

Australian Strategic Materials (Holdings) Ltd ABN 51 091 489 511

Annual Review & Annual Rehabilitation Report

1 July 2022 – 30 June 2023



Soil sampling to establish baseline carbon in soils – Dubbo Project Site . Photo taken 25 May 2023



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Definitions

Term	Definition
ACCU	Australian Carbon Credit Units (issued by Clean Energy Regulator)
ASM	Australian Strategic Materials Ltd (formerly known as AZL)
ASMH	Australian Strategic Materials (Holdings) Ltd - a wholly owned subsidiary of ASM
AZL	Australian Zirconia Ltd
BAM	Biodiversity Assessment Method (2020)
BCS	Biodiversity, Conservation and Science Directorate (Environment & Heritage Group is part of DPE)
BCT	Biodiversity Conservation Trust (Statutory authority under E&H)
BOA	Biodiversity Offset Area
BOM	Bureau of Meteorology
CaCO ₃	Calcium carbonate
CCC	Community Consultative Committee
CPVP	Conservation Property Vegetation Plan
DAWE	Australian Government – Department of Agriculture, Water and
	Australian Government – Department of Climate Change Energy the
DCCEEW	Environment and Water
DP	Dubbo Project (formerly known as DZP - Dubbo Zirconia Project)
DPE	Department of Planning and Environment (NSW Government)
DPI-Water	Water – NSW Department of Primary Industries
DRC	Dubbo Regional Council
DS	Dams Safety (NSW Government)
EC	Electrical Conductivity
EEC	Endangered ecological community
EES	Environment Energy & Science Group (part of DPIE - contains former OEH, EPA)
EIS	Environmental Impact Statement
EP&A	Environment Planning and Assessment Act 1979
EPA	Environment Protection Authority
EPBC	Environment Protection & Biodiversity Conservation Act 1999
EPL	Environment Protection Licence
ERML	Environmental Radiation Monitoring Location
GHG	Greenhouse Gas
HEC	Hyundai Engineering Corporation
HVAS	High volume air sampler
	Licensed discharge point
	Landscape function analysis
	Local Land Services
	Limit of Reporting
MEG	Mining Exploration & Geoscience
Mining Act	Mining Laploration & Geoscience
	Mining Loopo
	Modification 1 of SSD-5251 Consort
	National Greenhouse and Energy Departing Scheme
NUERO	



Term	Definition
NMP	Noise Management Plan
WNSW	Water NSW
PM10	Particulate matter 10 microns and smaller
PTWL	Pink-tailed Worm-lizard (Aprasia parapulchella)
PVP	Property Vegetation Plan
RAP	Registered Aboriginal Party
REE	Rare Earth Elements
RMP	Rehabilitation Management Plan
ROM	Run of Mine
SEC	Salt Encapsulation Cell
SEEC	Strategic Environmental and Engineering Consulting
SRSF	Solid Residue Storage Facility
TARP	Trigger action response plan
TfNSW	Transport for NSW
TEOM	Tapered Element Oscillating Microbalance
TIM	Total Insoluble Matter
TPC	Toongi Pastoral Company Pty Ltd
TSP	Total suspended particulates
WAL	Water access licence
WHS	Workplace Health & Safety
WRE	Waste Rock Emplacement



Title Block

Name of operation	Dubbo Project		
Name of operator	Australian Strategic Materials (Holdings) Ltd		
Development consent / project approval #	SSD-5251		
Name of holder of development consent / project approval	Australian Strategic Materials (Holdings) Ltd		
Mining lease #	ML 1724		
Name of holder of mining lease	Australian Strategic Materials (Holdings) Ltd		
Water licence #	WALs; 19994, 9191, 3396, 36409, 3412, 30259, 36790, 36791		
Name of holder of water licence	Australian Strategic Materials (Holdings) Ltd		
RMP start date	ТВА		
RMP end date	ТВА		
Annual Review start date	1 July 2022		
Annual Review end date	30 June 2023		

Table 1: Annual Review Title Block

I, Michael Sutherland, certify that this audit report is a true and accurate record of the compliance status of the Dubbo Project for the period 1 July 2022 to 30 June 2023 and that I am authorised to make this statement on behalf of Australian Strategic Materials (Holdings) Ltd.

Note.

The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.

The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).

