* sp. | Bottle-washers / Nineawn | N |
| POACEAE | *Enteropogon acicularis* | Umbrella Grass | N |
| POACEAE | *Enteropogon ramosus* | Umbrella Grass | N |
| POACEAE | *Enteropogon* sp. | Umbrella Grass | N |
| POACEAE | *Eragrostis australasica* | Cane-grass | Y |
| POACEAE | *Eragrostis dielsii* | Mulka | N |
| POACEAE | *Eragrostis eriopoda* | Woollybutt | N |
| POACEAE | *Eragrostis parviflora* | Soft Love-grass | N |
| POACEAE | *Eragrostis setifolia* | Bristly Love-grass | Y |
| POACEAE | *Eragrostis* sp. | Love-grass | Y |
| POACEAE | *Eragrostis xerophila* | Knotty-butt Neverfail | Y |
| SCROPHULARIACEAE | *Eremophila duttonii* | Harlequin Emubush | Y |
| SCROPHULARIACEAE | *Eremophila glabra* ssp. | Tar Bush | Y |
| SCROPHULARIACEAE | *Eremophila latrobei* ssp. | Crimson Emubush | Y |
| SCROPHULARIACEAE | *Eremophila maculata* ssp. | Spotted Emubush | Y |
| SCROPHULARIACEAE | *Eremophila oppositifolia* ssp. | Opposite-leaved Emubush | Y |

| Family | Scientific Name | Common Name | Long-lived woody? Yes (Y) No (N) |
|---|---|---|---|
| SCROPHULARIACEAE | *Eremophila serrulata* | Green Emubush | Y |
| GERANIACEAE | *Erodium crinitum* | Blue Heron's-bill | N |
| GERANIACEAE | *Erodium* sp. | Heron's-bill/Crowfoot | N |
| MYRTACEAE | *Eucalyptus camaldulensis* ssp. | River Red Gum | Y |
| POACEAE | *Eulalia aurea* | Silky Brown-top | Y |
| EUPHORBIACEAE | *Euphorbia drummondii group* | Spurge | N |
| EUPHORBIACEAE | *Euphorbia* sp. | Spurge | N |
| EUPHORBIACEAE | *Euphorbia stevenii* | Bottletree Spurge | N |
| EUPHORBIACEAE | *Euphorbia tannensis* ssp. *eremophila* | Desert Spurge | N |
| SANTALACEAE | *Exocarpos aphyllus* | Leafless Cherry | Y |
| ASTERACEAE | *Flaveria trinervia* | Clustered Yellow-tops | N |
| FRANKENIACEAE | *Frankenia serpyllifolia* | Thyme Sea-heath | Y |
| FRANKENIACEAE | *Frankenia* sp. | Sea-heath | Y |
| FRANKENIACEAE | *Frankenia subteres* | Round Sea-heath | Y |
| MALVACEAE | *Gilesia biniflora* | Western Tar-vine | N |
| ASTERACEAE | *Glossocardia bidens* | Native Cobbler's-pegs | N |
| FABACEAE | *Glycine* sp. | Glycine | N |
| ASTERACEAE | *Gnephosis arachnoidea* | Spidery Button-flower | N |
| ASTERACEAE | *Gnephosis* sp. | Cup-flower | N |
| GOODENIACEAE | *Goodenia fascicularis* | Silky Goodenia | N |
| GOODENIACEAE | *Goodenia lunata* | Stiff Goodenia | N |
| GOODENIACEAE | *Goodenia pinnatifida* | Cut-leaf Goodenia | N |
| GOODENIACEAE | *Goodenia* sp. | Goodenia | N |
| GRAMINEAE | *Gramineae* sp. | Grass Family | N |
| AIZOACEAE | *Gunniopsis quadrifida* | Sturt's Pigface | Y |
| BORAGINACEAE | *Heliotropium* sp. | Heliotrope | N |
| MALVACEAE | *Hibiscus krichauffianus* | Velvet-leaf Hibiscus | N |
| POACEAE | *Iseilema membranaceum* | Small Flinders-grass | N |
| ASTERACEAE | *Ixiochlamys cuneifolia* | Silverton Daisy | N |
| ASTERACEAE | *Ixiochlamys nana* | Small Fuzzweed | N |
| ASTERACEAE | *Leiocarpa leptolepis* | Pale Plover-daisy | N |
| BRASSICACEAE | *Lepidium phlebopetalum* | Veined Peppercress | N |
| BRASSICACEAE | *Lepidium* sp. | Peppercress | N |
| LILIACEAE | *Liliaceae* sp. | Lily Family | N |
| ASPARAGACEAE | *Lomandra* sp. | Mat-rush | Y |
| FABACEAE | *Lotus cruentus* | Red-flower Lotus | N |
| SOLANACEAE | *Lycium australe* | Australian Boxthorn | Y |
| AMARANTHACEAE | *Maireana aphylla* | Cotton-bush | Y |
| AMARANTHACEAE | *Maireana appressa* | Pale-fruit Bluebush | Y |
| AMARANTHACEAE | *Maireana astrotricha* | Low Bluebush | Y |
| AMARANTHACEAE | *Maireana coronata* | Crown Fissure-plant | Y |
| AMARANTHACEAE | *Maireana eriantha* | Woolly Bluebush | Y |
| AMARANTHACEAE | *Maireana georgei* | Satiny Bluebush | Y |
| AMARANTHACEAE | *Maireana integra* | Entire-wing Bluebush | Y |
| AMARANTHACEAE | *Maireana pyramidata* | Black Bluebush | Y |
| AMARANTHACEAE | *Maireana sedifolia* | Bluebush | Y |
| AMARANTHACEAE | *Maireana* sp. | Bluebush/Fissure-plant | Y |
| AMARANTHACEAE | *Maireana spongiocarpa* | Spongy-fruit Bluebush | Y |
| AMARANTHACEAE | *Maireana turbinata* | Top-fruit Bluebush | Y |
| AMARANTHACEAE | *Malacocera tricornis* | Goat-head Soft-horns | N |
| MALVACEAE | *Malvastrum americanum* var. | Malvastrum | N |
| MARSILEACEAE | *Marsilea drummondii* | Common Nardoo | N |
| ASTERACEAE | *Minuria cunninghamii* | Bush Minuria | Y |
| ASTERACEAE | *Minuria denticulata* | Woolly Minuria | N |
| ASTERACEAE | *Minuria integerrima* | Smooth Minuria | N |
| ASTERACEAE | *Minuria leptophylla* | Minnie Daisy | N |
| LOGANIACEAE | *Mitrasacme* sp. | Mitrewort | N |
| SCROPHULARIACEAE | *Myoporum montanum* | Native Myrtle | Y |
| AMARANTHACEAE | *Neobassia proceriflora* | Desert Glasswort | N |
| SOLANACEAE | *Nicotiana velutina* | Velvet Tobacco | N |
| AMARANTHACEAE | *Osteocarpum acropterum* var. | Bonefruit | N |

| Family | Scientific Name | Common Name | Long-lived woody? Yes (Y) No (N) |
|---|---|---|---|
| AMARANTHACEAE | *Osteocarpum dipterocarpum* | Two-wing Bonefruit | N |
| AMARANTHACEAE | *Osteocarpum* sp. | Bonefruit | N |
| POACEAE | *Panicum decompositum* var. | Native Millet | N |
| POACEAE | *Panicum* sp. | Panic/Millet | N |
| POACEAE | *Paractaenum novae-hollandiae* ssp. *reversum* | Barbed-wire Grass | N |
| PHYLLANTHACEAE | *Lysiandra fuernrohrii* | Sand Spurge | N |
| THYMELAEACEAE | *Pimelea simplex* ssp. *simplex* | Desert Riceflower | N |
| PLANTAGINACEAE | *Plantago drummondii* | Dark Plantain | N |
| ASTERACEAE | *Pluchea rubelliflora* | Plains-bush | N |
| ASTERACEAE | *Podolepis capillaris* | Wiry Podolepis | N |
| ASTERACEAE | *Polycalymma stuartii* | Poached-egg Daisy | N |
| PORTULACACEAE | *Portulaca oleracea* | Common Purslane | N |
| PORTULACACEAE | *Portulaca* sp. | Purslane | N |
| ASTERACEAE | *Pterocaulon sphacelatum* | Apple-bush | N |
| AMARANTHACEAE | *Ptilotus incanus/obovatus* | Mulla | Y |
| AMARANTHACEAE | *Ptilotus nobilis* ssp. | Yellow-tails | N |
| AMARANTHACEAE | *Ptilotus obovatus* | Silver Mulla | Y |
| ASTERACEAE | *Pycnosorus pleiocephalus* | Soft Billy-buttons | N |
| ASTERACEAE | *Pycnosorus* sp. | Billy-buttons | N |
| AMARANTHACEAE | *Rhagodia* sp. | Saltbush | Y |
| AMARANTHACEAE | *Rhagodia spinescens* | Spiny Saltbush | Y |
| ASTERACEAE | *Rhodanthe corymbiflora* | Paper Everlasting | N |
| ASTERACEAE | *Rhodanthe floribunda* | White Everlasting | N |
| ASTERACEAE | *Rhodanthe microglossa* | Clustered Everlasting | N |
| ASTERACEAE | *Rhodanthe stricta* | Slender Everlasting | N |
| ASTERACEAE | *Rhodanthe uniflora* | Woolly Daisy | N |
| FABACEAE | *Rhynchosia australis* | Rhynchosia | N |
| ZYGOPHYLLACEAE | *Roepera ammophila* | Sand Twinleaf | N |
| ZYGOPHYLLACEAE | *Roepera aurantiaca* ssp. *aurantiaca* | Shrubby Twinleaf | Y |
| ZYGOPHYLLACEAE | *Roepera billardierei* | Coast Twinleaf | N |
| ZYGOPHYLLACEAE | *Roepera crenata* | Notched Twinleaf | N |
| ZYGOPHYLLACEAE | *Roepera eremaea* | Climbing Twinleaf | N |
| ZYGOPHYLLACEAE | *Roepera iodocarpa* | Violet Twinleaf | N |
| ZYGOPHYLLACEAE | *Roepera ovata* | Dwarf Twinleaf | N |
| ZYGOPHYLLACEAE | *Roepera prismatotheca* | Square-fruit Twinleaf | N |
| ZYGOPHYLLACEAE | *Roepera* sp. | Twinleaf | N |
| ACANTHACEAE | *Rostellularia adscendens* var. *pogonanthera* | Pink Tongues | N |
| POACEAE | *Rytidosperma caespitosum* | Common Wallaby-grass | Y |
| POACEAE | *Rytidosperma* sp. | Wallaby-grass | Y |
| AMARANTHACEAE | *Salsola australis* | Buckbush | N |
| SANTALACEAE | *Santalum lanceolatum* | Plumbush | Y |
| SANTALACEAE | *Santalum* sp. | Plumbush | Y |
| AIZOACEAE | *Sarcozona praecox* | Sarcozona | N |
| GOODENIACEAE | *Scaevola spinescens* | Spiny Fanflower | Y |
| AMARANTHACEAE | *Sclerolaena anisacanthoides* | | N |
| AMARANTHACEAE | *Sclerolaena bicornis* var. *bicornis* | Goat-head Bindyi | N |
| AMARANTHACEAE | *Sclerolaena brachyptera* | Short-wing Bindyi | N |
| AMARANTHACEAE | *Sclerolaena cuneata* | Tangled Bindyi | N |
| AMARANTHACEAE | *Sclerolaena decurrens* | Green Bindyi | N |
| AMARANTHACEAE | *Sclerolaena diacantha* | Horned Bindyi | N |
| AMARANTHACEAE | *Sclerolaena divaricata* | Tangled Bindyi | N |
| AMARANTHACEAE | *Sclerolaena intricata* | Poverty Bush | N |
| AMARANTHACEAE | *Sclerolaena parallelicuspis* | Western Copperburr | N |
| AMARANTHACEAE | *Sclerolaena patenticuspis* | Spear-fruit Copperburr | N |
| AMARANTHACEAE | *Sclerolaena* sp. | Copperburr | N |
| #N/A | *Sclerolaena* sp. *Pernatty Station* | | N |
| AMARANTHACEAE | *Sclerolaena tricuspis* | Giant Redburr | N |
| AMARANTHACEAE | *Sclerolaena ventricosa* | Salt Copperbush | N |
| ASTERACEAE | *Senecio magnificus* | Showy Groundsel | Y |
| FABACEAE | *Senna artemisioides* ssp. | Desert Senna | Y |
| FABACEAE | *Senna artemisioides* ssp. *alicia x ssp. coriacea* | Desert Senna | Y |

| Family | Scientific Name | Common Name | Long-lived woody? Yes (Y) No (N) |
|---|---|---|---|
| FABACEAE | *Senna artemisioides* ssp. *artemisioides x* ssp. *coriacea* | Desert Senna | Y |
| FABACEAE | *Senna artemisioides* ssp. *helmsii* | Blunt-leaf Senna | Y |
| FABACEAE | *Senna artemisioides* ssp. *oligophylla* | Limestone Senna | Y |
| FABACEAE | *Senna artemisioides* ssp. *X artemisioides* | Silver Senna | Y |
| FABACEAE | *Senna artemisioides* ssp. *X coriacea* | Broad-leaf Desert Senna | Y |
| FABACEAE | *Senna artemisioides* ssp. *X sturtii* | Grey Senna | Y |
| POACEAE | *Setaria constricta* | Knotty-butt Paspalidium | Y |
| POACEAE | *Setaria* sp. | Pigeon-grass | Y |
| MALVACEAE | *Sida ammophila* | Sand Sida | N |
| MALVACEAE | *Sida corrugata* var. | Variable Sida | N |
| MALVACEAE | *Sida fibulifera* | Pin Sida | N |
| MALVACEAE | *Sida intricata* | Twiggy Sida | Y |
| MALVACEAE | *Sida petrophila* | Rock Sida | Y |
| MALVACEAE | *Sida trichopoda* | Narrow-leaf Sida | N |
| SOLANACEAE | *Solanum esuriale* | Potato-bush | N |
| SOLANACEAE | *Solanum quadriloculatum* | Tomato Bush | N |
| SOLANACEAE | *Solanum sturtianum* | Sturt's Nightshade | Y |
| POACEAE | *Sporobolus actinocladus* | Ray Grass | N |
| POACEAE | *Sporobolus caroli* | Yakka Grass | N |
| CELASTRACEAE | *Stackhousia muricata ssp. Perennial (W.R.Barker 3641)* | | N |
| BRASSICACEAE | *Stenopetalum lineare* | Narrow Thread-petal | N |
| FABACEAE | *Swainsona* sp. | Swainson-pea | N |
| ASTERACEAE | *Taraxacum cygnorum* | Dandelion | N |
| AMARANTHACEAE | *Tecticornia indica* ssp. | Samphire | Y |
| AMARANTHACEAE | *Tecticornia medullosa* | Samphire | Y |
| AMARANTHACEAE | *Tecticornia pergranulata* ssp. | Black-seed Samphire | Y |
| AMARANTHACEAE | *Tecticornia* sp. | Samphire | Y |
| AMARANTHACEAE | *Tecticornia tenuis* | Slender Samphire | Y |
| AIZOACEAE | *Tetragonia eremaea* | Annual Spinach | N |
| AIZOACEAE | *Tetragonia tetragonoides* | Warragul cabbage | N |
| LAMIACEAE | *Teucrium racemosum* | Grey Germander | N |
| POACEAE | *Themeda triandra* | Kangaroo Grass | Y |
| ASPARAGACEAE | *Thysanotus baueri* | Mallee Fringe-lily | N |
| ASPARAGACEAE | *Thysanotus patersonii* | Twining Fringe-lily | N |
| ASPARAGACEAE | *Thysanotus* sp. | Fringe-lily | N |
| ARALIACEAE | *Trachymene glaucifolia* | Blue Parsnip | N |
| POACEAE | *Tragus australianus* | Red Spinach | N |
| AIZOACEAE | *Trianthema triquetrum* | Small Hogweed | N |
| BORAGINACEAE | *Trichodesma zeylanicum* var. *zeylanicum* | Camel Bush | N |
| POACEAE | *Tripogonella loliiformis* | Purple Plume Grass | N |
| POACEAE | *Triraphis mollis* | Purple Needle-grass | N |
| ASTERACEAE | *Vittadinia cuneata* var. | Fuzzy New Holland Daisy | N |
| ASTERACEAE | *Vittadinia* sp. | New Holland Daisy | N |
| CAMPANULACEAE | *Wahlenbergia communis* | Tufted Bluebell | N |
| CAMPANULACEAE | *Wahlenbergia luteola* | Yellow-wash Bluebell | N |
| CAMPANULACEAE | *Wahlenbergia* sp. | Native Bluebell | N |
| CAMPANULACEAE | *Wahlenbergia stricta* ssp. *stricta* | Tall Bluebell | N |
| COLCHICACEAE | *Wurmbea latifolia* ssp. *latifolia* | Early Nancy | N |

# Appendix D. Jessup Sites raw data

## Appendix D1. Jessup raw data – total number of long-lived woody perennial adults and juveniles, spring 2024

| Species | Life Stage | Flora Site | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 11 | 12 | 13 | 15 | 16 | 17 | 18 | 19 | 20 | |
| *Abutilon halophilum* | Adult | 19 | 13 | 4 | | 73 | | | 1 | | 176 | | | 1 | 28 | | | | | 315 |
| | Juvenile | 2 | 4 | | | 23 | | 1 | 2 | | 23 | | | | 25 | | | | | 80 |
| *Abutilon otocarpum* | Adult | | | | | | | | | 10 | | | | | | | 4 | 1 | 3 | 18 |
| | Juvenile | | | | | | | | | 3 | | | | | | | | | | 3 |
| *Acacia papyrocarpa* | Adult | | 18 | | | | | | 1 | 1 | | | | | | | 334 | 10 | 1 | 365 |
| | Juvenile | | | | | | | | | | | | | | | 9 | | 1 | | 10 |
| *Acacia tetragonophylla* | Adult | | | | | | | | | 25 | | | | | | | | 27 | 9 | 61 |
| *Atriplex vesicaria* | Adult | 86 | 112 | 143 | 173 | 314 | 152 | 51 | 104 | 1 | 498 | 228 | 180 | 93 | 324 | 142 | 160 | 11 | | 2772 |
| | Juvenile | 3 | 9 | 19 | 30 | 77 | 5 | 10 | 39 | | 80 | 15 | 42 | 9 | 15 | 17 | | 4 | | 374 |
| *Chenopodium curvispicatum* | Adult | | | | | | | | | 2 | | | | | | 13 | 5 | 2 | | 22 |
| *Dodonaea lobulta* | Adult | | | | | | | | | 29 | | | | | | 19 | 15 | 112 | 13 | 188 |
| | Juvenile | | | | | | | | | | | | | | | | | | | |
| *Duma florulenta* | Adult | | | | | | | | | 7 | | | | | | | | 4 | 26 | 37 |
| | Juvenile | | | | | | | | | | | | | | | | | | 1 | 1 |
| *Einadia nutans* | Adult | | | | | | | | | 1 | | | | | | 1 | | 11 | 1 | 14 |
| *Enchylaena tomentosa* | Adult | | | | | | | | | 14 | | | | | | 58 | 55 | 34 | 6 | 167 |
| | Juvenile | | | | | | | | | | | | | | | 46 | 21 | 6 | | 73 |
| *Eremophila latrobei* | Adult | | | | | | | | | 2 | | | | | | | 9 | | 1 | 12 |
| | Juvenile | | | | | | | | | | | | | | | 1 | | | | 1 |
| *Eremophila oppositifolia* | Adult | | | | | | | | | | | | | | | | 1 | | | 1 |
| *Eremophila serrulata* | Adult | | | | | | | | | 1 | 1 | | | | | 2 | | | | 4 |
| *Eremopila oppositifolia* | Adult | | | | | | | | 1 | | | | | | | | | | | 1 |
| *Eucalyptus camaldulensis* ssp. *arida* | Adult | | | | | | | | | 6 | | | | | | | | 6 | 7 | 19 |
| | Juvenile | | | | | | | | | | | | | | | | | | 2 | 2 |
| *Exocarpos aphyllus* | Adult | | | | | | | | | 2 | | | | | | | | | | 2 |
| *Frankenia serpyllifolia* | Adult | | 1 | 27 | 3 | 65 | 5 | 9 | 11 | | 2 | 1 | 14 | 8 | | | | | | 146 |
| | Juvenile | | | 1 | | | | | 1 | | | | | | | | | | | 2 |
| *Maireana aphylla* | Adult | | | | | | | | | | 2 | | | 21 | | | 1 | | | 24 |
| *Maireana appressa* | Adult | | | 5 | | 1 | 1 | 11 | 1 | | | | 2 | | 2 | | | | | 23 |
| | Juvenile | | | | | | | 1 | | | | | | | | | | | | 1 |
| *Maireana astrotricha* | Adult | | | | | | | 3 | | | | | | | | | | | | 3 |

| Species | Life Stage | Flora Site | | | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 11 | 12 | 13 | 15 | 16 | 17 | 18 | 19 | 20 | |
| *Maireana eriantha* | Adult | | | | | 3 | | | | | | | | | | | | | | 3 |
| *Maireana spongiocarpa* | Adult | | | | | | | 4 | | | 37 | | | | | 18 | 19 | | | 78 |
| | Juvenile | | | | | | | | | | | | | | | 1 | | | | 1 |
| *Maireana turbinata* | Adult | | | | | 7 | | | | | | | | | | | | | | 7 |
| *Maireana turbinata/georgii* | Adult | | | | | | | 2 | | | | | | | | | | | | 2 |
| *Minuria cunninghamii* | Adult | 3 | | 12 | 1 | 5 | 24 | 1 | | | 43 | 8 | 3 | | 2 | | | | | 102 |
| | Juvenile | | | 1 | | | | | | | | | | 4 | 2 | | | | | 7 |
| *Myoporum montanum* | Adult | | | | | | | | | 7 | | | | | | | | 25 | 10 | 42 |
| | Juvenile | | | | | | | | | 7 | | | | | | | 1 | 11 | 14 | 33 |
| *Ptilotus obovatus* | Adult | | | | | | | | | 129 | | | | | | 48 | 97 | 13 | 5 | 292 |
| | Juvenile | | | | | | | | | 4 | | | | | | 34 | 7 | | | 45 |
| *Rhagodia spinescens* | Adult | | | | | | | | | 1 | | | | | | 3 | 7 | | | 11 |
| *Santalum lanceolatum* | Adult | | | | | | | | | 3 | | | | | | | | 2 | 1 | 6 |
| | Juvenile | | | | | | | | | 1 | | | | | | | | 2 | 12 | 15 |
| *Scaevola spinescens* | Adult | | | | | | | | | 26 | | | | | | 1 | 2 | 22 | 7 | 58 |
| | Juvenile | | | | | | | | | 2 | | | | | | 1 | | 2 | 2 | 7 |
| *Senna artemisiodes artemisioides* | Adult | | | | | | | | | 2 | | | | | | | | | | 2 |
| *Senna artemisiodes helmsii* | Adult | | | | | | | | | 1 | | | | | | | | | | 1 |
| *Senna artemisioides* ssp. *artemisioides* | Adult | | | | | | | | | | | | | | | 1 | | 1 | | 2 |
| | Juvenile | | | | | | | | | | | | | | | | 3 | | | 3 |
| *Senna artemisioides* ssp. *helmsii* | Adult | | | | | | | | | | | | | | | | | | 1 | 1 |
| *Senna artemisioides* ssp. *oligophylla* | Adult | | | | | | | | | | | | | | | 5 | | | | 5 |
| *Senna artemisioides* ssp. *sturtii* | Adult | | | | | | | | | | | | | | | | | 1 | | 1 |
| | Juvenile | | | | | | | | | | | | | | | | | 1 | | 1 |
| *Sida intricata* | Adult | 3 | | | 4 | | | 1 | | | 2 | | | 14 | | | | | | 24 |
| *Sida intricata/fibulifera* | Adult | | | | | | | | | | | 71 | | | | | | | | 71 |
| *Sida petrophila* | Adult | | | | | | | 3 | | 50 | | | | | | 3 | | 4 | 2 | 62 |
| | Juvenile | | | | | | | 15 | | 6 | | | | | | | | | 1 | 22 |
| *Tecticornia medullosa* | Adult | 1 | 1 | 59 | 2 | 112 | 20 | | | | 3 | 8 | 73 | 2 | 8 | | | | | 289 |
| | Juvenile | | | 1 | 0 | 3 | | | | | | | 5 | | 8 | | | | | 17 |
| *Tecticornia pergranulata* | Adult | | | | | | | 31 | 32 | | | | | | | | | | | 63 |
| *Tecticornia tenuis* | Adult | | | 1 | 5 | | | 6 | 9 | | | | | | | | | | | 21 |
| | Juvenile | | | | 2 | | | | 8 | | | | | | | | | | | 10 |
| *Teucrium racemosum* | Adult | | | | | | | | | | | | | | | | | 1 | | 1 |

# Appendix D2. Eliza Creek species abundance trends

| *Acacia tetragonophylla* | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
|---|---|---|---|---|---|---|---|---|
| 10 | 39 | 28 | 22 | 43 | 37 | 34 | 25 | 25 |
| 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 19 | 31 | 27 | 26 | 19 | 26 | 32 | 26 | 27 |
| 20 | 9 | 6 | 7 | 11 | 14 | 11 | 11 | 9 |
| ***A. tetragonophylla* All Sites** | **79** | **61** | **55** | **73** | **77** | **77** | **63** | **61** |
| *Acacia papyrocarpa* | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 10 | 0 | 1 | 0 | 2 | 3 | 0 | 0 | 1 |
| 17 | 33 | 28 | 30 | 29 | 33 | 37 | 21 | 27 |
| 18 | 42 | 53 | 15 | 49 | 45 | 63 | 56 | 54 |
| 19 | 8 | 20 | 11 | 10 | 15 | 13 | 13 | 11 |
| 20 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| ***A. papyrocarpa* Totals All Sites** | **85** | **103** | **57** | **90** | **97** | **114** | **91** | **94** |
| *Dodonaea lobulata* | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 10 | 25 | 37 | 25 | 31 | 33 | 25 | 38 | 30 |
| 17 | 17 | 21 | 24 | 20 | 21 | 22 | 18 | 19 |
| 18 | 11 | 11 | 13 | 15 | 15 | 14 | 13 | 15 |
| 19 | 106 | 122 | 116 | 118 | 150 | 128 | 106 | 112 |
| 20 | 13 | 6 | 12 | 16 | 12 | 20 | 11 | 13 |
| ***Dodonaea* Totals All Sites** | **172** | **197** | **190** | **200** | **231** | **209** | **186** | **189** |
| *Duma florulenta* | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 10 | 6 | 6 | 8 | 7 | 5 | 8 | 7 | 7 |
| 17 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19 | 0 | 2 | 5 | 2 | 7 | 7 | 5 | 4 |
| 20 | 27 | 31 | 24 | 26 | 26 | 24 | 24 | 27 |
| ***Duma* Totals All Sites** | **33** | **53** | **37** | **35** | **38** | **39** | **36** | **38** |
| *Eremophila latrobei* | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 10 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 2 |
| 17 | 0 | 0 | 1 | 1 | 1 | 2 | 0 | 1 |
| 18 | 3 | 7 | 9 | 5 | 11 | 9 | 10 | 9 |
| 20 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| ***E. latrobei* Totals All Sites** | **4** | **8** | **12** | **7** | **13** | **13** | **12** | **13** |
| *Eremophila serrulata* | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 10 | 2 | 2 | 2 | 0 | 1 | 0 | 1 | 1 |
| 17 | 1 | 1 | 0 | 1 | 1 | 3 | 2 | 2 |
| 18 | 2 | 1 | 0 | 4 | 0 | 0 | 0 | 0 |
| 19 | 1 | 2 | 1 | 2 | 0 | 1 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ***E. serrulata* Totals All Sites** | **6** | **6** | **3** | **7** | **2** | **4** | **3** | **3** |
| *Maireana spongiocarpa* | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 17 | nr | 14 | 10 | 24 | 12 | 27 | 18 | 19 |
| 18 | nr | 19 | 11 | 29 | 16 | 33 | 29 | 19 |
| ***Maireana* Totals All Sites** | | **33** | **21** | **53** | **28** | **60** | **47** | **38** |
| *Myoporum montanum* | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 10 | 23 | 7 | 19 | 23 | 10 | 27 | 5 | 14 |
| 19 | 27 | 17 | 18 | 15 | 17 | 19 | 36 | 1 |
| 20 | 16 | 14 | 19 | 16 | 16 | 27 | 20 | 36 |
| ***Myoporum* Totals All Sites** | **66** | **38** | **56** | **54** | **43** | **73** | **61** | **24** |
| *Ptilotus obovatus* | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 10 | 25 | 66 | 31 | 65 | 71 | 105 | 115 | 133 |
| 17 | 30 | 30 | 31 | 46 | 52 | 95 | 84 | 82 |
| 18 | 100 | 73 | 48 | 46 | 23 | 97 | 80 | 104 |
| 19 | 9 | 1 | 5 | 6 | 12 | 18 | 17 | 13 |
| 20 | 0 | 0 | 3 | 1 | 1 | 2 | 3 | 5 |
| ***Ptilotus* Totals All Sites** | **164** | **170** | **118** | **164** | **159** | **317** | **299** | **337** |

| *Scaevola spinescens* | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
|---|---|---|---|---|---|---|---|---|
| 10 | 12 | 21 | 6 | 11 | 22 | 13 | 23 | 28 |
| 17 | 4 | 4 | 5 | 2 | 3 | 4 | 5 | 2 |
| 18 | 4 | 3 | 3 | 2 | 1 | 2 | 2 | 2 |
| 19 | 11 | 9 | 11 | 12 | 15 | 18 | 16 | 24 |
| 20 | 2 | 1 | 9 | 10 | 6 | 5 | 5 | 9 |
| **Scaevola Totals All Sites** | **33** | **38** | **34** | **37** | **47** | **42** | **51** | **65** |
| Senna (all species combined) | 2018 Autumn | 2018 Spring | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
| 10 | 4 | 2 | 3 | 4 | 5 | 4 | 5 | 3 |
| 17 | 7 | 4 | 4 | 3 | 6 | 7 | 6 | 6 |
| 18 | 4 | 6 | 3 | 4 | 2 | 5 | 3 | 3 |
| 19 | 1 | 3 | 1 | 2 | 0 | 2 | 2 | 3 |
| 20 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| **Senna Totals All Sites** | **16** | **15** | **11** | **13** | **13** | **19** | **17** | **16** |

# Appendix E. Canopy cover visual estimates

**Western Myall Transects**

| Species / Transect | Tree No. | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 Spring |
|---|---|---|---|---|---|---|---|
| Western Myall / 17A | 1 | 98 | 100 | 100 | 100 | 100 | 90 |
| | 2 | 98 | 100 | 100 | 95 | 100 | 95 |
| | 2b | | | | 76 | 75 | 65 |
| | 2c* | | | | | | 100 |
| | 3 | 100 | 100 | 100 | 100 | 100 | 100 |
| | 4 | 40 | 32 | 45 | 41 | 40 | 20 |
| | 5 | 95 | 90 | 98 | 95 | 100 | 80 |
| | 5b | | | 95 | 90 | 100 | 90 |
| | 6 | 86 | 100 | 100 | 100 | 100 | 80 |
| | 7 | 86 | 86 | 100 | 98 | 100 | 100 |
| | 7b | | | 100 | 100 | 100 | 100 |
| | 7c | | | 100 | 100 | 100 | 100 |
| | **Mean** | **86** | **87** | **94** | **90** | **92** | **85** |
| | **SD** | **21** | **25** | **17** | **18** | **19** | **23** |
| Western Myall / 17B | 1 | 100 | 98 | 100 | 98 | 95 | 95 |
| | 2 | 95 | 95 | 95 | 90 | 100 | 80 |
| | 3 | 95 | 76 | 76 | 78 | 100 | 70 |
| | 4 | 76 | 95 | 90 | 86 | 90 | 90 |
| | 5 | 100 | 100 | 100 | 100 | 100 | 100 |
| | 5b | | | 100 | 95 | 100 | 90 |
| | 6 | 72 | 86 | 86 | 77 | 90 | 70 |
| | 7 | 90 | 95 | 100 | 100 | 100 | 95 |
| | **Mean** | **90** | **92** | **93** | **91** | **97** | **86** |
| | **SD** | **11.3** | **8.4** | **8.8** | **9.4** | **4.6** | **11.6** |
| Western Myall / 18A | 1 | 86 | nr | 81 | 81 | 100 | 95 |
| | 1b | | | | | | 95 |
| | 2 | 86 | nr | 81 | 90 | 90 | 80 |
| | 3 | 9 | nr | 1 | 5 | 5 | 5 |
| | 3b | | | | | 100 | 100 |
| | 4 | 98 | nr | 81 | 100 | 100 | 90 |
| | 5 | 98 | nr | 85.5 | 100 | 100 | 80 |
| | 6 | 98 | nr | 98 | 100 | 100 | 80 |
| | 7 | 100 | nr | 85.5 | 86 | 100 | 90 |
| | 7a | | | | | 100 | 90 |
| | 7b | | | | | 100 | 90 |
| Western Myall / 18A | 7c | | | | | 100 | 90 |
| | 8 | 10 | nr | 0 (died) | 0 | 0 | 0 |
| | 8a | | | | 90 | 100 | 90 |
| | 8c | | nr | 85.5 | 86 | 100 | Not intercepted |
| | 8d | | | | | 100 | Not intercepted |
| | 9 | 95 | nr | 76.5 | 77 | 100 | 60 |
| | 10 | 95 | nr | 76.5 | 100 | 100 | 100 |
| | 11 | 100 | nr | 90.25 | 100 | 100 | 100 |
| | 12 | 100 | nr | 90.25 | 100 | 100 | 90 |
| | **Mean** | **81** | | **72** | **80** | **89** | **80** |
| | **SD** | **34** | | **32** | **34** | **31** | **19** |
| Western Myall / 18B | 1 | 57 | nr | 8 | 1 | 0 | 5 |
| | 1b | | | | | | 60 |
| | 2 | 56 | nr | 25 | 40 | 72 | 50 |
| | 3 | 29 | nr | 6 | 23 | 12 | 10 |
| | 4 | 67 | nr | 49 | 76 | 90 | 70 |
| | 5 | 2 | nr | 0 (died) | 0 | 0 | 0 |
| | **Mean** | **42** | **nr** | **22** | **28** | **35** | **33** |
| | **SD** | **27** | **nr** | **20** | **32** | **43** | **31** |

*Shaded cells represent trees recorded for first time in 2024

**River Red Gum**

| Species / Transect | Tree No. | 2019 Autumn | 2019 Spring | 2020 Spring | 2021 Spring | 2022 Spring | 2023 Autumn | 2024 spring |
|---|---|---|---|---|---|---|---|---|
| River Red gum 19A | 1 | 93 | 88 | 90 | 86 | 81 | 90 | 85 |
| | 5 | 40 | 27 | 27 | 27 | 29 | 29 | 30 |
| | 7 | 72 | 77 | 90 | 75 | 80 | 100 | 70 |
| | 8 | 57 | 72 | 56 | 57 | 63 | 100 | 50 |
| | 9 | 26 | 68 | 45 | 63 | 75 | 100 | 70 |
| | 10 | 64 | 90 | 72 | 54 | 76 | 100 | 60 |
| | **Mean** | **59** | **70** | **63** | **60** | **67** | **87** | **61** |
| | **SD** | **24** | **23** | **25** | **20** | **20** | **29** | **19** |
| Western Myall 19A | 2 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | 4b | | | | 72 | 100 | 100 | 100 |
| | 4c | | | | 100 | 100 | 100 | 90 |
| | 6 | 93 | 100 | 100 | 100 | 100 | 100 | 90 |
| | 6b | | | | 100 | 100 | 100 | 90 |
| | 6c | | | | 100 | 90 | 100 | 90 |
| | 10b | | | | 100 | 100 | 100 | 100 |
| | **Mean** | **97** | **100** | **100** | **96** | **99** | **100** | **95** |
| | **SD** | **4** | **0** | **0** | **10** | **4** | **0** | **5** |
| River Red Gum 19B | 1 | 8 | 5 | 9 | 5 | 5 | 4 | 5 |
| | 2 | 46 | 86 | 81 | 90 | 96 | 100 | 80 |
| | 4 | 51 | 15 | 3 | 0 | 0 | 0 | 0 |
| | 5 | 33 | 81 | 56 | 43 | 81 | 100 | 35 |
| | 5A | | | | | 10 | 100 | 20 |
| | 6 | 67 | 90 | 86 | 77 | 60 | 100 | 70 |
| | **Mean** | **4** | **55** | **47** | **43** | **42** | **67** | **47** |
| | **SD** | **22** | **42** | **39** | **41** | **42** | **51** | **31** |
| Western Myall 19B | 6A | 100 | 100 | 100 | 100 | nr | nr | nr |
| | 7 | 10 | 8 | 5 | 3 | 5 | 15 | 5 |
| | 7B | | | | 81 | 86 | 100 | 95 |
| | 7C | | | | | | 100 | 95 |
| | 8 | 100 | 100 | 98 | 93 | 95 | 100 | 90 |
| | 5AA | | | | | 100 | 100 | 100 |
| | 5B | | | | 100 | 100 | 100 | 100 |
| | **Mean** | **70** | **69** | **68** | **75** | **77** | **86** | **79** |
| | **SD** | **52** | **53** | **54** | **41** | **41** | **35** | **37** |
| River Red Gum 20A | 1 | 55 | 80 | 46 | 68 | 90 | 100 | 80 |
| | 2 | 2 | 3 | 2 | 23 | 90 | 90 | 10 |
| | 3 | 6 | 11 | 30 | Not recorded | 96 | 100 | 90 |
| | 4 | 42 | 72 | 53 | 60 | 63 | 80 | 40 |
| | 5 | 34 | 45 | 35 | 18 | 67 | 90 | 60 |
| | 6 | 55 | 48 | 53 | 64 | 90 | 100 | 70 |
| | 7 | 86 | 88 | 56 | 81 | 98 | 100 | 80 |
| | 8 | 18 | 42 | 33 | 18 | 38 | 70 | 35 |
| | 10 | 54 | 49 | 49 | 46 | 90 | 90 | 80 |
| | **Mean** | **39** | **49** | **40** | **47** | **80** | **91** | **61** |
| | **SD** | **27** | **29** | **17** | **25** | **20** | **11** | **27** |
| River Red Gum 20B | 1 | 24 | 45 | 35 | 28 | 48 | 70 | 70 |
| | 2 | 81 | 86 | 68 | 77 | 98 | 100 | 95 |
| | 3 | 20 | 36 | 33 | 23 | 67 | 90 | 65 |
| | 4 | 81 | 86 | 49 | 56 | 86 | 80 | 80 |
| | **Mean** | **52** | **63** | **46** | **46** | **75** | **85** | **78** |
| | **SD** | **34** | **27** | **16** | **25** | **22** | **13** | **13** |
| Western Myall 20A (one tree only) | **9** | **100** | **100** | **90** | **77** | **100** | **100** | **70** |

# Appendix F. Fauna

**Table F1: Bird species detected at formal bird survey sites and opportunistic sites at Carrapateena during the spring 2024 survey**

| Family | *Species Name* | Common Name | Site | | | | | | | | | | | | | | | | Opportunistic[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 11 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | |
| Podicipedidae | *Tachybaptus novaehollandiae novaehollandiae* | Australasian Grebe | | | | | | | | 1 | | | | | | | | | | | DD, NED, SED, AD |
| Artamidae | *Gymnorhina tibicen* | Australian Magpie | 1 | 1[2] | | 1 | | 1 | 1 | | 1 | | | 1 | | | | | 1 | 1 | NED, SED |
| Aegothelidae | *Aegotheles cristatus* | Australian Owlet-nightjar | | | | | 1 | | 1 | | 1 | | | | | | | | | | |
| Motacillidae | *Anthus australis australis* | Australian Pipit | | 1[2] | | 1[2] | 1 | 1[2] | 1 | | 1 | 1 | 1[2] | 1[2] | | | | | | | DD, EV, NED, SED, Admin, AD |
| Glareolinae | *Stiltia isabella* | Australian Pratincole | 1 | 1 | | 1 | | 1[2] | 1 | | | | 1 | 1 | | | | | | | SED, AD |
| Corvidae | *Corvus coronoides* | Australian Raven | 1[2] | 1[2] | 1 | 1 | 1[2] | 1[2] | 1 | | 1 | | 1 | 1[2] | | | 1 | | | | DD, SED, WAR, |
| Psittacidae | *Barnardius zonarius zonarius* | Australian Ringneck | | | | | | | 1 | | 1 | | | | | | | 1 | | | YC |
| Rallidae | *Porzana fluminea* | Australian Spotted Crake | | | | | | | | | | | | | | | | | | | SED |
| Anatidae | *Chenonetta jubata* | Australian Wood Duck | | | | | | | | | | | | | | | | | | | SED |
| Charadriidae | *Vanellus tricolor* | Banded Lapwing | | | | | | | | | | | | | | | | | | | DD, SED |
| Anatidae | *Cygnus atratus* | Black Swan | | | | | | | | | | | | | | | | | | | SED |
| Artamidae | *Artamus cinereus* | Black-faced Woodswallow | 1 | 1 | 1 | | 1 | | 1 | 1 | 1 | 1 | | 1 | | 1 | 1 | 1 | 1 | | SED, WAR |
| Charadriidae | *Elseyornis melanops* | Black-fronted Dotterel | | | | | | | | | | | | | | | | | | | DD, NED, SED, AD |
| Rallidae | *Tribonyx ventralis* | Black-tailed Nativehen | | | | | | | | 1 | | | | | | | | | | | SED |
| Recurvirostridae | *Himantopus himantopus* | Black-winged Stilt | | | | | | | | | | | | | | | | | | | SED |
| Falconidae | *Falco berigora* | Brown Falcon | | | | 1 | | | | | | | 1 | | | | | | | | |
| Locustellidae | *Cincloramphus cruralis* | Brown Songlark | | | | 1 | | 1 | | | | | | 1 | | | | | | | |
| Psittacidae | *Melopsittacus undulatus* | Budgerigar | 1 | | | | 1 | | 1 | 1 | 1 | | | 1[2] | | | | 1 | | | SED |
| Acanthizidae | *Acanthiza uropygialis* | Chestnut-rumped Thornbill | | | | | | | 1 | | 1 | | | | | | | 1 | | | |
| Cinclosomatidae | *Cinclosoma cinnamomeum* | Cinnamon Quailthrush | 1 | 1 | | | | | 1 | | | | | | | | | | | | CWM02 |
| Cacatudiae | *Nymphicus hollandicus* | Cockatiel | 1 | | | | | | | | | | | | | | | | | | SED |
| Columbidae | *Phaps chalcoptera* | Common Bronzewing | | | | | | | 1 | | | | | | | | | | | | |
| Scolopacidae | *Actitis hypoleucos* | Common Sandpiper | | | | | | | | | | | | | | | | | | | |
| Columbidae | *Ocyphaps lophotes* | Crested Pigeon | 1 | | | | | | 1 | 1 | 1 | | | | 1 | 1 | | 1 | 1 | | NED, SED, AD |
| Meliphagidae | *Epthianura tricolor* | Crimson Chat | 1 | 1 | | | 1 | 1 | 1 | | | | 1 | 1 | | | | | 1 | | |
| Psittacidae | *Northiella haematogaster haematogaster* | Eastern Bluebonnet | | | | | | | | | | | | | | | | | | | |