Name of authorised reporting officer	Michael Sutherland
Title of authorised reporting officer	General Manager NSW
Signature of authorised reporting officer	
Date	24 August 2023



1 Statement of Compliance

Table 2 provides a statement of compliance status for Australian Strategic Materials (Holdings) Ltd (ASMH) with its project approval (SSD) and mining lease (ML), as at the end of the reporting period.

Table 2: Statement of Compliance

Were all conditions of the following approvals complied with?			
SSD-5251 YES			
ML 1724 YES			

Table 3 provides a summary of approval conditions not complied with as at the end of the reporting period.

Table 3: Non-Compliances

Relevant approval	Condition #	Condition description (summary)	Compliance status	Comment	Relevent Section
NA					

Compliance status key for Table 3					
Risk level	Colour Code	Description			
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence			
Medium	Non-compliant	Non-compliance with: potential for serious environmental consequences, but is unlikely to occur; or potential for moderate environmental consequences, but is likely to occur			
Low	Non-compliant	Non-compliance with: potential for moderate environmental consequences, but is unlikely to occur; or potential for low environmental consequences, but is likely to occur			
Administrative non- compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)			



2 Introduction

2.1 Dubbo Project

The Dubbo Project has not yet commenced construction on site, however, this Annual Review reports on environmental management activities undertaken by Australian Strategic Materials (Holdings) Ltd (ASMH) at the Dubbo Project during the financial year (FY) 2022-2023, and provides details on activities proposed for FY 2023/2024. The report has been produced in accordance with the Post-approval requirements for State significant mining developments - Annual Review Guideline (DPE, October 2015) to meet the annual reporting requirements conditioned in the ASMH Mining Lease (ML 1724) and Project Approval (SSD-5251).

The Dubbo Project, is a long-term polymetallic resource of rare earth elements, zirconium, niobium and hafnium. The Project represents an alternative and reliable source of the critical minerals and rare earths needed to de-risk and relieve bottle-necking in the global supply chain.

ASMH intends to develop the Dubbo Project to produce metal oxides in the form of chemicals, powders and metals at the Dubbo site. These products will be available in a range of standard and customised specifications, based on market requirements. Significant successful test work to optimise oxide recovery has been completed in partnership with the Australian Nuclear Science and Technology Organisation (ANSTO).

Long-term, the materials produced from the Dubbo Project will be used for refining into critical metals at ASM's proposed metals plants, the first of which is operating in Ochang, South Korea.

The Dubbo Project was approved as SSD-5251 by the NSW Planning Assessment Commission (PAC) on 28 May 2015 and will comprise a small scale open cut mine supplying ore containing 1 and rare earth elements to a processing plant near the locality of Toongi, approximately 25km south of Dubbo (the Dubbo Project Site) (see Figure 1).

Dubbo Project Modification 1 was sought from DPE and approved and approved on 2 March 2023. Consolidated consent conditions have been issued.

ASM identified opportunities to optimise the design of the project to maximise operational efficiencies at the mine. The key changes included adjustments to the site layout to accommodate additional plant and the relocation of infrastructure areas (see Figure 2, and Figure 4).

The Dubbo Project is yet to commence construction and thus there has been no rehabilitation activity to report, other than natural regeneration of grassy box woodland species in the biodiversity offsets (see Figure 6).

Annual extraction of ore from the open cut is planned to be approximately one million tonnes which could generate approximately 20 000t of export product. Waste residues produced by the processing operations will be managed in residue storage facilities (on site), designed to contain and encapsulate them.



The Dubbo Project also includes the construction of a water pipeline between the processing plant and the Macquarie River and Sweet Water bore, a pipeline to carry natural gas between Dubbo and the Dubbo Project Site, a 132kV electricity transmission line from Geurie substation to site and upgrades of the following linear infrastructure;

- Toongi Road;
- Obley Road; and
- the Toongi-Dubbo section of the currently disused Dubbo-Molong Rail Line.

Collectively, these are referred to as the Dubbo Project linear infrastructure.