| Family | *Species Name* | Common Name | Site | | | | | | | | | | | | | | | | Opportunistic[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 11 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | |
| Casuariidae | *Dromaius novaehollandiae* | Emu | | 1 | | | | | 1 | | 1 | | | | | | 1 | | | 1 | DD, SED, WAR |
| Rallidae | *Fulica atra* | Eurasian Coot | | | | | | | | | | | | | | | | | | | NED, SED |
| Hirundinidae | *Petrochelidon ariel* | Fairy Martin | | | | | | | 1 | | | | | | | | | | | | NED, SED |
| Cacatudiae | *Eolophus roseicapillus* | Galah | 1 | | | | 1 | | 1 | | 1 | | 1 | 1[2] | | | 1 | 1 | 1 | | |
| Artamidae | *Cracticus torquatus* | Grey Butcherbird | 1 | 1 | | | | | | | 1 | | | | 1 | | 1 | | | | |
| Anatidae | *Anas gracilis* | Grey Teal | | | | | | | 1 | 1 | | | | | | | | | | | |
| Anatidae | *Aythya australis* | Hardhead | | | | | | | | | | | | | | | | | | | |
| Podicipedidae | *Poliocephalus poliocephalus* | Hoary-headed Grebe | | | | | | | | | | | | | | | | | | | SED |
| Petroicidae | *Melanodryas cucullata westralensis* | Hooded Robin | | | | | | | | 1 | | | | | | | | | | | |
| Passeridae | *Passer domesticus* | House Sparrow | | | | | | | | | | | | | | | | | | | EV, Admin |
| Charadriidae | *Passer domesticus* | Inland Dotterel | 1 | | | | | | | | | | | | | | | | | | CMW02 |
| Cacatudiae | *Cacatua sanguinea sanguinea* | Little Corella | 1 | | | | | | | | 1 | | | | | | | | | | NED, SED, CWM05 |
| Monarchidae | *Grallina cyanoleuca* | Magpie-lark | | | | | | | 1 | | | | | | | | | | | | SED |
| Charadriidae | *Vanellus miles* | Masked Lapwing | | | | | | | | | | | | | | | | | | | SED |
| Artamidae | *Artamus personatus* | Masked Woodswallow | 1 | | | | | | 1 | | 1 | 1 | | 1 | | | | | | | |
| Dicaeidae | *Dicaeum hirundinaceum* | Mistletoe Bird | | | | | | | | | 1 | | | | | | | | | | |
| Psittacidae | *Psephotus varius* | Mulga Parrot | | | | | | | | | 1 | | | | 1 | 1 | | 1 | | | SED |
| Falconidae | *Falco cenchroides* | Nankeen Kestrel | | | 1 | 1 | 1 | | 1 | 1 | | | | 1 | | | | 1 | | | SED, WAR |
| Meliphagidae | *Epthianura aurifrons* | Orange Chat | | | | 1 | | 1 | | 1 | | | 1 | | | | | | | | SED, AD |
| Anatidae | *Anas superciliosa* | Pacific Black Duck | | | | | | | | 1 | | | | | | | | | | | SED |
| Pelecanidae | *Pelecanus conspicillatus* | Pelican | | | | 1 | | | | | | | | | | | | | | | |
| Anatidae | *Malacorhynchus membranaceus* | Pink-eared Duck | | | | | | | | | | | | | | | | | | | SED |
| Maluridae | *Malurus assimilis* | Purple-backed Fairywren | | | | | | | 1 | 1 | 1 | | | | | | | 1 | | 1 | |
| Meropidae | *Merops ornatus* | Rainbow Bee-eater | | | | | | | 1 | | 1 | 1 | | | | | | | | | |
| Alcedinidae | *Todiramphus pyrrhopygius* | Red-backed Kingfisher | 1 | 1 | | | | | | | | | | | | | | | | | |
| Petroicidae | *Petroica goodenovii* | Red-capped Robin | | | | | | | | | | | | | | | | | | | SED |
| Charadriidae | *Erythrogonys cinctus* | Red-kneed Dotterel | | | | | | | | | | | | | | | | | | | SED |
| Recurvirostridae | *Recurvirostra novaehollandiae* | Red-necked Avocet | | | | | | | | | | | | | | | | | | | SED |
| Acanthizidae | *Calamanthus campestris* | Rufous Fieldwren | 1 | 1 | | 1[2] | 1[2] | 1[2] | 1 | | | 1 | 1[2] | 1[2] | | | | | | | LFA Aero, LFA Tju |
| Locustellidae | *Cincloramphus mathewsi* | Rufous Songlark | | | | | | | | | | | | | | | | | | | SED |
| Scolopacidae | *Calidris acuminata* | Sharp-tailed Sandpiper | | | | | | | | | | | | | | | | | | | SED |
| Laridae | *Larus novaehollandiae* | Silver Gull | | | 1 | | | | | | | | | | | | | | | | |

| Family | *Species Name* | Common Name | Site | | | | | | | | | | | | | | | | | Opportunistic[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 11 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | |
| Meliphagidae | *Gavicalis virescens* | Singing Honeyeater | 1 | 1 | | | | 1 | 1 | 1 | 1 | | 1 | 1[2] | 1 | 1 | | 1 | 1 | 1 | NED, SED |
| Meliphagidae | *Acanthogenys rufogularis* | Spiny-cheeked Honeyeater | 1 | 1 | | | | | 1 | | 1 | | 1 | | 1 | | 1 | 1 | | | DD, SED |
| Pardalotidae | *Pardalotus striatus* | Striated Pardalote | | | | | | | 1 | | 1 | | | | | | | | | | |
| Hirundinidae | *Petrochelidon nigricans* | Tree Martin | | | | | | | 1 | | 1 | | | | | | | 1 | | | NED, SED, AD |
| Accipitridae | *Aquila audax* | Wedge-tailed Eagle | | | | | | 1 | | | | 1 | | | | | | 1 | | | AD |
| Hirundinidae | *Hirundo neoxena* | Welcome Swallow | | | | 1 | | 1 | 1 | | 1 | | 1 | 1[2] | | | | | | | DD, NED, SED, EV, AD |
| Hirundinidae | *Cheramoeca leucosterna* | White-backed Swallow | | | | 1 | | 1 | 1[2] | | | | 1 | | | | | | | | |
| Pomatostomidae | *Pomatostomus superciliosus* | White-browed Babbler | | | | | | | 1 | 1 | 1 | | | 1 | | | | | 1 | | |
| Ardeidae | *Egretta novaehollandiae* | White-faced Heron | | | | | | | | | | | | | | | | | | | SED |
| Meliphagidae | *Epthianura albifrons* | White-fronted Chat | | | | | | | 1 | | | | 1 | | | | | | | | SED |
| Meliphagidae | *Lichenostomus penicillatus* | White-plumed honeyeater | | | | | | | | | | | | | | | | | | | SED |
| Maluridae | *Malurus leucopterus* | White-winged Fairywren | | 1 | 1 | | 1 | | 1 | 1 | 1 | 1 | 1 | 1[2] | 1 | | | 1 | | 1 | DD, SED, LFA Tju |
| Campephagidae | *Lalage tricolor* | White-winged Triller | | | | | | | 1[2] | | 1 | | | | | | | | | | |
| Rhipiduridae | *Rhipidura leucophrys* | Willie Wagtail | | | | | | | 1 | | 1 | | | | | | 1 | | | | NED, SED, DD, EV |
| Meliphagidae | *Manorina flavigula* | Yellow-throated Miner | | | | | | | | | 1 | | | | | | | | | | |
| Estrildidae | *Taeniopygia guttata* | Zebra Finch | 1 | | 1 | 1 | | | 1 | 1 | 1 | 1 | | 1 | | | | 1 | | 1 | |
| | | Grand Total | 19 | 14 | 6 | 13 | 10 | 12 | 35 | 15 | 29 | 8 | 14 | 17 | 6 | 4 | 7 | 15 | 7 | 6 | |

[1]Opportunistic observation locations: South Eliza Dam (SED), North Eliza Dam (NED), Dawson Dam (DD), Exploration Village (EV), Western Access Road (WAR), Exploration Village (EV), CWM02/5 (weed monitoring sites), YC (Yeltacowie Creek), [2]Observed plus Song meter detection.; Note '1' denotes present, not counts of individuals; Grey cells = EPBC Status. No bird surveys were undertaken at Site 12 and 13 due to unsuitable conditions and limited time available.

Specialised Zoological

# Acoustic analysis and bat call identification from Carrapateena, South Australia

Prepared for **Lathwida Environmental Pty Ltd**

Version **29 January 2025**

SZ project reference **SZ754**

**Specialised Zoological** ABN 92 265 437 422
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This report should be included as an appendix in any larger submission to Government, and cited as:

Specialised Zoological (2025). Acoustic analysis and bat call identification from Carrapateena, South Australia. Unpublished report by Specialised Zoological for Lathwida Environmental Pty Ltd, version 2025-01-29, project reference SZ754.

## Version history

| Date | Note |
|---|---|
| 2025-01-29 | Final version |
| | |
| | |
| | |

## Summary

Bat identifications from bat detector sound files are provided from recordings made in the Carrapateena study area, c. 65 km east of Woomera, near the Carrapateena Arm of Lake Torrens, South Australia.

The dataset submitted for analysis included a total of 539 WAV format bat detector sound files from three recording sites over 8 recording nights (nights of 2024-10-16 – 2024-10-21).

Five species of bat were detected in the recordings (**Tables 1** and **2**; **Figure 1**). All species were identified unambiguously.

## Methods

The ultrasonic recordings provided were recorded in WAV sound format from Wildlife Acoustics Song Meter Mini Bat bat detectors. All sound files were inspected in Anabat Insight version 2.1.3 software and Adobe Audition version 23.1.

Species identifications were made based on measurements of characteristic frequency and observation of pulse shape, and with reference to information in Armstrong et al. (2021). Nomenclature follows Jackson and Groves (2015). Distribution information for all bat species considered here was checked against the BatMap resource hosted by the Australasian Bat Society, Inc (https://www.ausbats.org.au/batmap.html) (Milne et al. 2023).

## References

Armstrong K.N., Clarke S., Linke A., Scanlon A., Roetman P., Hitch, A.T. and Donnellan S.C. (2021b). Citizen science implements the first intensive acoustics-based survey of insectivorous bat species across the Murray-Darling Basin of South Australia. *Australian Journal of Zoology* 68: 364–381. https://doi.org/10.1071/ZO20051

Jackson, S.M. and Groves, C.P. (2015). *Taxonomy of Australian mammals*. CSIRO Publishing, Victoria.

Milne D.J., Reardon T.B. and Ford G. (2023) BatMap – authoritative distribution maps for Australian bats. *Australian Mammalogy*. 45: 350–355. https://doi.org/10.1071/AM23005

# Limitations

The identifications presented in this report have been made within the following context:

1. The identifications made herein were based on the ultrasonic acoustic data recorded and provided by a 'third party' (the client named on the front of this report).

2. The scope of this report extended to providing information on the identification of bat species in bulk ultrasonic recordings. Further extended comment on these species and the possible impacts of a planned project on bat species were not part of the scope.

3. In the case of the present report, the recording equipment was not set up and supplied by Specialised Zoological. The equipment was operated by the third party during the survey.

4. Other than the general location of the study area, Specialised Zoological has not been provided with detailed information of the survey area, has not made a visit to observe the habitats available for bats, nor have we visited the specific project areas on a previous occasion.

5. Specialised Zoological has had no input into the overall design and timing of this bat survey, recording site placement, nor the degree of recording site replication.

6. While Specialised Zoological has made identifications to the best of our ability given the available materials, and reserves the right to re-examine the data and revise any identification following a query, it is the client's and / or proponent's responsibility to provide supporting evidence for any identification, which might require follow-up trapping effort or non-invasive methods such as video recordings. Specialised Zoological bears no liability for any follow-up work that may be required to support an identification based initially on the analysis of acoustic recordings undertaken and reported on here.

7. There are a variety of factors that affect the 'detectability' of each bat species, given the frequency, power and shape characteristics of their calls. Further information on the analysis and the various factors that can impinge on the reliability of identifications can be requested.

8. The analysis of ultrasonic recordings is one of several methods that can be used to survey for bats, and comprehensive surveys typically employ more than one method. If an identification in the present report is ambiguous or in question, a trapping programme would help to resolve the presence of the possibilities in the project area.

9. This version of the document supersedes any previous version. Previous drafts are not authorised by us for submission to the regulator or the public domain.

**Table 1**. Species identified from all sites combined.

| | |
|---|---|
| **VESPERTILIONIDAE** | |
| Gould's Wattled Bat | *Chalinolobus gouldii* |
| Lesser Long-eared Bat | *Nyctophilus geoffroyi* |
| Inland Forest Bat | *Vespadelus baverstocki* |
| **MOLOSSIDAE** | |
| White-striped Free-tailed Bat | *Austronomus australis* |
| Inland Free-tailed Bat | *Ozimops petersi* |

**Table 2**. Species identifications summarised for all nights across each recording site (see *Table 1* for full species names).

| Site | Unit serial | Night | Coordinates | *A. australis* | *C. gouldii* | *O. petersi* | *N. geoffroyi* | *V. baverstocki* |
|---|---|---|---|---|---|---|---|---|
| Carra CAR007 | SMU13599 | 16/10/2024 | -31.17247, 137.44265 | . | . | X | X | X |
| Carra CAR007 | SMU13599 | 17/10/2024 | -31.17247, 137.44265 | . | . | X | X | . |
| Carra CAR007 | SMU13599 | 18/10/2024 | -31.17247, 137.44265 | . | . | . | X | X |
| Eliza Creek CAR010 | SMU13599 | 21/10/2024 | -31.23181, 137.52590 | . | X | . | X | X |
| South Eliza Dam | SMU13725 | 18/10/2024 | -31.34085, 137.50383 | . | X | . | . | X |
| South Eliza Dam | SMU13725 | 19/10/2024 | -31.34085, 137.50383 | . | X | X | X | X |
| South Eliza Dam | SMU13725 | 20/10/2024 | -31.34085, 137.50383 | . | X | X | X | X |
| South Eliza Dam | SMU13725 | 21/10/2024 | -31.34085, 137.50383 | X | X | X | X | X |

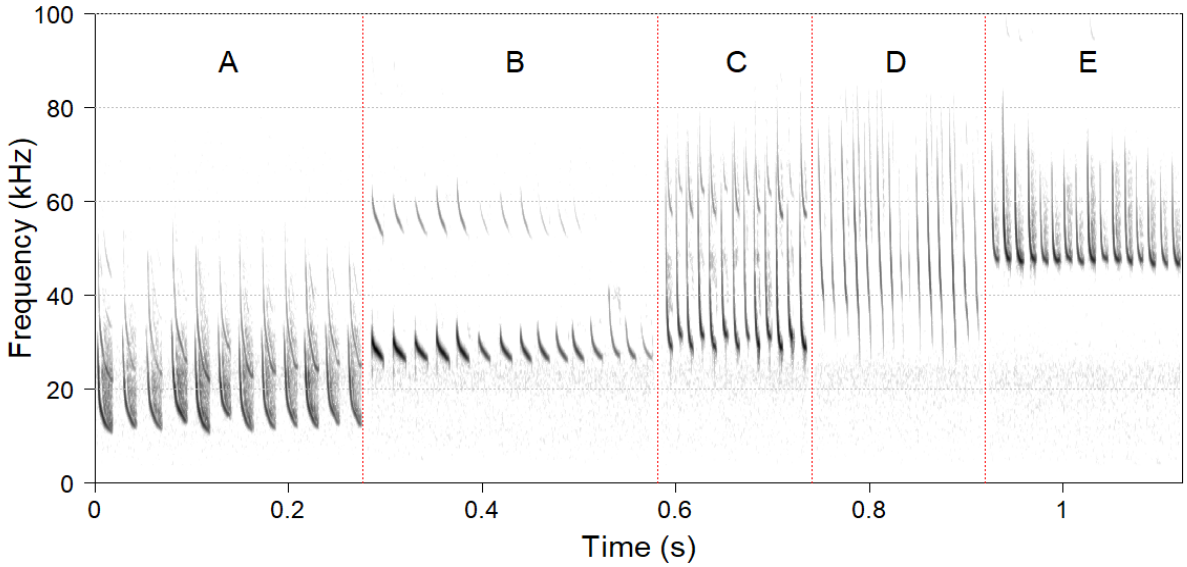


**Figure 1**. Representative echolocation call sequence portions of the species identified (**A**: *Austronomus australis*; **B**: *Ozimops petersi*; **C**: *Chalinolobus gouldii*; **D**: *Nyctophilus geoffroyi*; **E**: *Vespadelus baverstocki*; time between pulses has been compressed).

# Appendix G. Weeds

## Appendix G1. Weed summary

**Table G1: Weeds recorded at various locations across the Carrapateena Site during baseline (2012-2016) and compliance (autumn 2018 to spring 2024)**

| *Scientific name* | Common Name | Location | EBS 2012 – 2016 | Years recorded between 2018 and 2023 and (CSR)* | Spring 2024 CSR* |
|---|---|---|---|---|---|
| *Asphodelus fistulosus* | Onion Weed | Dawson Dam | NR | 2020 (2) | NR |
| *Brassica tournefortii* | Mustard | CWM01 | Present | NR | NR |
| *Carrichtera annua* | Wards Weed | CWM01 | NR | 2021 (isolated CSR 4) | |
| | | CWM05 | NS | NR | 1 |
| *Carthamus lanatus* | Saffron Thistle | CWM01 | Present | 2018, 2021, 2023 (1,2) | |
| | | CAR007 | Present | NR | |
| | | South Eliza Dam | NS | 2021 (2) | 2 |
| | | Whittata Creek | NS | NS | |
| *Centaurea calcitrapa* | Star Thistle | CWM02 | Present | NR | |
| *Centaurea melitensis* | Malta Thistle | CAR010 | Present | 2021 (1) | |
| | | CAR018 | NS | 2021, 2023 (1) | |
| | | CAR020 | NS | 2021, 2023 (2) | 2/4 |
| | | CWM01 | NS | NR | 1/5 |
| | | Dawson Dam | NS | 2021, 2022 (2) | 1/3 |
| *Centarium erythraea / tenuiflorum* | Centaury | CAR010 | Present | NR | |
| | | EV EIA | NS | 2018 (1), 2023 (4) | |
| | | Dawson Dam | NS | 2020 (4), 2023 (1) | |
| | | Anzac Dam | NS | 2022 (1) | |
| | | South Eliza Dam | NS | 2022 (2) | |
| | | North Eliza Dam | NS | NR | |
| | | Dawson | NS | 2023 (2/4) | |
| *Chenopodium album/murale* | Goosefoot | Expo Village EIA | NS | 2018, 2019, 2021, 2023 (2/4) | 2/4 |
| | | Anzac Dam | NS | 2018, 2020 - 2023 (1/2/4) | |
| | | Whittata Creek | NS | 2021 (1) | |
| | | Dawson Dam | NR | 2020 - 2023 (2/3/4) | |
| *Citrullus species, inc. C. colocynthis* | Bitter Melon | Anzac Dam | NS | 2019 – 2023 (2/3/4) | |
| | | South Eliza Dam | NS | 2019, 2020 (2/4) | |
| | | Dawson Dam | NS | 2018 – 2020, 2023 (1/2/4) | 2 |
| | | CWM01 | NR | 2020, 2022 (1/3) | |
| | | CWM02 | NR | 2022 (1) | |
| | | CWM05 | NS | 2020, 2022, 2023 (2/3/4/5) | 3 |

| *Scientific name* | Common Name | Location | EBS 2012 – 2016 | Years recorded between 2018 and 2023 and (CSR)* | Spring 2024 CSR* |
|---|---|---|---|---|---|
| | | CWM06 | NR | 2020, 2022, 2023 (1/2/3) | |
| | | CWM021 | NS | 2020, 2022, 2023 (1/2) | |
| | | CWM022 | NS | 2020, 2022, 2023 (1/2) | |
| | | Tjungu EIA | NS | 2023 (1/3) | |
| *Cucumis myriocarpus* | Paddy Melon | EV EIA | NS | 2020, 2023 (3) | |
| | | CWM01 | NR | 2020 (3) | |
| | | Dawson Dam | NR | 2020, 2023 (2/3/5) | |
| | | South Eliza Dak | NR | 2020, 2023 (2/3/5) | |
| *Cynodon dactylon* | Couch | Whittata Creek | NS | 2021 (2) | 2 |
| *Erodium sp. including E. cicutarium* | Cut-leaf Stork's-bill | CWM02 | NR | 2020 (1) | |
| | | Dawson Dam | NR | 2020 (1) | |
| | | Whittata Creek | NS | 2021 (1) | |
| | | Anzac Dam | NR | 2020, 2021 (1/2) | |
| *Heliotropium curassavicum* | Smooth Heliotrope | North Eliza | NS | 2018 – 2023 (2/3/4/5) | 2/3 |
| | | South Eliza | NS | 2018 – 2023 (2/3/4/5) | 2/4/5 |
| | | Anzac Dam | NS | 2018 – 2023 (2/4/5/6) | |
| | | Dawson Dam | NS | 2018 – 2023 (2/4/5/6) | 2/4/5/6 |
| | | CWM02 | Present | 2019 – 2023 (1/2/3/4/) | 3 |
| | | Whittata Creek | NS | 2021 (2) | |
| | | CWM01 | NR | 2023 (1) | 2 |
| | | CWM02 | Present | 2019 – 2021, 2023 (1/2) | |
| | | CWM06 | NR | 2023 (1) | |
| *Heliotropium europeum and/or supinum* | Spreading Heliotrope | CWM01 | Present | 2018, 2021 (1/2) | |
| | | CWM02 | NR? | NR | |
| | | Anzac Dam | NS | 2019 (1) | |
| | | North Eliza Dam | NS | 2019 – 2023 (2/3/4) | 2 |
| | | South Eliza Dam | NS | 2021 – 2023 (1/2/4) | 2 |
| | | Dawson Dam | NS | 2018 – 2021 (2/3/4) | 2 |
| | | Whittata Creek | NS | 2021 (2) | |
| *Lepidium africanum* | Peppercress | CWM02 | Present | NR | |
| *Lysimachia arvensis* | Scarlet Pimpernel | Expo Village EIA | NS | 2018 – 2022 (2/4) | 2/6 |
| | | CWM001 | NR | 2022 (1) | |
| | | CWM006 | NR | 2020 (1) | |
| | | North Eliza Dam | NS | NR | 1 |
| *Malva parviflora* | Mallow | Anzac Dam | NS | 2019 (1) | |
| | | North Eliza Dam | NS | NR | 1 |
| | | South Eliza Dam | NS | 2023 (3) | |

| *Scientific name* | Common Name | Location | EBS 2012 – 2016 | Years recorded between 2018 and 2023 and (CSR)* | Spring 2024 CSR* |
|---|---|---|---|---|---|
| | | CWM01 | NR | 2020, 2022 (1) | |
| | | CWM02 | NR | 2020, 2023 (2/3) | |
| *Medicago* sp. *(including M. minima)* | Medic | CWM01 | NR | 2022 (1) | |
| | | CWM02 | NR | 2022 (1) | 3 |
| | | North Eliza Dam | NS | NR | 3 |
| | | South Eliza Dam | NS | NE | 3 |
| *Mesembryanthemum crystallinum* | Iceplant | CWM01 | NR | 2020 (3) | |
| | | South Eliza Dam, EV | NR | 2020 (1) | |
| *Mesembryanthemum nodiflorum* | Slender Iceplant | CAR001, CAR008, CAR009, CAR010 | Present | NR | |
| *Nicotiana glauca* | Tree Tobacco | CAR013 | Present | 2022 (1) | |
| | | Dawson Dam | NS | 2023 (1) | |
| | | South Eliza Dam | NS | 2018 – 2023 (2/4/5) | 2/4 |
| *Opuntia* sp. [1] | Prickly Pear | Yeltacowie homestead | NS | 2018 – 2023 (1) | 1 |
| *Polygonum aviculare* | Wire Weed | Anzac Dam | NS | 2019 (1) | |
| *Rostraria pumila* | Tiny Bristle Grass | CAR003-CAR005, CAR007, CAR008, CAR012-CAR015, CAR022 | CAR003- CAR005, CAR007, CAR008, CAR012-CAR015 | CAR004, CAR012 (1)<br>Recorded in 2019 an 2020 | |
| | | South Eliza Dam | NS | 2019 (3) | |
| | | Expo Villlage | NS | 2019 – 2022 (1/2/4) | 2 |
| *Rumex vesicarius* | Rosy Dock | CAR004, CAR013 | Present | NR | |
| *Rumex vesicarius* | Rosy Dock | CAR007 | Present | 2020 (1) | |
| *Schinus molle* | Pepper Tree | Whittata Creek | NS | 2021 (1) Not surveyed other years | |
| *Schismus barbatus* | Arabian Grass | CAR003, CAR006, CAR012, CAR014 | Present | NR | |
| *Sisymbrium erysimoides* | Smooth Mustard | Anzac Dam | NS | 2019 (1) | |
| | | Dawson Dam | | | 2/4 |
| | | CAR001, CAR009, CAR011, CAR013, CAR014, CAR016 | Present | NR | |
| | | CAR010 | NS | 2021 (1) | |
| | | CAR012, CAR017 | | 2019 (1) | |
| | | CAR020 | | NR | 1 |
| | | CAR021 | | 2020, 2022, 2023 (1/2/3/4) | 2/4 |
| | | CAR022 | | 2019 – 2023 (1/2/3/4) | 4/5 |
| | | CWM01 | NR | 2019, 2020, 2022, 2023 (1/2/3/4) | 3 |
| | | CWM03 | Present | NR | |
| | | CWM05 | NS | 2020, 2021 (1/3) | 1/4 |
| | | CWM06 | NR | 2019 – 2023 (1/3) | 1/5 |
| | | South Eliza Dam | NS | 2019, 2020 (3) | 3 |
| | | Norh Eliza Dam | | NR | 1/3 |

| *Scientific name* | Common Name | Location | EBS 2012 – 2016 | Years recorded between 2018 and 2023 and (CSR)* | Spring 2024 CSR* |
|---|---|---|---|---|---|
| | | Expo Village | | 2020 (2) | 2/4 |
| *Solanum nigrum* | Black Nightshade | Anzac Dam | NS | 2019 – 2023 (1) | |
| | | Dawson Dam | | 2019 – 2020, 2023 (2) | 2 |
| | | South Eliza Dam | | 2020, 2023 (1) | 1 |
| | | Expo Village | | 2018 – 2021, 2023 (1/2) | 1 |
| | | Expo Village EIA | | 2018 – 2021, 2023 (1/2/3/4) | 2/3 |
| | | Whittata Creek | | 2021 (1) Not surveyed other years | |
| | | CWM01 | Present | 2021, 2022 (1) | 1 |
| | | CWM02 | | NR | |
| *Sonchus oleraceus* | Sow Thistle | Expo Village | NS | 2018 (1) | 2 |
| | | CWM02 | NR | NR | 3 |
| | | Expo Village EIA | NS | 2018, 2019, 2021, 2023 (1/3/4) | 3/4 |
| | | TV EIA | NS | 2018 – 2023 (4) | |
| | | CAR006-CAR010, CAR014 | Present | NR | |
| | | CAR012 | | 2023 (1) | |
| | | CAR003, CAR011, CAR015 | | 2019 (1) | |
| | | CAR013 | | 2019, 2023 (1) | |
| | | CAR016 | NR | 2019 (1) | |
| | | CAR018 | | 2023 (1) | 1 |
| | | CAR019 | NS | 2020 (1) | 1 |
| *Tamarix aphylla*[1,2] | Athel Pine | Yeltacowie homestead | NS | 2018, 2019, 2021 – 2023 (1) | 1 |
| *Tribulus terrestris* | Caltrop | CAR002, CAR005, CAR008-CAR010, CAR013, CAR014 | Present | NR | |
| | | CAR020 | NS | 2020 (1) | |
| *Urtica urens* | Stinging Nettle | Exploration Village EIA | NS | 2023 (2) | |
| *Verbena supina* | Trailing Verbena | Anzac Dam | NS | 2022 (2) | |
| | | North Eliza Dam | | NR | 1 |
| *Xanthium spinosum*[1] | Bathurst Burr | CWM01 | NR | 2018, 2019, 2021, 2023 (1/3) | 2 |
| | | CWM02 | | 2019. 2021, 2023 (2//3/4) | 3 |
| | | Dawson Dam | NS | 2019 – 2023 (4/5) | 4/5 |
| | | South Eliza Dam | | 2019, 2021, 2023 (2/3/4/5) | 3 |
| | | Whittata Creek | | 2021 (2/5) Not surveyed other years | 1 |

*CSR = Crown Separation Ratio: Abundance recorded using the CSR scale 1 = < 12 individuals; 2 = isolated clumps, 3 = isolated individuals, 4 = plants separated by 6-20 crown widths, 5 = plants separated by 1-5 crown widths

[1] Declared in SA under the Landscapes South Australia 2019 Act. Declared plant species are regulated as to their movement, sale, notification and/or control.

[2] WoNS - Weed of National Significance. Must be controlled within 100 m of a watercourse

[3] EV = Exploration Village, EV EIA = Exploration Village Effluent Irrigation Area. TV EIA = Tjungu Village Effluent Irrigation Area, NR = Not Recorded, site was surveyed, but weed species was not observed; NA = Not applicable, site was discontinued in spring 2018, NS = Not surveyed.

# Appendix G2. Weed transect species (baseline and compliance)

**Table G2: Weed species recorded along weed transects, baseline and compliance/operational monitoring**

| Transect* | Species | 2012-2016[1] | Years recorded between 2018 and 2023 and (CSR)* | Spring 2024 notes and/or CSR** |
|---|---|---|---|---|
| CWM01 | *Brassica tournefortii* (Mustard) | Present | NR# | NR |
| CWM01 | *Carrichtera annua* (Wards Weed) | NR | 2021 | NR |
| CWM01 | *Carthamus lanatus* (Saffron Thistle) | Present | 2018, 2023 (1) | NR |
| CWM01 | *Centaurea melitensis* (Malta Thistle) | NR | NR | 1 plant recorded at small creek |
| | *Cucumis* sp. (Paddy Melon) | NR | 2020 | NR |
| | *Cynodon dactylon* (Couch) | NR | 2021 (2) | Localised at Whittata creek |
| | *Heliotropium curassavicum* (Smooth Heliotrope) | NR | 2022 (1), 2023 (1) | Localised at culvert where CSR = 4 |
| | *Heliotropium supinum* (Spreading Heltiotrope) | Present | 2018, 2019, 2021 | NR |
| | *Lysimachia arvensis* (Scarlet Pimpernel) | NR | 2022 (1) | NR |
| | *Malva parviflora* (Mallow) | NR | 2020, 2022 (1) | NR |
| | *Medicago minima* (Medic) | NR | 2022 (3) | NR |
| | *Mesembryanthemum crystallinum* (Iceplant) | NR | 2020 | NR |
| | *Sisymbrium erysimoides* (Smooth Mustard) | NR | 2020, 2022 (1), 2023 (2/4) | NR |
| | *Sonchus oleraceus* (Sow Thistle) | Present | 2021, 2022 (1), 2023 (1) | NR |
| | *Solanum nigrum* (Black Nightshade) | NR | 2022 (1) | NR |
| | *Xanthium spinosum* (Bathurst Burr) | NR | 2018, 2019, 2021, 2023 (3) | Localised, 30+ seedlings at culvert |
| CWM02 | *Centaurea calcitrapa* (Star Thistle) | Present | NR | |
| | *Citrullus Cucumis* (Bitter Melon) | NR | 2022 (1) | |
| | *Erodium cicutarium* (Cut-leaf Stork's-bill) | NR | 2020 | |
| | *Heliotropium curassavicum* (Smooth Heliotrope) | Present | 2019, 2020, 2021, 2022 (3), 2023 (2) | Culvert and water's edge CSR =b3 |
| | *Lepidium africanum* (Peppercress) | Present | NR | |
| | *Malva parviflorus* (Mallow) | NR | 2020, 2023 (2) | |
| | *Medicago minima* (Medic) | NR | 2022 (1) | Culvert and water's edge CSR = 4 |
| | *Solanum nigrum* (Black Nightshade) | NR | 2022 (1) | |
| | *Sonchus oleraceus* (Sow Thistle) | NR | 2022 (1) | Culvert + water's edge CSR = 4 |
| | *Xanthium spinosum* (Bathurst Burr) | Present | 2019, 2021, 2023 (2/4) | Culvert + water's edge CSR = 3 |
| CWM03 | *Sisymbrium erysimoides* (Smooth Mustard) | Present | NR | NR |
| CWM04 | *Sonchus oleraceus* (Sow Thistle) | Present | NR | NR |
| CWM05 | *Carrichtera annua* (Wards Weed) | NR | NR | Two dead stalks midway CSR = 1 |
| | *Citrullus* sp. (Bitter Melon) | NS | 2020, 2022 (4/5), 2023 (4/5) | Localised, sparse CSR = 3 |
| | *Sisymbrium erysimoides* (Smooth Mustard) | NS## | 2020 | Widespread CSR 1 to 4 |
| CWM06 | *Citrullus* sp. (Bitter Melon) | NR | 2020, 2022 (1), 2023 (2/3) | |
| | *Lysimachia arvensis* (Scarlet Pimpernel) | NR | 2020 | |
| | *Sisymbrium erysimoides* (Smooth Mustard) | NS | 2018, 2019, 2020, 2022 (1), 2023 (1) | Widespread CSR 1 to 5 |
| CWM07 | No weeds present | | | |
| NWM01 | *Tribulus terrestris* (Caltrop) | NS | 2019 | NR |

| Transect* | Species | 2012-2016[1] | Years recorded between 2018 and 2023 and (CSR)* | Spring 2024 notes and/or CSR** |
|---|---|---|---|---|
| NWM02 | *Citrullus* sp. (Bitter Melon) | NS | 2019 | NR |
| NWM02 | *Cucumis* sp. (Paddy Melon) | NS | 2019 | NR |
| NWM03 | No weeds present | NS | Nil | Nil |

# Appendix E

# 2024 Air Quality Monitoring Report

# 2024 Compliance Report

# Carrapateena

# Air Quality Review

BHP

LATHWIDA ENVIRONMENTAL

March 2025

FINAL

## Document status

| Version | Doc Type | Reviewed By | Approved By | Date Issued |
|---|---|---|---|---|
| Final | Final report | Rachel Farrugia | David Winterburn | 20 March 2025 |

## Project details

| | |
|---|---|
| Client | BHP |
| Project | Carrapateena 2024 Air Quality Compliance Review |
| Project Number | LE25004 |
| Report Subject | Air Quality |
| Project Manager | David Winterburn |
| Authors | David Winterburn |
| File Reference | 250320_Carrapateena AQ Compliance Review 2024_FINAL |

## Table of contents



## List of tables



## List of figures

# 1 Introduction

## 1.1 Context

BHP operates the Carrapateena copper and gold mine (the Operation) in the far north of South Australia, approximately 160 km north of Port Augusta. The site operates in accordance with a Program for Environment Protection and Rehabilitation (PEPR), approved by the Government of South Australia's Department for Energy and Mining (DEM).

The current, approved PEPR is MPEPR2024/009, approved on 1 October 2024 (BHP 2024). The PEPR contains a suite of Outcomes, Outcome Measurement Criteria (OMC) and Leading Indicators (LI) designed to manage the environmental and social impacts and risks associated with the Operation.

BHP commissioned Lathwida Environmental Pty Ltd (Lathwida) to review the results of monitoring undertaken on site during 2024 in the context of those Outcomes, OMCs and LIs related to air quality. This is presented across the following sections, with reference to the relevant PEPR requirement.

## 1.2 Data sources

BHP provided the following information in support of this review:

- Environmental Radiation Monitoring Location (ERML) quarterly depositional dust data for 2024
- High Volume Air Sampler (HVAS) $PM_{10}$ dust results for 2024
- metals in dust data for July 2023 to June 2024
- Carrapateena meteorological data spreadsheet for 2024
- data related to soil sampling (ERML16–ERML19) in the vicinity of the Tailings Storage Facility (TSF) undertaken in March 2024.

# 2 Air quality compliance review

The review of the above information was undertaken with reference to the relevant Outcome, OMCs and LIs described in MPEPR2024/009.

## 2.1 Public nuisance

### 2.1.1 Criteria

The compliance criteria for public nuisance impacts as a result of effects to air quality are described in Table 2.1.

**Table 2.1: Air quality-related public nuisance compliance criteria**

| Public nuisance criteria | Details |
|---|---|
| **Environmental Outcome** | |
| The Tenement Holder must during construction and operation ensure that there are no public nuisance impacts from dust and noise generated by mining operations or mining-related traffic | |
| **Outcome Measurement Criteria** | |
| ID | PN2 |
| Measurement method | Gravimetric analysis of continuous dust deposition |
| Location | Monitoring site adjacent to Pernatty Homestead (ERML09) |
| Achievement value | Dust deposition rates do not exceed 4 g/m$^2$/month (total) as per Table 7.1 of Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC 2005; superseded by NSW EPA 2017) |
| Frequency | Quarterly collection and analysis during operation of the southern access road |
| Project phase | Construction and operations |
| **Leading Indicator** | |
| ID | PN3 |
| Measurement method | Gravimetric analysis of continuous dust deposition |
| Location | Monitoring site adjacent to Pernatty Homestead (ERML09) |
| Achievement value | Exceedances of baseline levels of 1.6 g/m$^2$/month over three consecutive months |
| Frequency | Monthly collection and analysis |
| Project phase | Construction |

### 2.1.2 Results

#### OMC PN2: Not applicable

Outcome Measurement Criteria PN2 applies only during the operation of the Southern Access Road. Following the commissioning of the Western Access Road, the Southern Access Road is no longer used by BHP and management of the road has been handed back to Government of South Australia's Department for Infrastructure and Transport (DIT) and therefore compliance against this criterion was not monitored during the 2024 reporting period.

#### LI PN3: Not applicable

Leading Indicator PN3 applied only during the construction phase of the Southern Access Road. Following the commissioning of the Western Access Road, the Southern Access Road is no longer used by BHP and management of the road has been handed back to Government of South Australia's Department for Infrastructure and Transport (DIT) and therefore compliance against this criterion was not monitored during the 2024 reporting period.

## 2.2 Air quality

### 2.2.1 Criteria

The compliance criteria for air quality impacts as a result of effects to air quality are described in Table 2.2.

**Table 2.2: Air quality compliance criteria**

| Air quality criteria | Details |
|---|---|
| **Environmental Outcome** | |
| The Tenement Holder must during construction, operation and post Completion ensure no adverse change to the air quality environment as a result of particulate emissions and/or dust generated by mining operations or mining-related activities | |
| **Outcome Measurement Criteria** | |
| ID | AQ1 |
| Measurement method | Gravimetric analysis of continuous dust deposition |
| Location | Monitoring sites adjacent to the TSF (ERML16 – ERML19) |
| Achievement value | Dust deposition rates do not exceed 4 g/m$^2$/month (total) as per Table 7.1 of Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC 2005; superseded by NSW EPA 2017) |
| Frequency | Quarterly collection and analysis |
| Project phase | Construction and operations |
| **Leading Indicator** | |
| ID | AQ4 |
| Measurement method | Laboratory analysis of continuous metals in dust |

| Air quality criteria | Details |
|---|---|
| Location | Monitoring sites adjacent to the TSF (ERML16 – ERML19) |
| Achievement value | Rising trend in metals concentrations over three consecutive years when compared to previous monitoring results (ERML1–ERML15) |
| Frequency | Annual |
| Project phase | Construction and operations |
| ID | AQ7 |
| Measurement method | Soil sampling and laboratory analysis |
| Location | Monitoring sites adjacent to the TSF (ERML16–ERML19) |
| Achievement value | Rising trend in metals concentrations over three consecutive years when compared to previous monitoring results (ERML1–ERML15) |
| Frequency | Annual |
| Project phase | Construction and operations |

### 2.2.2 Results

#### OMC AQ1: Compliant

The average rate of dust deposition at ERML16–ERML19 (inclusive) in 2024 was approximately 1.2 g/m$^2$/month. This is significantly below the OMC achievement value of an annual average of 4 g/m$^2$/month in accordance with NSW EPA (2017) guidance.

In 2024, dust deposition rates were generally consistent with, and slightly down on, results over the last two years (see Figure 2.1). Dust deposition rates at ERML16 (TSF North) decreased to be consistent with the other ERML results following two quarters of elevated results caused by local TSF embankment and seepage collection infrastructure construction activities. continued the downward trend observed in the latter half of 2022 following the completion of TSF Stage 2 embankment construction works.

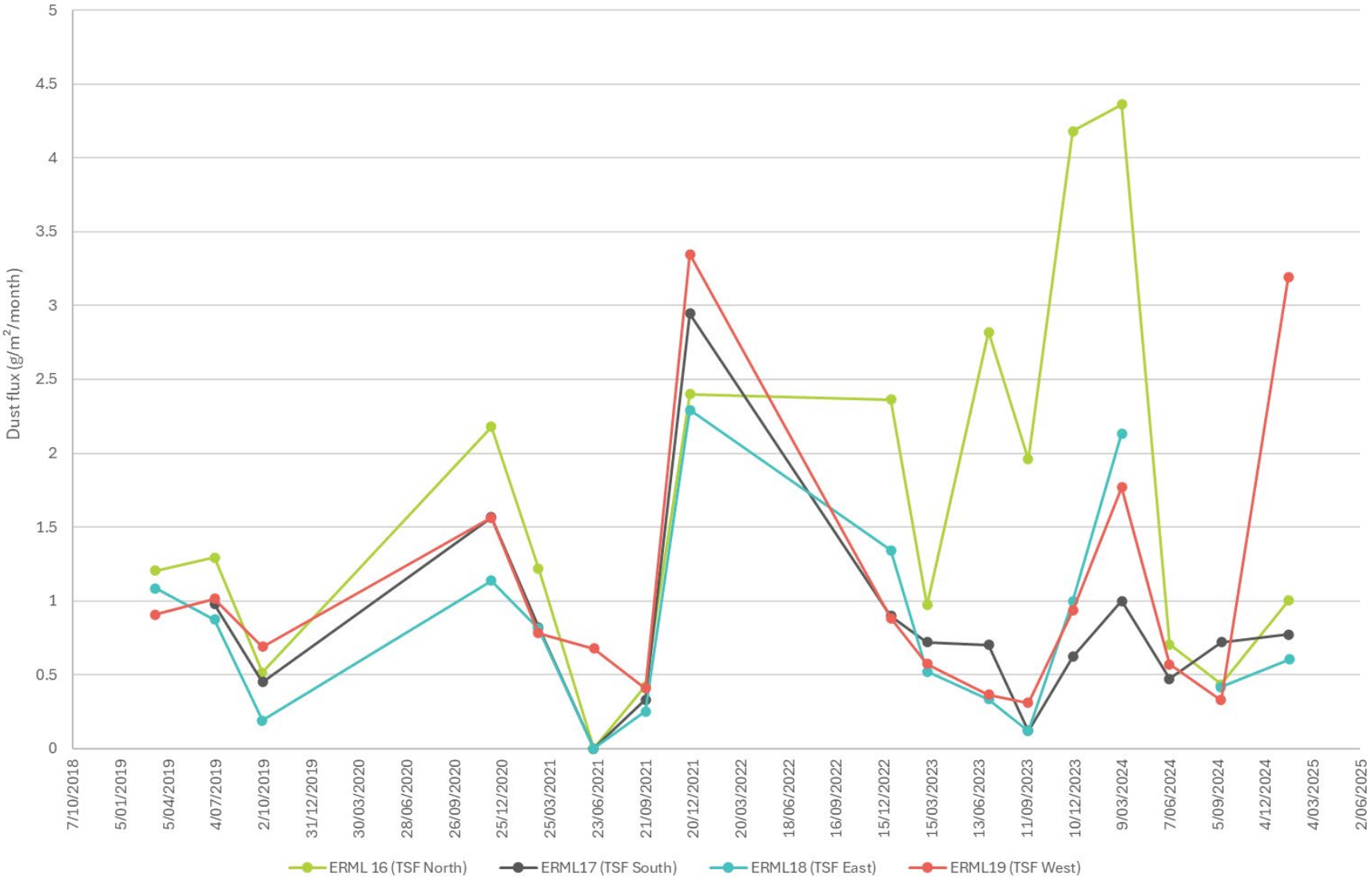


**Figure 2.1: Measured deposited dust at the TSF (2019–2024)**

### LI AQ4: Compliant

Metals in deposited dust concentrations were generally similar to the previous reporting period with only copper, uranium and titanium recording small increases, and are typically consistent with pre-operations baseline concentrations except for chromium, copper and uranium which are slightly above baseline. Copper, titanium and uranium have exhibited a trend of increasing concentrations as defined in the Leading Indicator criterion; however, it is noted that this trend remains consistent with, if slightly above, baseline ranges and has also occurred at sites remote from the TSF, and thus may be attributed to aspects not wholly related to TSF operations.