2.2 Mine Contacts

The primary contacts for the Dubbo Project during the review period are detailed in Table 4. Dubbo Project Key Contacts

Key Contact	Position	Contact Details
Rowena Smith	Managing Director	PO Box 768 West Perth WA 6005 Phone (08) 9200 1681
Michael Sutherland	General Manager NSW	PO Box 910 Dubbo NSW 2830 Phone: (02) 6882 2866
Community Information Line	General Manager NSW	(02) 6882 2866

Table 4. Dubbo Project Key Contacts





Figure 1: Dubbo Project – Local Setting





Figure 2: Dubbo Project – Modified Site Layout





Figure 3: Dubbo Project – Modified Processing Plant & Administration Area Layout



Figure 4: Dubbo Project – Modified Disturbance Footprint





Figure 5: Dubbo Project – Environmental Monitoring Locations





Figure 6: Biodiversity Management Area



Approvals - The Dubbo Project operates under the environmental consents, leases and licenses specified in **Error! Reference source not found.**

Title	Legislation	Regulatory Authority	Approval Duration/ Expiry
State Significant Development approval 5251(28 May 2015)	Environmental Planning & Assessment (EP&A) Act 1979	NSW Planning and Environment (DPE)	31 December 2037
SSD-5251 – Modification 1 (2 Mar 2023)	Environmental Planning & Assessment (EP&A) Act 1979	NSW DPE	31 December 2045
EPBC 2012/6625 (24 Aug 2015)	EPBC Act 1999	Australian Government Dept of the Environment	31 December 2045
EPBC 2012/6625 Variation of Conditions attached to Approval (15 Mar 2022)	EPBC Act 1999	Australian Government-Dept of Agriculture, Water & Environment	31 December 2057
Mining Lease 1724 (18 Dec 2015)	Mining Act 1992	NSW Department Resources & Geoscience (DRG) now MEG	18 December 2035
Environment Protection License (EPL) 20702 (14 March 2016)	Protection of the Environment Operations (POEO) Act 1997	NSW Environment Protection Authority (EPA)	Ongoing until surrendered (14 March Anniversary)
Environment Protection License (EPL) 20702 Variation (15 Aug 2022)	Protection of the Environment Operations (POEO) Act 1997	NSW Environment Protection Authority (EPA)	Ongoing until surrendered (14 March Anniversary)
Water Access Licences WALs; 19994, 9191, 3396, 36409, 3412, 30259, 36790 and 36791	Water Management Act 2000	Water NSW	N/A
Water Supply Work Approval 80WA726382	s.95 Water Management Act 2000	Natural Resources Access Regulator	N/A
Conservation Property Vegetation Plan (31 May 2015)	Native Vegetation Act 2003	Local Land Services	In perpetuity

Table 5: Consents, leases and licenses



Title	Legislation	Regulatory Authority	Approval Duration/ Expiry
DA D2016-70 Karingle Quarry (13 July 2016)	Environmental Planning & Assessment (EP&A) Act 1979	Western Joint Regional Planning Panel	7 July 2021
DA D2016-70 Karingle Quarry Modification (25 August 2021)	Section 4.55 (1A) Environmental Planning & Assessment (EP&A) Act 1979	Dubbo Regional Council	N/A
General Terms of Approval Notice No. 1541379 (14 Jun 2016)	Section 91A (2) EP&A Act 1979	NSW Environment Protection Authority (EPA)	N/A
Occupation Certificate 2021-826 (26 May 2022)	Section 6.9, EP&A Act	Dubbo Regional Council	N/A



3 Operations Summary

3.1 Construction

No construction works were carried out on site during the period.

ASMH completed project commencement works (site entrance road and site office) by 27 May 2022. An Occupation Certificate was issued by Dubbo Regional Council on 26 May 2022.

An environmental monitoring shelter was installed on Wychitella (see Figure 5) and commissioned in March 2022. Meteorological data, PM2.5, PM10 and TSP baseline data is being collected prior to construction activity commencement.

In the three years since listing on the ASX, Australian Strategic Materials Limited (ASM) has progressed the financing needed for construction of the Dubbo Project.

On 9 June 2022 Hyundai Engineering Corporation (HEC) was awarded a contract for Engineering, Procurement and Construction Definition work (EPCD). Completion of the EPCD will allow HEC to produce an open book cost estimate and an offer to build the processing facilities for the Dubbo Project. The EPCD contract was divided into 3 Stages of work with HEC commencing Stage 1 (being establishment of the front-end engineering design activities and development of standards) in January 2023.



An environmental monitoring shelter supplied by ACOEM was installed during the previous reporting period southeast of the nearest sensitive receptor (Toongi Hall).



No significant ground disturbing activities associated with the Dubbo Project construction had commenced as of 30 June 2023.

3.2 **Operations**

All of the land enclosing the Dubbo Project was aquired by Australian Strategic Materials (Holdings) Ltd by June 2016 and a professional Farm Manager was appointed in May 2016.