Metals in dust from sites ERML16–ERML19 inclusive are compared to average metal in dust concentrations and baseline concentrations from ERML01–ERML15 in Figure 2.2. Metals concentrations at sites around the TSF continue to be, in general, elevated compared to other monitoring sites across the operation except for uranium, which is higher at locations remote from the TSF.

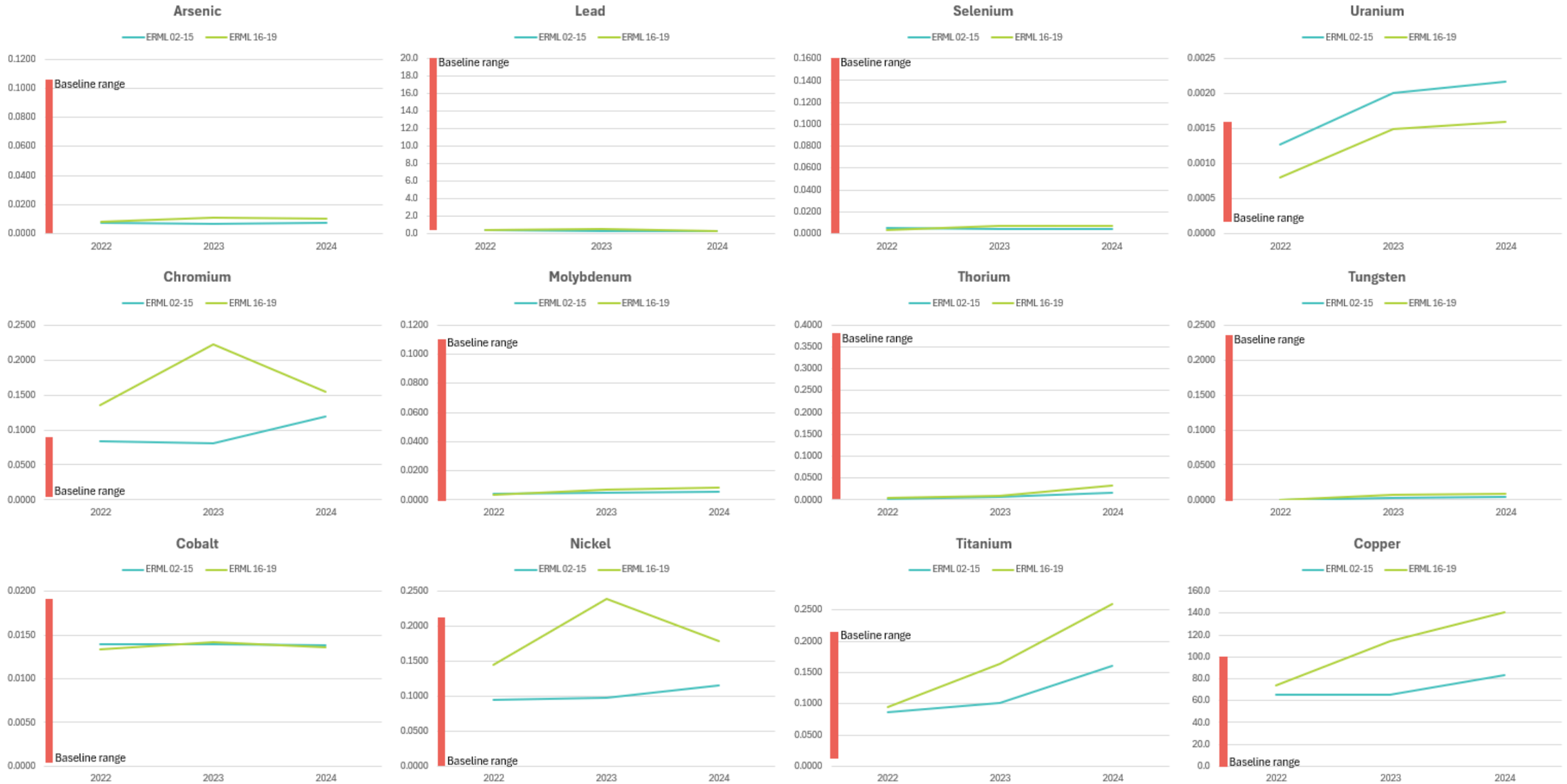


**Figure 2.2: Metals in deposited dust (mg/g) at the TSF (ERML16–ERML19) versus areas remote from the TSF (ERML02–ERML15) and baseline ranges**

### LI AQ7: Compliant

The average concentration of metals in soil sediments was presented in Appendix B1 to the MLP (OZ Minerals 2017), with sites SED2, SED6 and SED8 occurring in the Eliza Creek catchment. Comparison against monitoring undertaken during 2024 is presented in Figure 2.3.

This demonstrates that measured concentrations at the ERML sites are consistent with previous reporting periods. The measured concentrations remain (generally) orders of magnitude less than the relevant National Environment Protection (Assessment of Site Contamination) Measure 1999 guidelines for commercial/industrial environments.

The 2019 values are considered to represent baseline conditions at the ERML sites as no tailings deposition occurred prior to the soil sampling in 2019.

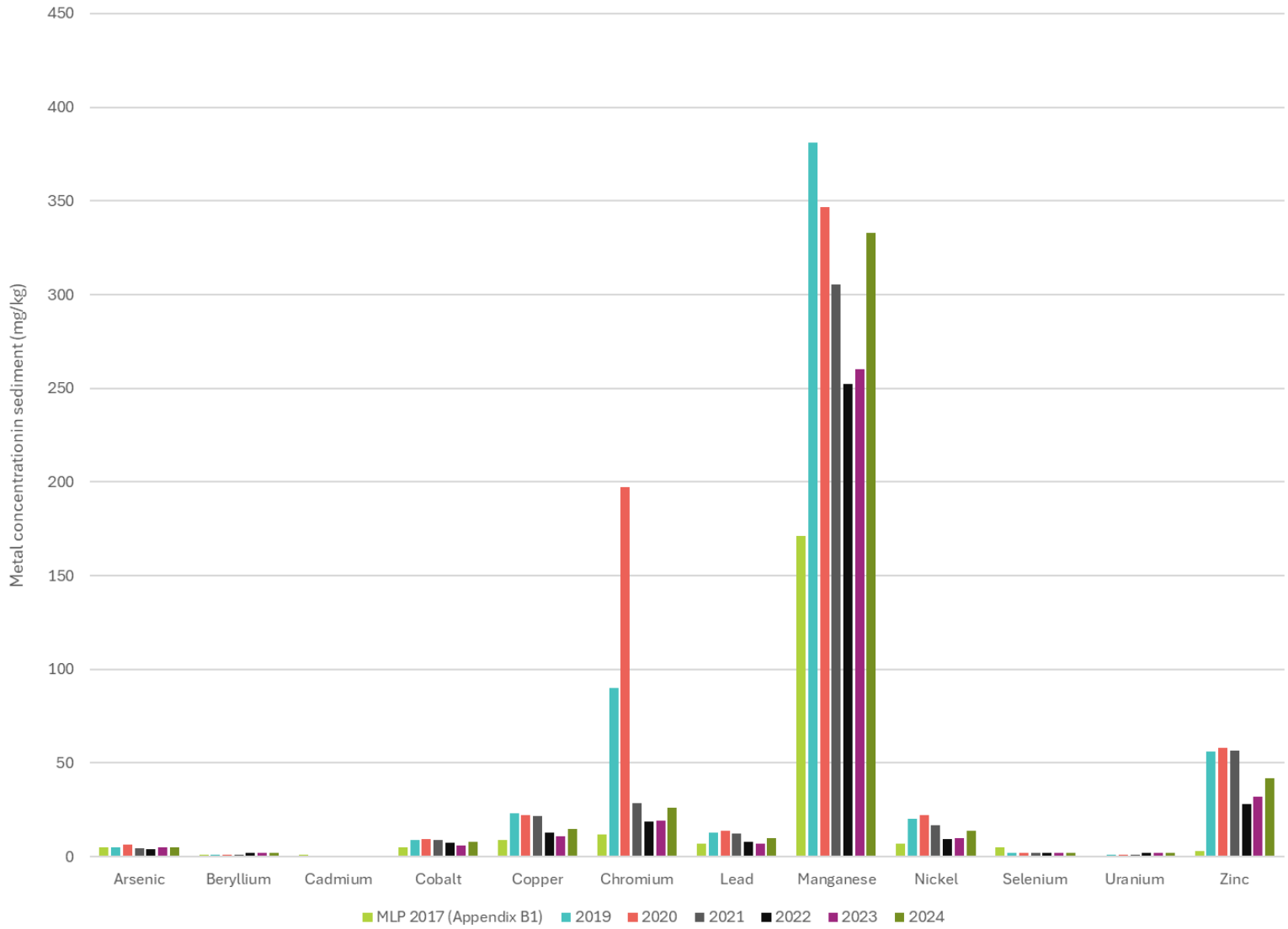


**Figure 2.3: Metals in soil (ERML16–ERML19, all years) versus baseline**

# 3 Conclusion

Review of relevant 2024 air quality and soil monitoring data were undertaken in order to establish the status of compliance against relevant Environmental Outcomes, OMCs and LIs as presented in the PEPR for Carrapateena (BHP 2024).

The compliance status determined from this review is:

- PN2: **Not applicable**
- PN3: **Not applicable**
- AQ1: **Compliant**
- AQ4: **Compliant**
- AQ7: **Compliant.**

This review demonstrated that all OMCs and LIs were met for the reporting period, and thus the Outcomes associated with public nuisance and air quality were achieved during 2024. A trend of rising copper, uranium and titanium has been observed in dust deposited around the TSF which may require further investigation, in compliance with the AQ7 LI criterion, if this trend is observed to continue during the next reporting period.

# 4 References

NSW EPA (2016) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*. Published January 2017. New South Wales Environment Protection Authority, New South Wales, Sydney.

OZ Minerals (2017) *Carrapateena Project Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans*. May 2017. South Australia, Adelaide.

BHP (2024) *Carrapateena Project Program for Environment Protection and Rehabilitation. ML 6471 Mineral Lease, MPL 149 Airstrip, Workers' Accommodation Village, Access Road and Ancillary Infrastructure, MPL 152 Western Infrastructure Corridor, MPL 153 Eastern Radial Wellfield, MPL 154 Southern Access Road and Radial Wellfield, MPL 156 Northern Wellfield*, MPEPR2024/009. June 2024. BHP, South Australia, Adelaide.

# Appendix F

# 2024 Environmental Radiation Impact Assessment

BHP

# Carrapateena Environmental Radiation Impact Assessment 2024

## Non-Human Biota and Member of Public Doses

27 March 2025

# Contents



## List of tables



## List of figures

# 1 Introduction

## 1.1 Purpose of this report

The purpose of this technical report is to:

- Provide an assessment of the radiation related impacts specific to non-human biota and members of the public for the existing Carrapateena operation.

The assessment of potential radiological impacts will be undertaken using the Environmental Risks from Ionising Contaminants: Assessment and Management (ERICA) Tool.

This report consists of the following:

- An outline of the relevant radiological characteristics of the operation
- A description of the methods for the assessment
- Assessment of the radiological impacts to representative and user-specific flora and fauna, referred to as non-human biota (NHB)
- Assessment of doses to members of the public.

## 1.2 Overview

BHP operates the Carrapateena mine in the mid-north of South Australia. The orebody predominantly contains copper but also includes uranium at an average concentration of approximately 3 Bq/g head of chain.

During mining and mineral processing activities, radiological impact to the environment may occur if not adequately controlled. As such, an environmental radiation monitoring program is established and executed to assess the potential dose pathways for members of the public and non-human biota.

When mining and processing is carried out with materials containing uranium, there is the potential for radiological impacts to the environment to occur. It is therefore important to measure and characterise the potential dose pathways for members of the public and non-human species present in the environment, to determine whether there are any radiological impacts, and what dose pathways may require further control.

# 2 Environmental Radiation Impact Assessment

This document assumes a basic understanding of radiation protection. An overview of key concepts is provided here for contextualization of the environmental radiation impact assessment.

The protection of the natural environment from emissions from nearby human activities has historically been based on the protection of humans. This approach was outlined by the International Commission on Radiation Protection (ICRP), which stated that “if man is protected then it can be assumed that the environment is protected” (ICRP, 1991). Under the Carrapateena PEPR, it is a requirement to demonstrate that non-human biota living in the local environment are protected against ionising radiation risks from radionuclides released to the environment by mining and processing activities. This is executed in accordance with the Carrapateena Radioactive Waste Environmental Management Plan (000792) and the Carrapateena Air Quality Environmental Management Plan (001374).

More recent publications (ICRP, 2014 and ARPANSA, 2015) have addressed this, and recommended that assessments be made on the impact of radiation on non-human biota. It is important to note that protection of non-human biota is demonstrated at the species level, rather than the individual level, as is the case for humans.

ARPANSA, 2015, suggests considering an as-simple-as-possible but as-complex-as-necessary approach to demonstrating protection, which assists in optimising the resources spent on the assessment and allows for a graded approach to protection. To facilitate this, a tiered approach may be used, which involves a first screening using simplified methodology and deliberately conservative (although not necessarily unrealistic) assumptions and parameter values, against a screening value of dose rate.

## 2.1 The ERICA Tool

The ERICA Tool was developed under the European Commission to provide a method of assessing the impact of radiological contaminants to the natural environment.

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has noted that the ERICA Tool is applicable for use in Australia (ARPANSA, 2010). The software uses changes in radionuclide concentrations and concentration ratios in species, derived from monitoring and studies, to provide an estimated dose and measure of radiological impact to a number of Reference Animals and Plants (RAPs).

The database of the ERICA Tool has been built around a number of RAPs. Each RAP has a specified geometry, and default concentration ratio (CR) values. The geometry of an organism is represented as an ellipsoid – and by varying its axes – it can be used as a reasonable approximation for much of the existing wildlife on earth. Radiation damage arises due to ionisation along the path radiation takes as it passes through tissues, hence the dimensions of the organism have relevance to the degree of radiation damage that can occur. User specific organisms can be defined in ERICA, and the size and weight altered from that of RAPs.

Some simplifications introduced when using RAPs include:

- An assumption of homogenous radionuclide distribution in the tissues of the organism (for internal
- dosimetry),
- Generic biological data in terms of habitat, occupancy, life cycle, and reproduction among other factors.

Each assessment tier produces a dose rate which is comparable to a ‘screening dose rate’. The default ERICA screening dose rate is 10 µGy/h (ARPANSA, 2015), which is the level below which no effects would be observed for even the most sensitive species (predicted no-effect dose rate).

The two important inputs for an ERICA assessment are:

- Operationally derived changes in media concentration (the additional radionuclide concentration in soils or water attributable to the operation), in units of Bq/kg or Bq/L.
- The radionuclide concentration ratios, which is the ratio of radionuclide concentrations in the media to concentrations in flora and fauna.

These inputs allow external and internal doses to be estimated for reference (or user defined) animals and plants. User defined species with specific CR value data (where available) and user specified geometry allow the user to estimate doses to specific species more accurately.
The latest version of the ERICA software was released in February 2024 (version 2.0.225) and was used in the assessment. A Tier 2 ERICA assessment was conducted because some additional concentration ratio data is available.

## 2.2 Initial (Pre-Mining) Conditions

The area surrounding the Carrapateena mine site was extensively surveyed in 2007 (Papari Radiation Services, 2008) to determine pre-mining baseline radiological conditions in the immediate area surrounding proposed mining activities. Gamma dose rates were measured in a grid pattern over the entire study area, as well as along transects of interest. The study area and measurement locations are shown in Figure 1.

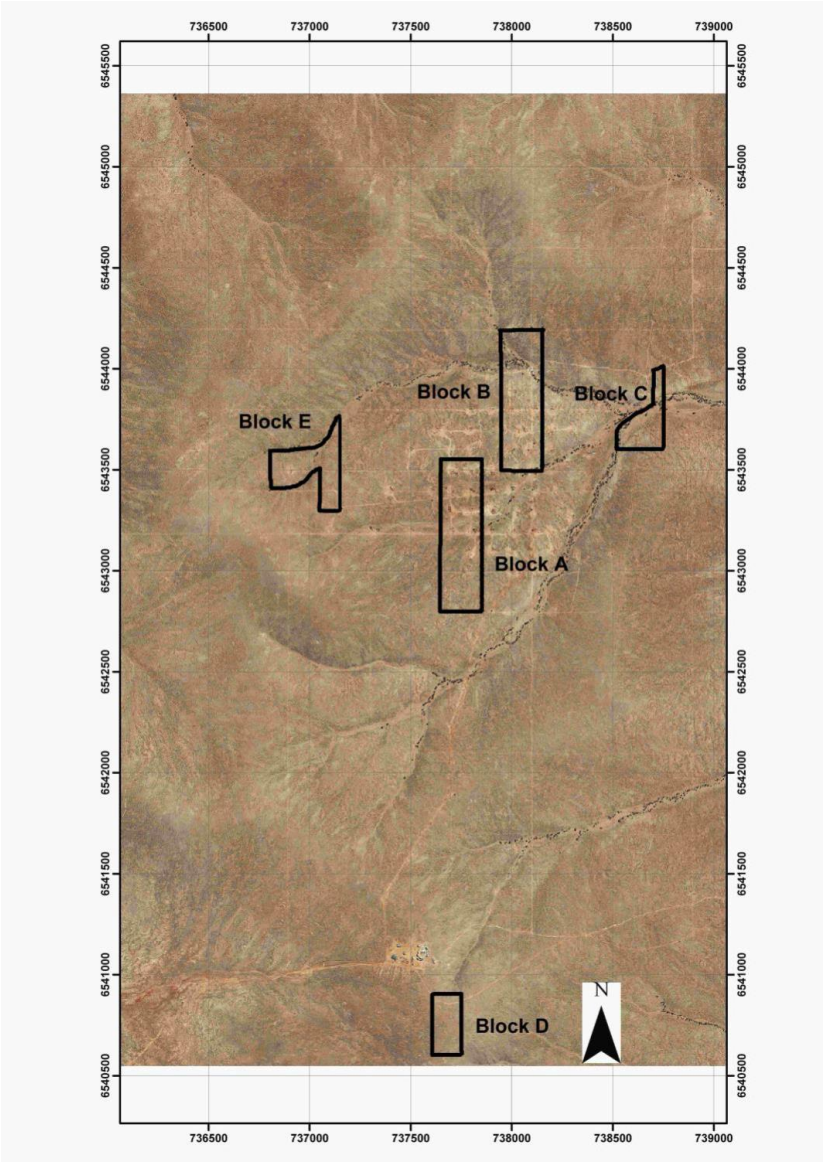


**Figure 1: Carrapateena mine area showing monitoring locations from the 2007 survey**

Gamma surveys were conducted in 2007, and the average contact dose rate was found to be 0.074 µGy/h over all measurements. This dose rate is again low compared to typical environmental levels, with the average in Australia being 0.09 µGy/h (UNSCEAR, 2000).

Measurements conducted in 2012 (JRHC, 2014) were similar. Several locations were monitored over a long-term period, with average dose rate estimated to be 0.06 µSv/h. The same locations were sampled to determine radionuclide concentrations in the soil, and the average concentration of uranium in soil was found to be 13 Bq/kg (0-2cm soil depth), equivalent to approximately 1ppm U. This concentration is low, but still typical of normal soil. For reference, the worldwide average uranium concentration is approximately 3 ppm (UNSCEAR, 2000).

The data collected from all locations showed that the radiological conditions are fairly consistent across the wider area. Uranium concentrations in soil are low compared to Australian averages, which are reflected in measured terrestrial dose rates.

Baseline data has been collected for dust over a number of years, and the most recent baseline report (JRHC, 2020) documents baseline radionuclide dust deposition data for U238, Ra226, Pb210 and Po210. The average deposition rates were 0.017 Bq/m2/month U238, 0.027 Bq/m2/month Ra226, 3.04 Bq/m2/month Pb210 and 2.04 Bq/m2/month Po210.

Radon monitoring was conducted as part of the same baseline study, and reported concentrations ranged from <15 to 37 Bq/m3.

Groundwater radionuclide concentrations were measured in 2019 prior to TSF activities, with average concentrations of 0.31 Bq/L for gross alpha, 0.69 Bq/L for gross beta (excluding K40), 0.19 Bq/L for Ra226, and 0.69 Bq/L for Ra228.

## 2.3 Assessment Approach

Dust deposition has been monitored since the commencement of mining at a total of 18 sites surrounding the Carrapateena deposit, mine, processing facility, camp and access roads (Figure 2). Dust mass varies at each site, with some of the highest sites being away from any operation activities. Dust mass per square meter per month has been calculated for each location and ranged from 0.52 g/m$^2$/month to 9.4 g/m$^2$/month over the monitoring conducted FY 2024. The average deposition of uranium was approximately 0.035 Bq/m2/month, with maximum deposition of 0.17 Bq/m2/month. Note that values below the Minimum Detection Limit (MDL) are taken as half the MDL. radium-226, lead-210, and polonium-210 deposition rates averaged 0.08 Bq/m2/month, 1.8 Bq/m2/month, and 2.2 Bq/m2/month respectively. The deposition rates for uranium-238 and radium-226 are similar to last year while polonium-210 and lead-210 have decreased.

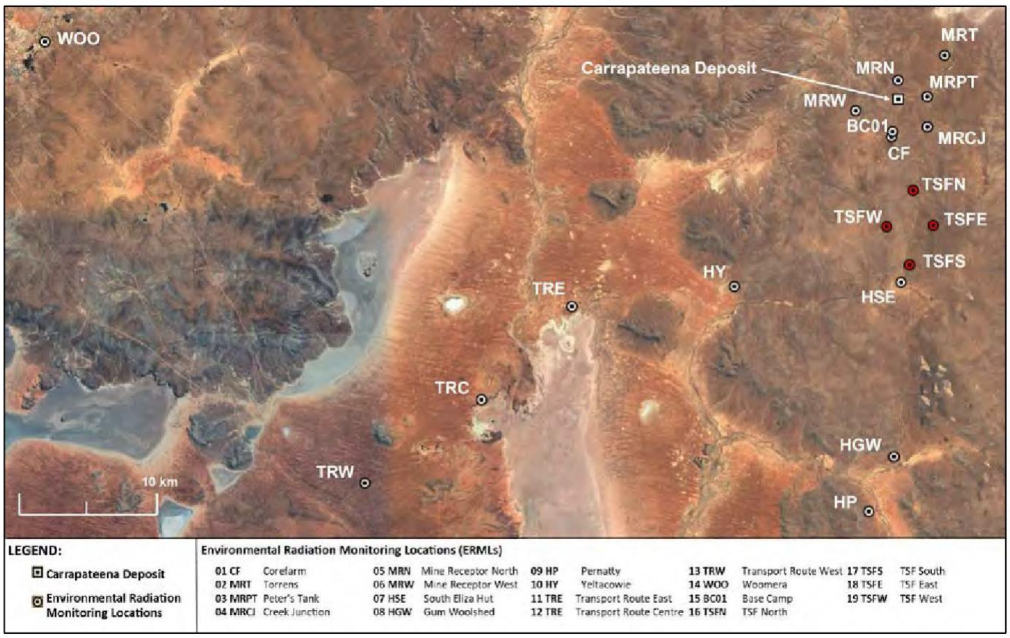


**Figure 2: Dust deposition gauge locations Carrapateena**

The difference between the approximate baseline dust and the dust measured at each location could be attributable to operational activities (dust generated by processing, mining and stockpiling activities, along with dust generated from use and maintenance of roads).

Groundwater activity concentrations have been analysed at four TSF monitoring bores since 2019 and an additional three have begun monitoring in 2024. Of the four initial sampling points, three have seen noticeable increases in gross alpha and gross beta radionuclide levels from baseline values determined in 2019, however all three are now below the highest concentration measured in 2022 or 2023 (see figure 3 and 4). Although the gross alpha and gross beta are beyond trigger values for drinking water for these bores (which also occurred in some samples during baseline monitoring), the water is not for human consumption – and even in the case that it was, calculated doses would be below 1 mSv/annum in all locations. These bores will continue to be monitored quarterly for seepage, with radionuclides and trace elements analysed annually.

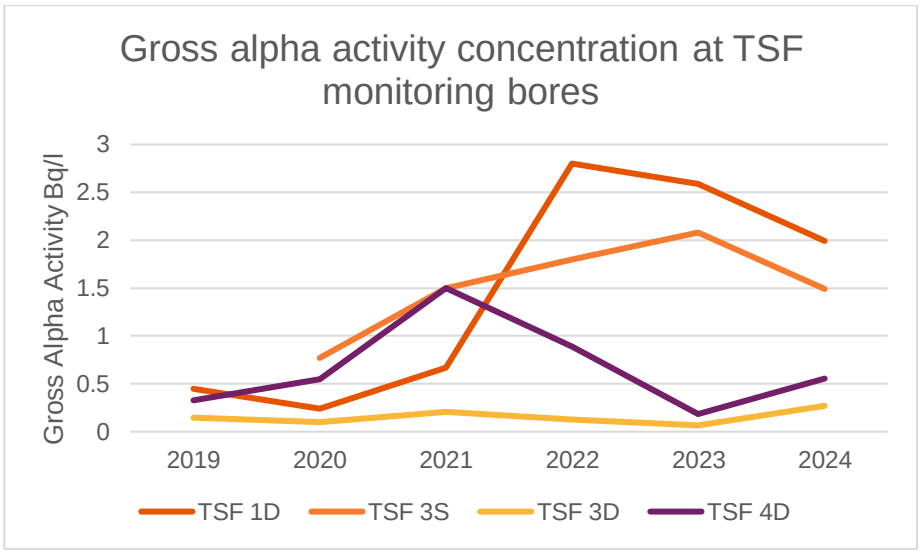


**Figure 3: Gross alpha activity concentration in groundwater at TSF monitoring bores**

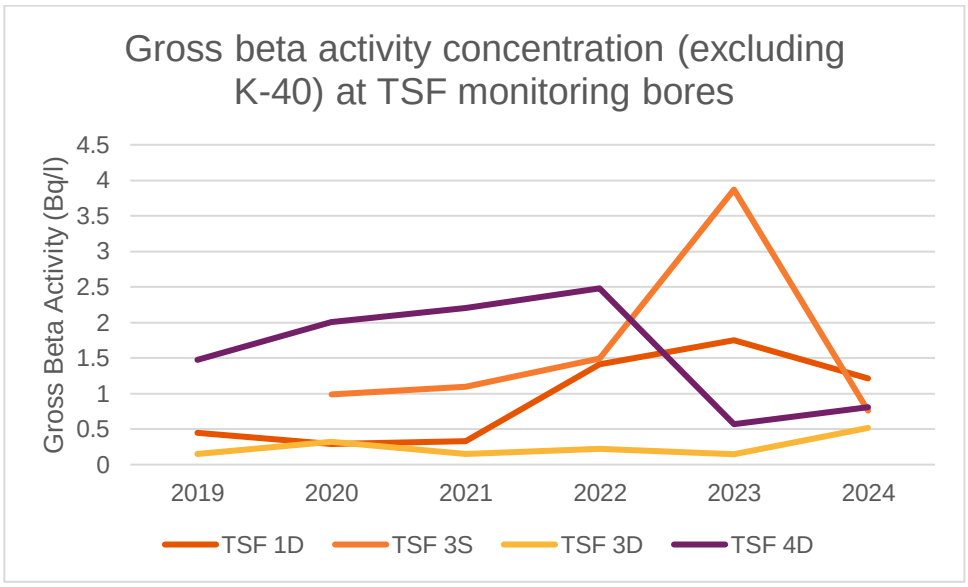


**Figure 4: Gross beta activity concentration in groundwater at TSF monitoring bores**

# 2.4 Radiological Impact of Operations

The dust deposition rates determined in section 2.3 were used to estimate the soil radionuclide content due to operations in FY2024. The deposited radionuclides are assumed to mix with the top 10 mm of soil evenly over time (consistent with measurements in SE Australia and in grasslands – Kaste, Heimsath and Bostick, 2007), and soil density is assumed to be 1500 kg/m$^3$.

This assessment does not include radionuclides from the Th-232 chain, due to the comparatively minimal concentrations of thorium within the ore and processing material handled during Carrapateena operations.

Where specific radionuclide progeny have not ben analysed, they are assumed to be in equilibrium with their relevant parent for any operationally derived dust. The soil concentrations (additional to baseline concentrations) used in the ERICA analysis are displayed in Table 1. It should be noted that radioactive progeny nuclides are included in the dose conversion coefficients of their parents if their half-lives are shorter than 10 days. Ac-227 and Ra-223 were excluded from analysis as the appropriate dose information is not available in ERICA, but due to the low activity concentration, the effect on total dose is negligible. Where appropraite baseline information is available for the radionuclide, the values have been corrected to account for the background. In some cases this has resulted in zero values for net operational contribution.

**Table 1: Increased radionuclide concentrations in soil at reference location for 2024**

| Radionuclide | Annual net average radionuclides in deposited dust (Bq/m$^2$) | Activity Concentration in Soil due to deposited dust in Bq/kg (with baseline subtracted) |
|---|---|---|
| **U-238 Decay Chain** | | |
| **U-238** | 0.256 | 0.0171 |
| **Th-234** | 0.256 | 0.0171 |
| **U-234** | 0.663 | 0.0442 |
| **Th-230** | 0.686 | 0.0457 |
| **Ra-226** | 0.602 | 0.0402 |
| **Pb-210** | 0 | 0 |
| **Po-210** | 1.472 | 0.0098 |
| | | |
| **U-235 Decay Chain** | | |
| **U-235** | 0.041 | 0.0027 |
| **Pa-231** | 0.041 | 0.0027 |
| **Th-227** | 0.156 | 0.01 |

Using the increased concentration in soils as inputs to ERICA, the output doses to RAPs can be determined (using generic CR values). All terrestrial RAPs available in ERICA were selected for assessment. Three additional Australian organisms were added into the default analysis, based on available data and their profiles as representatives of australian fauna. Table 2 and 3 show the species specific data used for the ERICA assessment. No concentration ratio data is available for Emus so the default ERICA data for Bird is used.

**Table 2: User specific geometry, mass and occupancy values**

| Species | Body geometry and mass data | | | | Occupancy Factor |
|---|---|---|---|---|---|
| | Organism mass (kg) | Height (m) | Width (m) | Length (m) | |
| **Red kangaroo (Macropus rufus)** | 45.0 | 0.4 | 0.25 | 1 | 100% on soil |
| **Emu (Dromaius novaehollandiae)** | 34.0 | 0.4 | 0.4 | 0.8 | 100% on soil |
| **Sand Goanna (Varanus gouldii)** | 6.0 | 0.1 | 0.1 | 1.4 | 50% in soil, 50% on soil |

**Table 3: User specific CR values derived from Australian data**

| Species | Elemental Concentration Ratio (Bq/kg fw whole organism / Bq/kg dw soil) | | | | | Source |
|---|---|---|---|---|---|---|
| | U | Th | Ra | Pb | Po | |
| **Red kangaroo (Macropus rufus)** | 0.0076 | 0.000111* | 0.289 | 0.0222 | 0.598 | ARPANSA, 2014 |
| **Sand Goanna (Varanus gouldii)** | 2.5 | 0.027 | 0.2* | 1.2 | 11 | ARPANSA, 2014 |
| *Default ERICA values used where Australian data was unavailable. No protactinium values are available so ERICA default values have been used | | | | | | |

The ERICA assessment dose rates for NHBs from radiation due to operations at Carrapateena in 2024 are displayed in Table 4.

**Table 4: Doses to reference animals and plants at the Carrapateena site in 2024**

| Organism | Total dose rate per organism (µGy/h) | No effect dose threshold (µGy/h) |
|---|---|---|
| **Amphibian (reference)** | 0.00120 | 10 |
| **Annelid (reference)** | 0.00130 | 10 |
| **Arthropod – detritivorous (reference)** | 0.00141 | 10 |
| **Bird (reference)** | 0.000218 | 10 |
| **Emu (Custom)** | 0.000216 | 10 |
| **Flying insects (reference)** | 0.000355 | 10 |
| **Sand Goanna (Custom)** | 0.00831 | 10 |
| **Grasses & Herbs (reference)** | 0.00162 | 10 |
| **Red Kangaroo (Custom)** | 0.00181 | 10 |

| Organism | Total dose rate per organism (µGy/h) | No effect dose threshold (µGy/h) |
|---|---|---|
| **Lichen and Bryophytes (reference)** | 0.00710 | 10 |
| **Mammal – large (reference)** | 0.000545 | 10 |
| **Mammal – small-burrowing (reference)** | 0.000569 | 10 |
| **Mollusc – gastropod (reference)** | 0.000281 | 10 |
| **Reptile (reference)** | 0.00120 | 10 |
| **Shrub (reference)** | 0.00225 | 10 |
| **Tree (reference)** | 0.000132 | 10 |

All doses to RAPs and user-defined species in ERICA are below the screening threshold of 10 µGy/h. The screening threshold is the threshold at which even the most sensitive NHB are unlikely to suffer any population effects as a result of chronic exposure to that dose.

# 3 Human Doses

## 3.1 Member of Public Dose Assessment

The potential exposure pathways for members of the public are:

- Irradiation by gamma radiation,
- Inhalation of radionuclides in dust,
- Inhalation of radon, thoron and associated decay products,
- Ingestion of animals or plants that have come in contact with radionuclides released into the environment as a result of operations.

Assessments assume that a member of the public resides at the location with the highest levels of inhalable and deposited dust that has been modelled or measured at the site for a full year. This is considered conservative, as members of public are unlikely to be able to access or reside in these areas (due to the site being located in a reserve). Dust levels at accessible locations will be considerably lower. It is likely that if public exposure does occur close to or at locations that have the highest levels of inhalable and deposited dust, that exposure will occur for only a relatively short period of time (e.g. hours or days, rather than an entire year).

Gamma radiation exposures to members of the public from sources within the Carrapateena Mining Lease (ML) are considered to be negligible due to the distance between the sources and the public. The sources of gamma radiation (for example ore stockpiles) are well within the mining lease boundary and inaccessible by the public. The gamma levels in addition to natural background at the closest accessible area are unlikely to be detectable. Gamma monitoring at each location, has not shown an increase in dose rate vs control dosimeters, nor baseline data, since operations began. For this year the net average radiation dose recorded by Optically Stimulated Luminescence Dosimeters (OSLDs) at the monitoring locations was 0.0032 mSv and this has been taken as a conservative upper limit for dose by this pathway.

Doses due to inhalable dust have been calculated based on dust concentrations measured by hi-vol air sampling. The formula to determine dust dose, as given by ICRP Publication 119 (ICRP, 2012) is:

Inhalation dose (mSv/y) = Dust activity concentration (Bq/$m^3$) x Breathing rate (1.0 $m^3$/h for members of the public)

x hours per year (8,760 h/y) x Dose Conversion factor for each radionuclide (mSv/Bq)

The information relevant to the estimate of inhalation dose to members of the public is displayed in Table 5.

**Table 5: Doses to members of the public due to inhalation of suspended dust**

| Radionuclide | Inhalation coefficient (5 um particulates) (Sv/Bq) from ICRP 119 (Table G.1 – M type as default) | Average annual radionuclide concentration (Bq/$m^3$) (not baseline corrected) | Dose (1.0m3/h breathing rate, 8760 h/y occupancy) (mSv) |
|---|---|---|---|
| **U-238 Decay Chain** | | | |
| **U-238** | 2.90E-06 | 4.34E-06 | 1.10E-04 |
| **Th-234** | 6.60E-09 | 6.60E-06 | 3.82E-07 |
| **Pa-234** | 3.80E-10 | 6.60E-06 | 2.20E-08 |
| **U-234** | 3.50E-06 | 4.34E-06 | 1.33E-04 |

| Radionuclide | Inhalation coefficient (5 um particulates) (Sv/Bq) from ICRP 119 (Table G.1 – M type as default) | Average annual radionuclide concentration ($Bq/m^3$) (not baseline corrected) | Dose (1.0m3/h breathing rate, 8760 h/y occupancy) (mSv) |
|---|---|---|---|
| **Th-230** | 4.30E-05 | 4.59E-06 | 1.73E-03 |
| **Ra-226** | 3.50E-06 | 6.70E-06 | 2.06E-04 |
| **Pb-214** | 1.40E-08 | 6.70E-06 | 8.22E-07 |
| **Bi-214** | 1.10E-06 | 6.70E-06 | 6.46E-05 |
| **Pb-210** | 9.30E-08 | 5.25E-04 | 4.27E-04 |
| **Bi-210** | 3.30E-06 | 5.25E-04 | 1.52E-02 |
| **Po-210** | 2.90E-06 | 5.25E-04 | 1.33E-02 |
| **Total Dose** | | | **3.12 E-02 (31.2 µSv)** |

Radon, thoron and associated decay products are considered negligible for this assessment, as any radon and/or thoron will be quickly diluted in outdoor air. Monitoring conducted at all locations since commencement of mining have not detected any radon concentrations above typical background concentrations (<15 – 37 Bq/m3) measured during baseline data collection (with the overwhelming majority of results below detection limits).

Ingestion doses for members of the public have been calculated in previous years, with extremely conservative assumptions showing the dose is not significant. These calculations were based on food grown and sourced from the immediate area which is not a realistic assumption. As such, ingestion of food grown on the area of influence of the Carrapateena operation has not been included in the dose calculations.

Consequently, the estimated maximum dose for members of the public due to operations at Carrapateena is 0.0343 mSv, which is well below the dose limit. Actual doses would be expected to be much lower due to actual occupancy times being less than assumed and considering the inhaled dust values do not have background levels subtracted.

# 4 Summary

No RAP or user defined animal or plant received a dose of above the screening dose rate of 10 µGy/h, at the based on average exposure in the Carrapateena operations area. This demonstrates that there are no radiological impacts at a species level from current operational activities.

Dose estimates for members of the public are below the member of public dose limit of 1 mSv/year. Public doses are considered conservative given the occupancy times of members of the public in the region will be lower than assumed in the calculations.

The assessment has shown that Carrapateena operations result in no radiological impacts to non-human biota, and to members of the public.

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# Appendix G

# 2024 South Gap Offset Annual Report


# South Gap EPBC Offset Annual Report 2024

## 06 February 2025

# Contents

# Abbreviations

| | |
|---|---|
| IBRA | Interim Biogeographic Regionalisation for Australia (Region, Sub-region, Association) |
| EPBC Act | Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) |
| EOMP | EPBC Offset Management Plan |
| MNES | Matters of National Environmental Significance |

# 1. Introduction

## 1.1 Background

The on-ground offset program at South Gap Station (central South Australia) is halfway through the fourth year of management. The main focus of this site is to protect the EPBC listed plains mouse (*Pseudomys australis*) and restore their habitat. The EPBC Offset Management Plan (EOMP) is followed to satisfy relevant approval conditions, with 5 key goals:

Goal 1- Establish baseline conditions, including the distribution and condition of plains mouse habitat, the presence and distribution of target species, and the identification and prioritisation of local threats (refer to Jacobs 2020)
Goal 2- Refine the presence, distribution, and abundance of plains mouse within the offset
Goal 3- Manage total predation pressure (from cats, foxes and possibly wild dogs)
Goal 4- Maintain and / or enhance the condition of the habitat for the benefit of plains mouse through the management of total grazing pressure and invasive weeds
Goal 5- Improve knowledge of local target species populations, including how they respond to management locally.

The EOMP presents 14 individual objectives grouped under 11 management strategies to address EPBC Act offset liability and associated legislative and policy obligations for the first 10-year management period.