The Senior Manager Farm and Business Operations is charged with the responsibility of operating a commercially viable mixed farming operation (Toongi Pastoral Company Pty Ltd) on 3,715Ha of land containing the Mining Lease and project footprint.

Fencing and managing the 1,021Ha Biodiversity Offset Area also falls under the responsibility of the Farm Manager. The final three kilometres of 29.2km of fencing was installed enclosing the biodiversity offsets by 30 June 2019.

During the period, areas of the farm were identified to register with the Commonwealth as a carbon project. Soil cores have been taken from the carbon estimation areas to identify the baseline carbon levels in those soils (outside of the mine deelopment footprint).

Environmental monitoring points are shown in Figure 5: Dubbo Project – Environmental Monitoring Locations.

Baseline water quality, air quality and meteorological data is collected by trained ASMH staff.

Ecological monitoring continues to be undertaken by qualified professionals.

A Community Consultative Committee with an independent Chairperson was established in late 2015 and has met quarterly, or as frequently as deemed necessary by the committee.

Australian Strategic Materials (Holdings) Ltd submitted an application for a modification (MOD 1) to State Significant Development consent (SSD) 5251 for the Dubbo Project. The application was made under Section 4.55(2) of the *Environmental Planning & Assessment Act 1979 (EP&A Act)*. A *Modification Report* was prepared by R.W. Corkery & Co. Pty Limited (RWC), on behalf of ASMH to support the application for MOD 1.

The key components of the modification can be summarised as:

- Construction and operation of:
 - a Chlor-alkali Plant for the production of hydrochloric acid and sodium hydroxide for use in on-site processing operations;
 - a brine concentrator to maximise water recovery; and
 - a conveyor between the Processing Plant and Administration Area and the Salt Encapsulation Cells.
- Relocation of:
 - the Salt Encapsulation Cells from the approved location southwest of the Open Cut to the approved location of the Liquid Residue Storage Facility Area 3;
 - the Solid Residue Storage Facility from the approved location west of the Waste Rock Emplacement to the approved location of the Liquid Residue Storage Facility Area 5; and



- the Rail Container Laydown and Storage Area from the approved location to an area immediately to the west of the approved location; and
- Reclassification of various approved disturbance areas to permit alternative uses.

The *Modification Report*, including supporting technical assessments, was publicly exhibited from 30 March 2022 to 19 April 2022. During and following that period, eight submissions were received by the Department of Planning and Environment (DPE) from Government agencies. A further six submissions were received from members of the public and private organisations.

A Response to Submissions was provided to DPE in July 2022. Approval was granted on 3 March 2023.

3.3 Next reporting period

Management plans for the numerous Dubbo Project environmental aspects will be revised and updated to accommodate MOD1 changes and additional consent conditions.

HEC will coninue the Stage 1 of the EPCD work. Stage 2 of the EPCD work will further develop engineering design to allow for identification and selection of technology requirements at the Dubbo Project. ASM will evaluate when Stage 2 will commence as the additional areas of non-process infrastructure work progresses.

As a result of the Stage 1 activities, additional areas of work were identified to be completed ahead of Stage 2 commencement. This includes, progressing the maturity of design of areas outside of the process plant, including: residue storage and handling facilities, site water management, greenhouse gas emission reduction studies, and site establishment planning. Work on these areas to support the project will continue during the next reporting period.

To develop the Dubbo Project, ASM is targeting a project financing funding strategy based on a mix of equity, supported by offtakes and debt, supported by export credit finance in Australia and other relevant jurisdictions. ASM continues to progress discussions with potential offtake and strategic partners in a broad range of industries and jurisdictions and these activities will continue in the next reporting period.

Subject to the outcome of the funding activities, ASM is targeting to make Final Investment Decision by its Board to progress the Dubbo Project by December 2024.



4 Actions Required from Previous Annual Review

This is the eighth Annual Environmental Management Review for the Dubbo Project.

There were no actions required by DPE from the seventh Annual Review.

Correspondence from DPE, EPA and DCCEEW is contained in Appendix C.

Notifications and Actions Required from previous Annual Review	Requested by	Action taken by Operator	Section where discussed
Letter dated 26 Sep 2022 – upload Annual Review to Company website	DPE	Michael Sutherland	Appendix C
Letter dated 15 Aug 2022 – Notice of variation of licence No. 20702	EPA	Michael Sutherland	Appendix C
Email dated 9 Dec 2022 – Offsets register now on Public Portal	DCCEEW	Michael Sutherland	Appendix C
Planning Portal – Notice of Decision- Dubbo Project – 2 Mar 2023	DPE	Michael Sutherland	Appendix C

Table 6: Actions from review previous Annual Review



5 Environmental Performance

5.1 Air Quality

The Dubbo Project Air Quality Management Plan (AQMP) was prepared to describe dust control measures at Dubbo Project site and meet the requirements of Schedule 3, Condition 18 of SSD-5251.