## 1.2 Location and site features

The two South Gap EPBC offset areas are situated in central South Australia, approximately 100 km north of Port Augusta and 30 km south-east of the Carrapateena mine (Fig. 1). The site is adjacent to Lake Torrens. It is in the traditional country of the Kokatha people, who have strong connections to this land. The pastoral industry has utilised the landscape for the last 160 years, with sheep as the dominant stock for the area. The northern South Gap EPBC offset area is 1882 ha in size, whilst the southern is 1369 ha

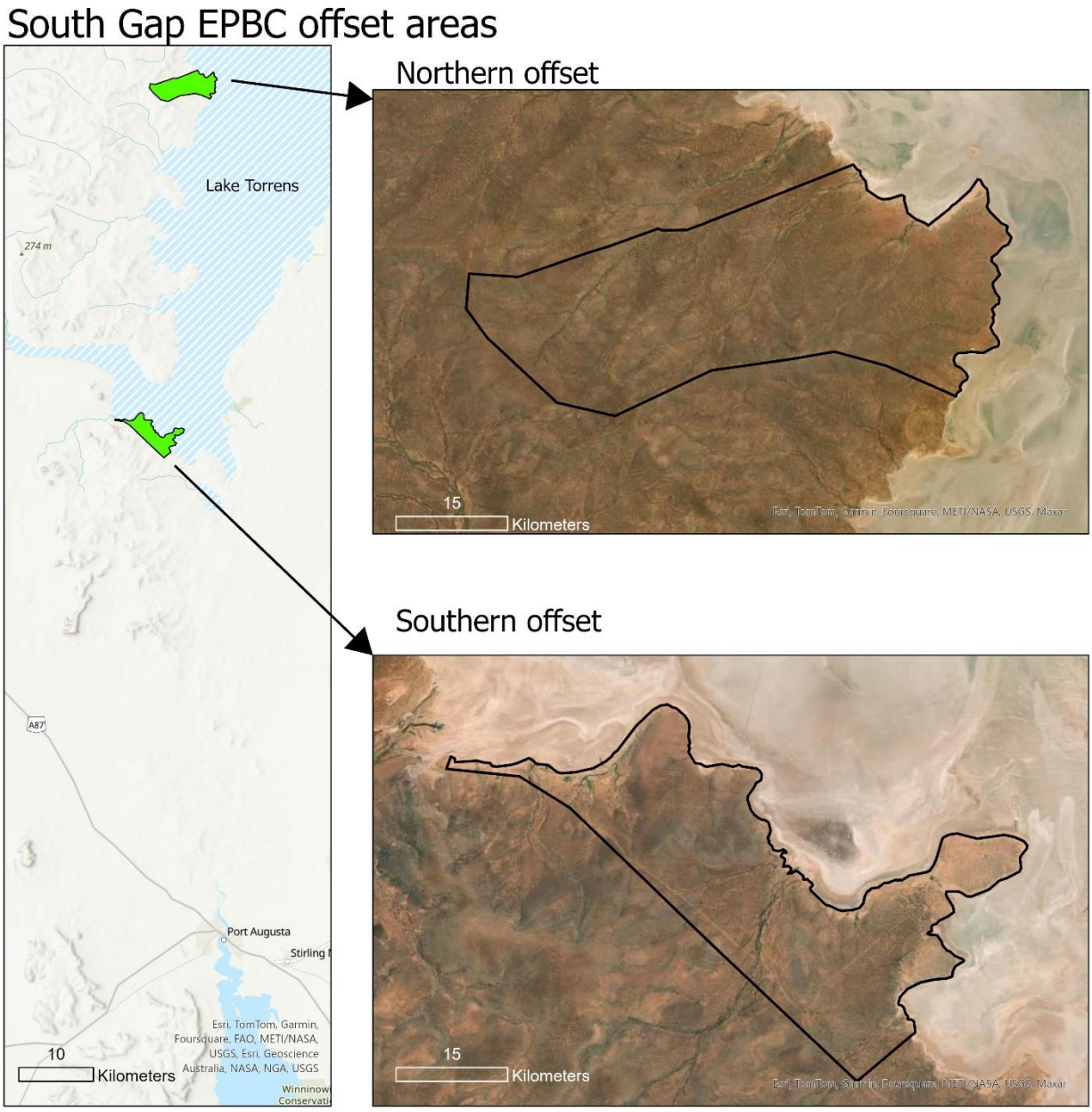


Figure 1. Location of the South Gap EPBC offset area (Red Our) within South Australia

## 1.3 Landscape

Habitat in the South Gap EPBC offset area (henceforth "the offset") is dominated by low plateau hills around 200m high. Vegetation is mostly low open Chenopod shrublands, interspersed with trees and shrubs along the drainage lines. The most important habitat features for the plains mouse (*Pseudomys australis*) are cracking clays (also known as Gilgai's). There are no waterpoints in the northern offset. There is a dam on the southern offset (Gum dam) that is occasionally full.

## 1.4 Climate

The offset is in a region where annual average rainfall is around 180 mm per year (nearest Bureau of Meteorology station, South Gap station number 016043, complete records for 1884–November 2024), marking it as a semi-arid climate. Rainfall is low, and on average roughly equally distributed across the year. Over the last seven years, there was a drought in 2018 and 2019, yet each subsequent year has been around average rainfall (Fig. 2). During 2024, there has been 212 mm as of November (as recorded at the South Gap homestead), which is above average. There was heavy rainfall in July and November 2024 (Fig. 3), though it did not appear that much of this rain fell on the north offset (personal observation). Rain gauges will be established in both offsets in 2025.

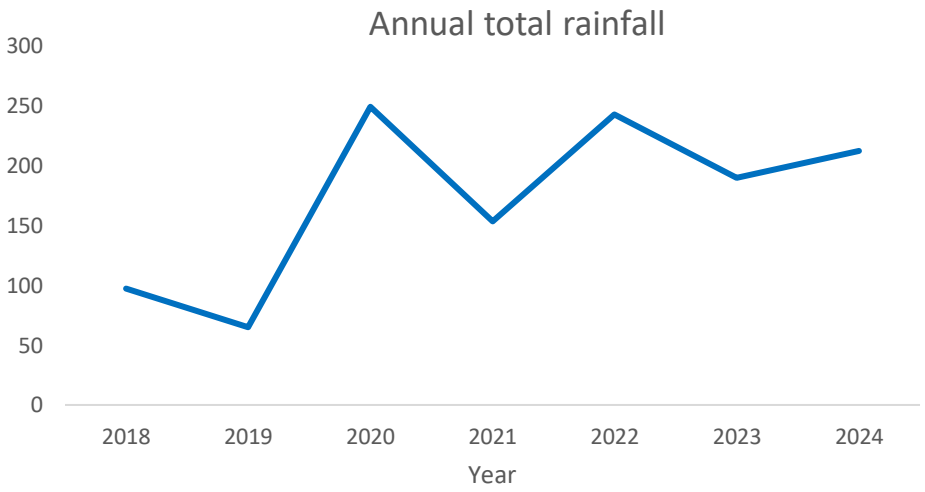


Figure 2. Total rainfall for each year from the South Gap weather station (Bureau of Meteorology # 016043)

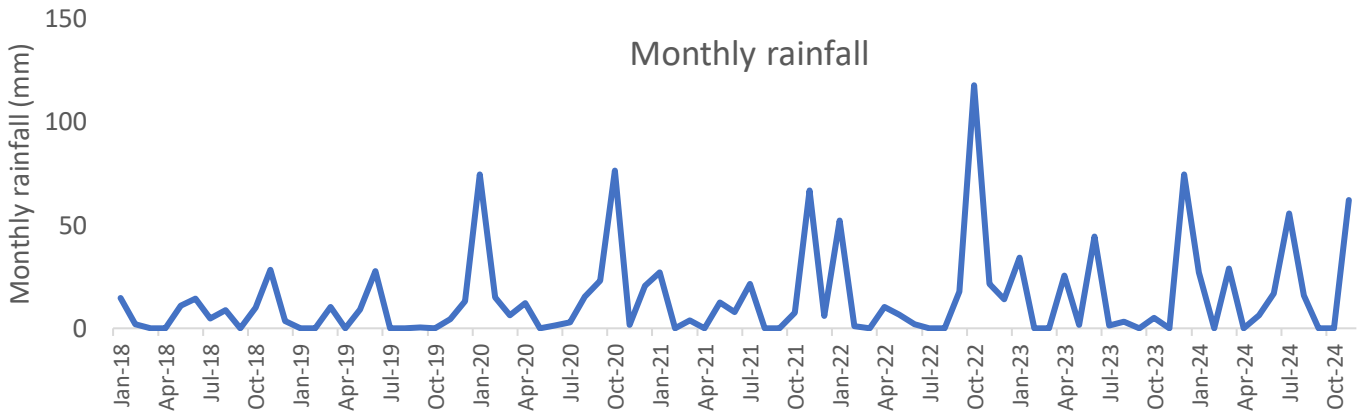


Figure 3. Rainfall from each month from January 2019 to November 2024, measured by the South Gap weather station (Bureau of Meteorology # 016043)

## 1.5 Conservation Values

The primary conservation value for the offset is the preservation of habitat for the plains mouse, a threatened native rodent. This species lives in the open dry shrubland, builds small burrows, and is, on average, 55 g. This makes it within the critical weight range of mammals, where species with a body mass between 35 – 5500 g have a propensity to be threatened by feral cats and foxes (Johnson and Isaac 2009, Woinarski, Burbidge et al. 2015). Plains mouse are listed under Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) as a Vulnerable Matter of National Environment Significance.

Two nationally threatened species may occur on site, although there are no known recent records from the surrounding area. These are the thick-billed grass-wren (*Amytornis modestus*) and night parrot (*Pezoporus occidentalis*). Other local species of note include the locally endemic Pernatty knob-tailed gecko (*Nephrurus deleani*), along with small native mammals like spinifex hopping mouse (*Notomys alexis*) and Bolam's mouse (*Pseudomys bolami*).

## 1.6 Threatening processes

Key threatening processes most likely affecting the offset areas and the Plains Mouse include:

- Predation by european red fox (*Vulpes vulpes*)
- Predation by feral cat (*Felis catus*)
- Predation by wild dog (*Canis* spp.)
- Competition and land degradation by european rabbit (*Oryctolagus cuniculus*)
- Competition and land degradation by domestic stock (*Bos* spp. and *Ovis aries*)
- Competition and land degradation by feral goats (*Capra hircus*)

# 2. Legislative Framework

## 2.1 Environment Protection and Biodiversity Conservation Act (1999)

The Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) is the primary Commonwealth legislation established to protect and manage Matters of National Environmental Significance (MNES), including nationally and internationally important flora, fauna, ecological communities, and heritage places.

The EOMP guides the delivery of an on-ground offset required to address the residual impact to Plains Mouse (Condition 3, 4 and 5) as per the EPBC Act Approval conditions (granted on 29 March 2018).

## 2.2 Other legislation

Other relevant legislation relating to the offset area includes the National Parks and Wildlife Act (1972), Native Title Act (1993), Aboriginal Heritage Act (1988), Landscape Act (2019) and the Pastoral Land Management and Conservation Act (1989). For more detail on these acts, refer to the EOMP.

# 3. Management Goals, Strategies and Objectives

| **Goals** | **Strategies** | **Objectives** (under same acronym headings as EOMP) |
|---|---|---|
| Goal 1- Establish baseline conditions | Strategy 2: Improve knowledge of target species population dynamics and management | PM1: Quantify and monitor Plains Mouse habitat within the offset |
| Goal 2- Refine the presence, distribution, and abundance of Plains Mouse within the offset | Strategy 2: Improve knowledge of target species population dynamics and management | PM1: Quantify and monitor Plains Mouse habitat within the offset |
| Goal 3- Reduce predation pressure | Strategy 3: Cat control<br>Strategy 4: Fox control<br>Strategy 5: Wild dog control | CC1: Reduce Cat density to less than 4 Cats / 100 km within the offset area.<br>FC1: Reduce Fox density to less than 1 Fox / 100 km within the offset area.<br>DC1: Keep the offset area free of Wild Dogs. |
| Goal 4- Reduce total grazing pressure | Strategy 1: Stock management<br>Strategy 6: Rabbit control<br>Strategy 7: Weed control | SM1: Keep the offset area free of domestic livestock.<br>RC1: By 2023, reduce Rabbit numbers and warrens by 80% within the offset area.<br>RC2: Map and rip 5 $km^2$ of chenopod shrublands in priority areas each year for 4 yrs.<br>WC1: By 2028, the distributions of invasive weeds (i.e. Declared and Weeds of National Significance) will be reduced. |
| Goal 5- Improve knowledge of local target species populations | Strategy 2: Improve knowledge of target species population dynamics and management | PM1: Quantify and monitor Plains Mouse habitat within the offset |

# 4. Results

## 4.1 Goal 1 - Establish baseline conditions

### 4.1.1 Overview

The vegetation of the South Gap EPBC offset area is important to manage and understand. We monitor vegetation condition with annual Rangeland Assessment Method (RAM) floral surveys and Jessop transects (described in more detail below). These surveys have not been completed at the time of reporting due to a lack of rainfall on the northern offset, and a focus on efforts to establish the southern offset. Surveys in both offsets will be carried out in early 2025.

### 4.1.1 Weed assessments

To limit the spread of weeds to the South Gap EPBC offset area, vehicles are washed down before and after arrival. For the Nature Foundation field ecologist based in Roxby Downs, this occurs at the Arid Recovery wash down facility at Olympic Dam. No weeds of national significance were detected. However, some annual exotic forbs were found at cracking clay sites, including sow thistle (*Sonchus oleraceus*), malvastrum (*Malvastrum americanum*) and london rocket (*Sisymbrium irio*). These will be monitored through 2025 and controlled as required.

## 4.2 Goal 2 - Presence, distribution, and abundance of Plains Mouse

Plains Mouse activity is monitored at 12 permanent remote camera sites. Each consists of a remote camera (Reconyx Hyperfire 2 Professional HP2X) with adjusted focus to 90 cm placed on a star-picket facing down at a lure (PVC tube with peanut butter). A 50 x 50 cm corkboard with 10 mm gridlines was placed underneath to enable measurements of animal size. Cameras were last checked in November 2024. Three cameras were not operational, with one having too many false triggers and running out of battery, and two knocked down by kangaroos.

Once images were downloaded, small animals recorded were identified. We identified plains mouse from a head and body length of 90 to 145 mm and a tail shorter than 125 mm (Van Dyck *et al.* 2013). Images of rodents with a head and body length of approximately 90 mm were only classed as 'likely' plains mouse. We could reliably identify to species level the spinifex hopping-mouse (*Notomys alexis*), narrow-nosed planigale (*Planigale tenuirostris*), and desert short-tailed mouse (*Leggadina forresti*). Some individuals of the other small mammal species could be identified to species, though not all. For example, some dunnart images could be differentiated between *Sminthopsis crassicaudata* or *S. macroura*, though often not. Therefore, these species were often clumped together, along with small rodents (*P. bolami*, *P. hermanbergiensis* or *M. domesticus*).

During 2024, only one plains mouse was detected. This was a small individual, recorded at a site that was located in creekline habitat dominated by shrubs (Fig. 4). It was possibly not resident at the site. The lack of sightings is part of a general low

detection rate since mid-2022 (Fig. 5). Over this same time, activity rates of dunnarts, spinifex hopping-mice, and other small rodents have remained low yet stable (Fig. 6).

Figure 4. Creekline shrub habitat on the northern South Gap EPBC offset area where a plains mouse was detected in 2024.

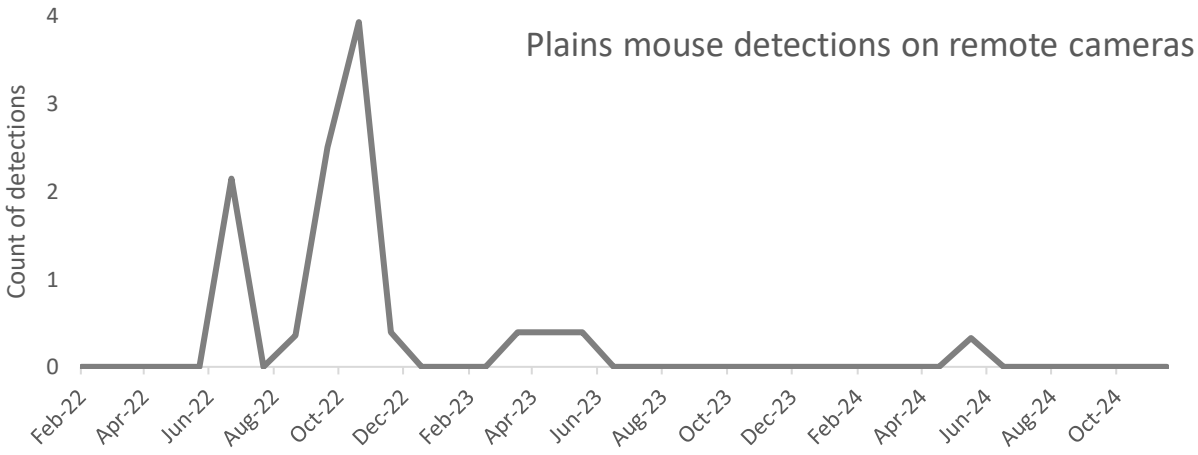


Figure 5. Plains mouse detections on remote cameras at the northern South Gap EPBC offset.

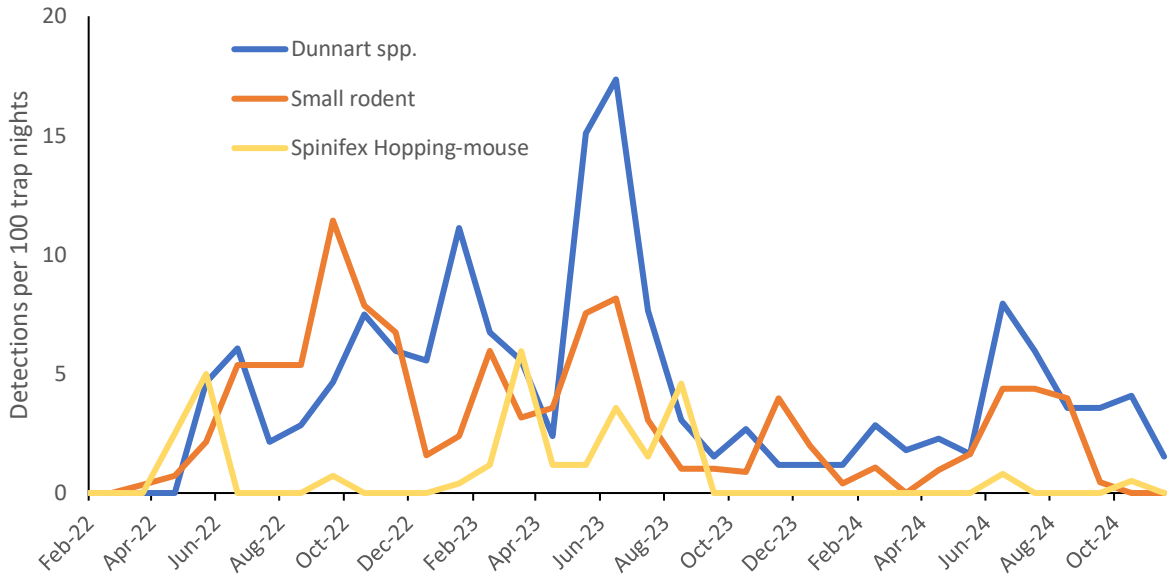


Figure 6. Detection rates of dunnarts (*Sminthopsis* spp.), small rodents (<20g) and spinifex hopping mice at the South Gap EPBC offset area.

## 4.3 Goal 3 - Reduce predation pressure

There were two feral predator control trips to the South Gap EPBC offset area during 2024, conducted by the professional shooter Graham Miller. On these trips, three feral cats and one red fox have been shot. This brings the total number of feral animals removed through EOMP activities to 38 (15 cats and 23 foxes, Table 1). To further monitor trends in feral animal presence and abundance and place this control in context, we have deployed 20 Swift Enduro Pro remote cameras across the paddock (Fig. 7). These have been continuously operating since February 2022. Results for 2024 demonstrate that fox and cat activity fluctuated through the year, though both remained well below 2022 (fox) and 2023 (cat) peaks (Fig 8). There were spikes in cat activity ~February/March and August/September, and spikes in fox activity in March and May, which have both since abated. Feral predator control will be continued through 2025. It should be noted that Canid bait injectors cannot be used on the offsets to ensure that the organic certification of the South Gap property is maintained.

Table 1. Feral predators removed from South Gap EPBC offset area through EOMP activities.

| Year | Cats | Foxes |
|---|---|---|
| 2021 | 4 | 12 |
| 2022 | 2 | 8 |
| 2023 | 6 | 2 |
| 2024 | 3 | 1 |
| Total | 15 | 23 |

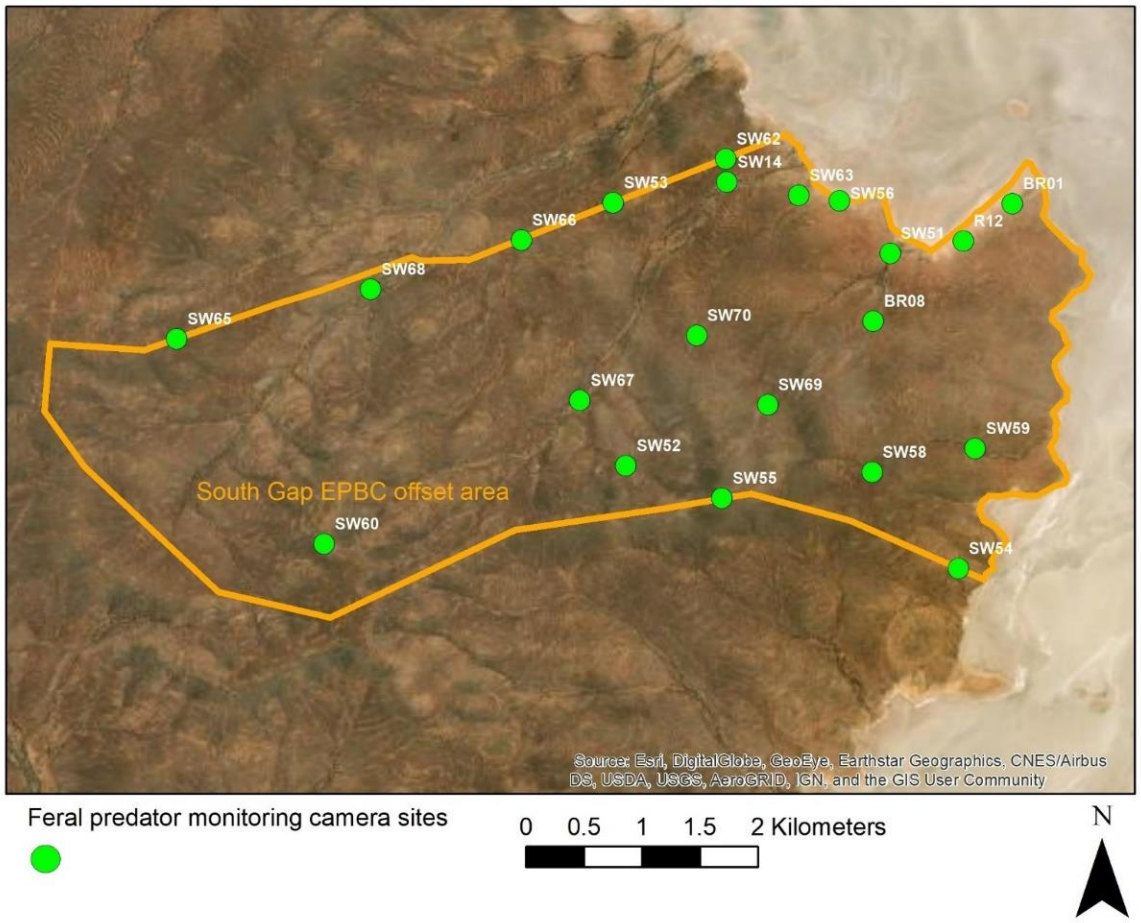


Figure 7. Location of the remote camera sites used at the northern South Gap EPBC offset area to monitor feral predators from 2022, 2023, and 2024.

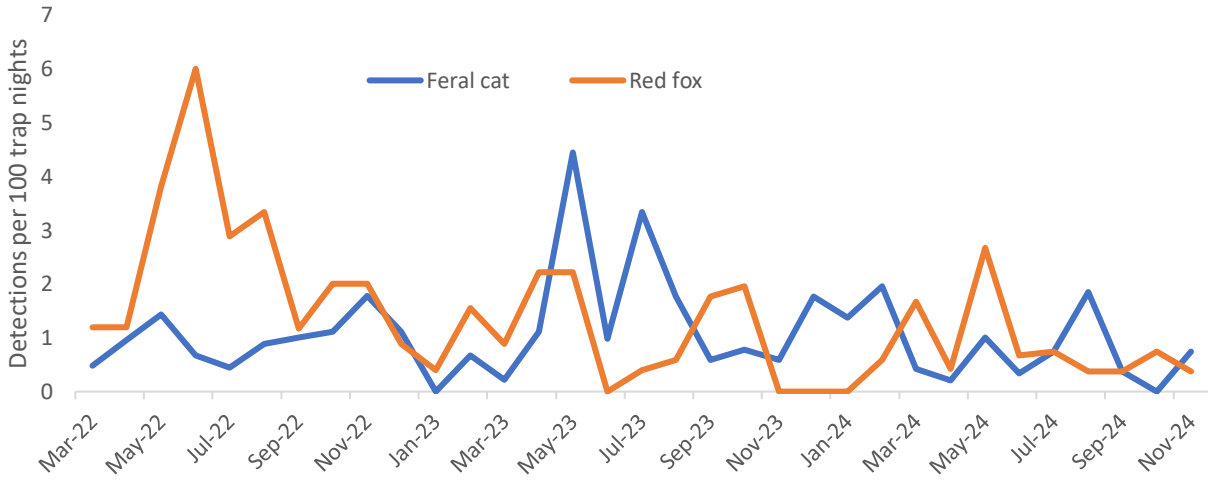


Figure 8. Detection rates of Feral cats and Red Fox at remote camera trap sites spread across the northern South Gap EPBC offset area from intial deployment in Feb 2022 to November 2024.

## 4.4 Goal 4 - Maintain habitat condition through management of grazing and invasive weeds

To maintain and enhance habitat condition, we aim to reduce total grazing pressure to prevent negative impacts on vegetation. Primarily, this is achieved using stock-proof perimeter fence and removal of sheep and goats. We also control rabbits and aim to manage kangaroo numbers.

### 4.4.1 Fence condition

After much of the northern fence to the northern offset fell down in 2023, a new fence was rebuilt in 2024. This is a ring-lock fence, the same as the southern boundary fence. During each site visit, a full audit was conducted, and all issues with the fence were recorded and fixed where possible. After the new fence was erected, there were no holes found during fence checks. However, there have been some holes dug under the southern fence by kangaroos (Fig. 9), which have all been patched up with small sections of mesh.

Figure 9. Example of a hole dug underneath the stock exclusion fence by kangaroos. These were patched up each time they were found with either large rocks or mesh wire.

### 4.4.2 Sheep activity

The fence in the northern offset was compromised and non-functional for most of 2023. After the fence in the was repaired in early 2024, there was a single event where a flock of sheep was detected in the paddock and were mustered out (Fig. 10).

### 4.4.3 Goats

Only a small number of goats were detected on remote cameras in the northern offset during 2024 (Fig. 10). There are, however, reports of large influxes over the general region (Kate Greenfield pers com). They are therefore likely to be a major threat in 2025.

### 4.4.4 Rabbits

Few rabbits were detected in 2024 (Fig. 10), and no historic calcrete warrens visited have been reopened. Due to these low numbers, no rabbit control was conducted. Monitoring will continue in 2025 to guide control requirements.

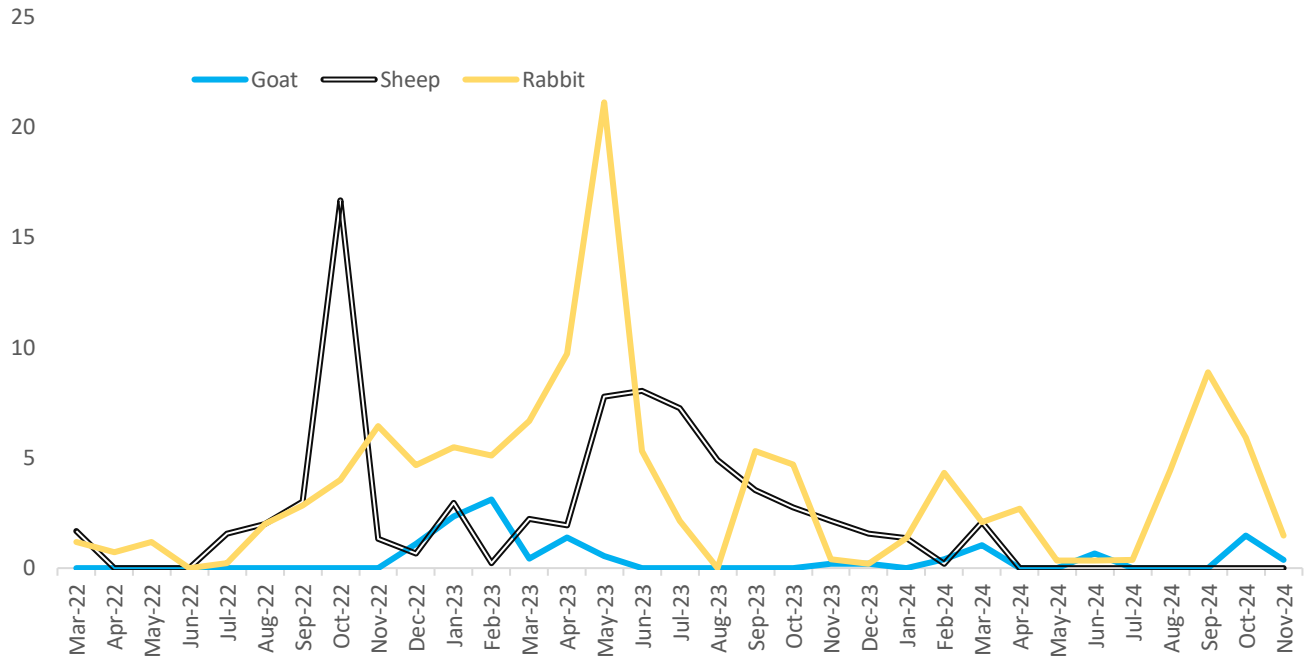


Figure 10. Detection rates on remote cameras within the northern offset of Goats, Sheep and Rabbits.

### 4.4.5 Kangaroos

Remote camera data revealed very high kangaroo activity in winter, which decreased significantly in spring (Fig. 11). A thermal camera survey of kangaroos was also conducted in 2024, in April, when activity rates in remote cameras were especially low. Only two kangaroos were detected during this survey, from 20 sites.

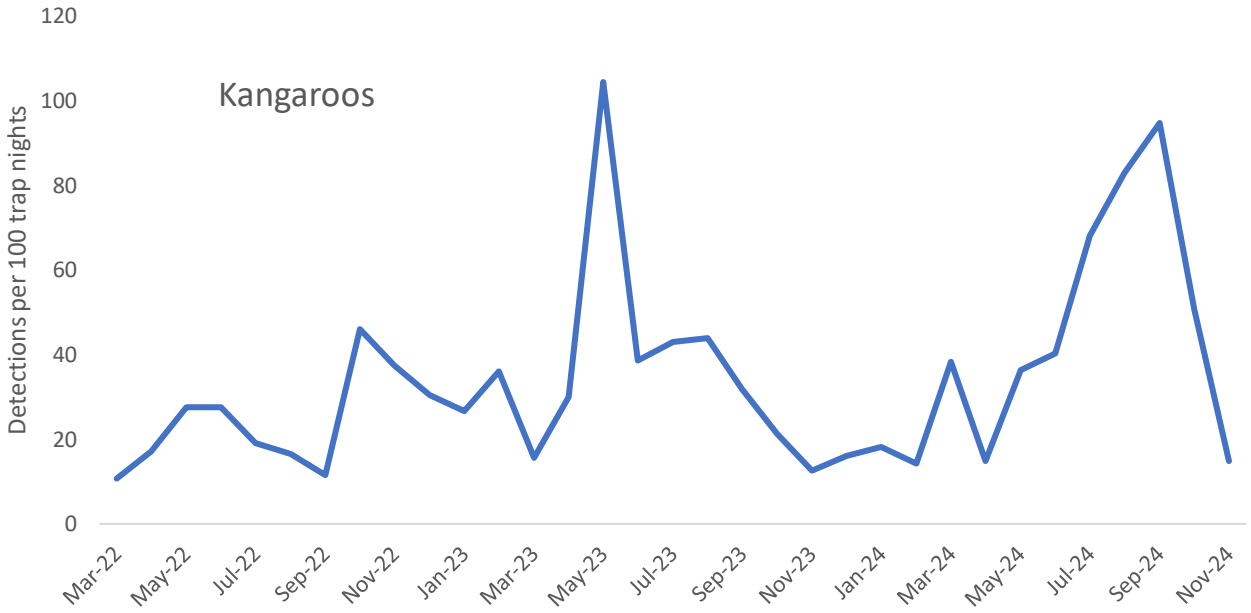


Figure 11. Activity rates of kangaroos (both Red Kangaroos and Euros) from remote cameras at the South Gap EPBC offset area.

## 4.5 Goal 5- Improve knowledge of local target species populations, including how they respond locally to management.

While the key focus of the EOMP is on plains mouse, birdlife is also monitored on the offset. Birds were surveyed at three sites within the northern offset. Each site was scanned for birds for 20 minutes, with a count taken of each species seen or heard. All incidental sightings of note were also recorded. Each site was surveyed twice in 2024 (July and November). Habitat varied at each site, from creek woodland near Grim dam, open saltbush plains, and dense saltbush on the banks of Lake Torrens.

A total of 70 birds have been detected thus far (Table 2). Two species detected are listed as vulnerable under the EBPC act, the blue-winged parrot and southern whiteface. A mixture of birds from different ecosystems were detected, including wetland birds like the red-necked avocet, arid-zone birds like the cinnamon quail-thrush, and woodland birds like the rufous whistler. Incidentally, we also detected spotted marsh frogs and Stoke's skink (or gidgee skink).

Table 2. South Gap offset areas' bird list to from 2021 to 2024. Species listing under EPBC act in brackets.

| Bird List | |
|---|---|
| Australian Boobook | Mulga Parrot |
| Australian Magpie | Nankeen Kestrel |
| Australian Owlet-nightjar | Orange Chat |
| Australian Pipit | Pacific Black Duck |
| Australian Raven | Pied Butcherbird |
| Banded Stilt | Pink-eared Duck |
| Barn owl | Purple-backed Fairywren |
| Black-faced Woodswallow | Red-capped Robin |
| Black-shouldered Kite | Red-necked Avocet |
| Black-tailed Native-hen | Rufous Field-wren |
| Blue-winged Parrot (Vulnerable) | Rufous Songlark |
| Brown Falcon | Rufous Whistler* |
| Brown Goshawk | Singing Honeyeater |
| Budgerigar | Slender-billed Thornbill |
| Chirruping Wedgebill | Southern Whiteface (Vulnerable) |
| Cinnamon Quail-thrush | Spiny-cheeked Honeyeater |
| Common Bronzewing | Spotted Harrier |
| Crested Bellbird | Spotted Nightjar |
| Crested Pigeon | Striated Pardalote* |
| Crimson Chat | Stubble Quail |
| Eastern Bluebonnet | Tawny Frogmouth |
| Elegant Parrot* | Wedge-tailed Eagle |
| Emu | Weebill |
| Galah | Welcome Swallow |
| Grey Fantail* | White-backed Swallow |
| Grey Shrike thrush | White-browed Babbler |
| Grey Teal | White-faced Heron |
| Grey-crowned Babbler | White-fronted Honeyeater* |
| Hooded Robin | White-winged Fairywren |
| Inland Dotterel | Willie Wagtail |
| Inland Thornbill* | Yellow Chat |
| Little Buttonquail | Yellow-throated Miner |
| Little Crow | Zebra Finch |
| Mallee Ringneck | Silver Gull |

*Only detected on southern offset.

# 5. Infrastructure

The access roads to both the northern and southern offset present some challenges. While previously accessed through Pernatty station, the northern offset now needs to be accessed through South Gap station. This is achieved via one of two roads: a rough road following alongside a dry creek, or a road that goes directly over a hill with a small section of steep incline (Fig. 15). While each are traversable by experienced four-wheel drivers, they may pose access limitations in unfavorable conditions. In contrast, while the road to the southern offset is in good condition, the internal roads are poor, with large erosion gullies.

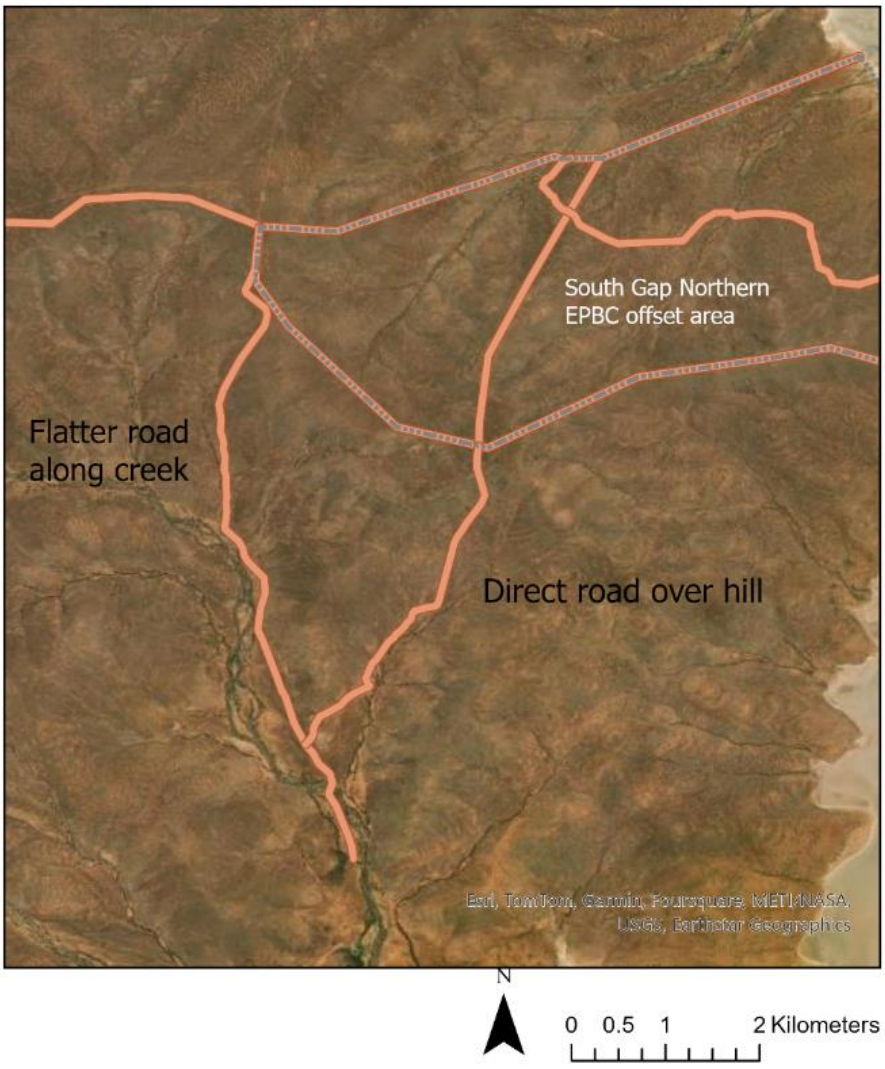


Figure 15. Map of the two access routes into the South Gap northern EPBC offset area.

# 6. Initial works on the South Gap southern offset

Work began in 2024 on the new southern offset, a 1369 ha area on the southern end of Lake Torrens (Fig. 1, page 7). Initial efforts have focused on laying groundwork for establishing the stock-exclusion fence, while implementing on-site surveys designed to assess the presence and status of native species, the level of feral animal activity, and the diversity and extent of weeds.

To assess the presence of native species we deployed six small mammal cameras at cracking clay gilgai sites, conducted two rounds of bird surveys at three sites (total 6 surveys, reported), and conducted targeted searches for threatened plants. Of the six remote cameras set for small mammals, useable data was only obtained from three cameras for three months. On these we observed Bolam's mouse and dunnarts, but no plains mouse. This was not surprising given the site is outside the current known distribution for the species, and the sample size is small. As conditions improve post grazing management, and more cameras are set, our chances for future detections will improve. In 2025 we will map and measure cracking clay habitats and add more small mammal cameras. Sixty bird species were recorded during the surveys, including several not yet observed in the northern offset. And after a walk along all major watercourses, we found four Sandalwood plants, all of which had evidence of goat browsing.

To monitor feral animals, we deployed six remote cameras in August 2024, and another four in November 2024. We acquired data from four of the six cameras. On those four cameras, many goats were detected with mobs of between 50 to 130 observed around Gum dam (Fig. 16). These had likely come in from the south. We also detected numerous feral cats and foxes, at a higher rate than reported on the northern offset (Fig. 17). It should be noted, however, that observations for the southern offset have come from only four sites (in contrast to the northern offset with sixteen), which is too few sites to provide any significant indication of trends.

In contrast to the northern offset, the southern offset had an abundance of recognized weeds. Of note was prickly pear cactus, scattered across the offset. We began monitoring by recording every clump seen near the main track (14.5 km long), estimating its rough size, assigning each a health score (0 = dead to 5 = completely alive), and conducting control if relevant. On the first trip, each healthy (score > 2) cactus had chunks infected by the cochaneil bio-control insect transplanted onto it (see Figure below). Subsequent trips showed there had been little success using this control method (Fig. 18). Instead, the whole plant was dug up, with all bits placed on a rock or saltbush (where they would otherwise be able to rejuvenate). 14 clumps were killed in this way, and the number of healthy cacti has already declined substantially (Fig. 19). We will aim to do this every trip and should thus be able maintain a low cactus presence.

Figure 16. The Gum Dam, located within the southern offset. It is a focal point for both grazing mammals and native birds.

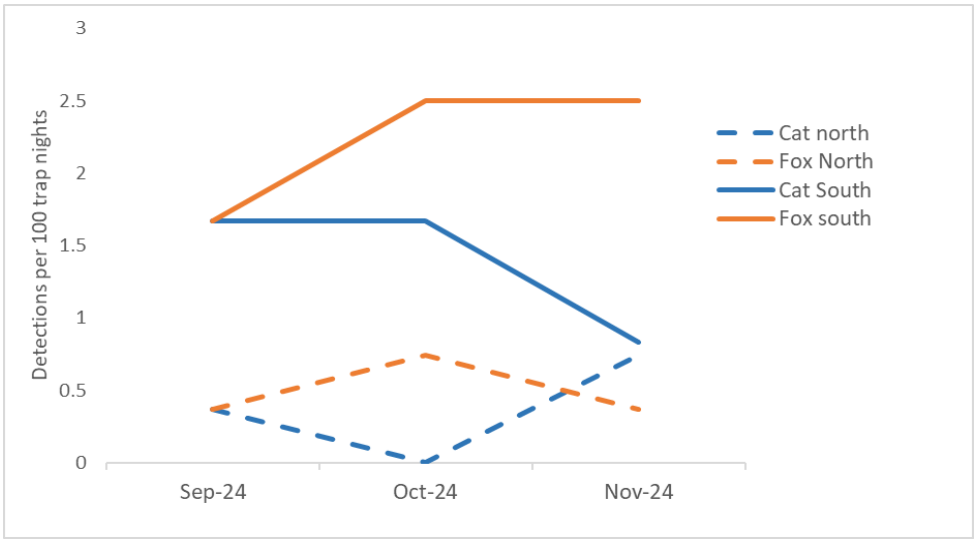


Figure 17. Comparison of detection rates of cats and foxes on remote cameras at South Gaps' northern offset (dashed lines) and southern offset (solid lines). Data is from 16 sites at northern offset and four at southern offset.

Figure 18. Prickly pear with a small section of cochineal infected pear transplanted into it (left), which did not appear to work by the next trip (right).

Figure 19. Prickly pear, dug up from the base and placed off the ground.

A patch of the declared environmental weed “tree tobacco” (*Nicotiana glauca*) was also found on-site (Fig. 20). This patch was about 140 m x 50 m with around 100 plants. The use of herbicides to control plants is prohibited on South Gap, so these were removed manually. We will continue to monitor this patch in 2025.

Figure 20. The patch of Tree tobacco bush on the southern offset. All were removed.

# 7. Future Priorities

For 2025, we will continue all ongoing monitoring and management actions as directed by the EOMP. Additional priorities will include:

- The implementation of management plans in the southern offset, and preparation for a new fence
- The promotion of sandalwood regeneration in the southern offset
- The continuation of gilgai research to improve understanding of plains mouse habitat use
- Track work to ensure safe access to, and travel across, the offsets
- Preparations to enable us to respond to rainfall driven increases in goat and/or rabbit populations with appropriate controls

# 8. References

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