Management Plans can be found on the Dubbo Project web page at:

https://asm-au.com/dubbo-project-overview/environmental-reports-management-plans/

The Dubbo Project Air Quality Management Plan will be updated to include changes described in MOD1 EIS and additional consent condions in the next reporting period.

Air Quality criteria for the project are outlined in Table 7- Table 9.

A High Volume Air Sampler (HVAS) for measuring Total Suspended Particulates (TSP) and a Met One BAM1020 for measuring Particulate Matter (PM_{10 and} PM_{2.5}) were installed and commissioned between the Wychitella homestead and the Toongi Hall in February 2022.

The February 2023 Modification 1 has resulted in the issue of a consolidated consent. The new consent has removed the requirement to monitor deposited dust and TSP and added the requirement to monitor $PM_{2.5.}$ For the sake of completeness TSP is reported to the end of this reporting period.

Table 7: Long term criteria for particulate matter

Pollutant	Averaging period	a, d Criterion
Particulate matter <10 µm (PM10)	Annual	a 25 µg/m3
Particulate matter <2.5 µm (PM _{2.5})	Annual	a 8 µg/m3

Table 8: Short term criteria for particulate matter

Pollutant	Averaging period	b Criterion
Particulate matter <10 µm (PM10)	24 hours	50 μg/m3
Particulate matter <2.5 µm (PM2.5)	24 hours	25 µg/m3



Table 9: Short term criteria for particulate matter

Pollutar	nt	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
^c Deposi	ted dust	Annual	b 2 g/m ² /month	a 4 g/m ² /month
 Notes to Table 7-9: a) Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to other sources); b) Incremental impact (i.e. incremental increase in concentrations due to the development) 				
on its own); and c) Deleted				
d)	Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, illegal activities or any other activity agreed by the Secretary.			

Results for Total Suspended Particulates from 6 July March 2022 to 25 June 2023 ranged 2.0 μ g/m³ to 239.0 μ g/m³ for the 24 hour collection period measured every six days. The poorest air quality was experienced during a bushfire that ignited from a lightning strike a few kilmotres northwest of the project site on 6 March 2023. Back burning operations meant that air quality remained very poor for several days.

PM10 (suspended particulates <10 microns in size) were monitored continuously once the monitoring shelter at Wychitella was commissioned. Data is processed by ACOEM and monthly report provided to ASM. The abnormally wet first six months of the monitoring period has seen very low concentrations of $PM_{10 and} PM_{2.5}$ in the air.



Figure 7: PM 2.5 & 10 monthly averages at Wychitella monitoring shelter



Minimal dust management measures were employed during this reporting period as project construction has not commenced. These are baseline monitoring results which are influenced by seasonal and routine agricultural practices.

Toongi Pastoral Company is relatively conservatively stocked and has maintained good pasture cover in all but cropping paddocks (where minimum tillage is employed).



Bushfire smoke from Cranbrook fire seen from Karingle on 6 March 2023.

5.1.1 Proposed Improvements

The next reporting period should see the Construction Management Plan detail air quality controls and a revised Air Quality Management Plan prepared to include the MOD1 changes.

5.2 Biodiversity

ASMH settled on the last of the Dubbo Project property aquisitions in June 2016 which created the opportunity for a change in focus of land management to biodiversity enhancement in offset areas and building carbon in soils across the estate. This is a significant change in focus after 150 years of management of the land for agricultural production.

ASMH acquired an additional 169Ha rural property, Wheeler's Block, which fronts the Obley Road in late 2020 as part of a prior commercial arrangement.



TPC secured Commonwealth funds to assist with fencing gullies on Wheelers Block and Grandale and fencing along Wambangalang Creek (Grey Box Woodland Program and Northern Basin MDBA Program). This work was completed this reporting period.

Biodiversity at the Dubbo Project is managed under the Biodiversity Management Plan (BMP), which was completed in accordance with Schedule 3, Condition 31-35 of SSD-5251.

A component of the BMP is the Biodiversity Offset Strategy, which delineates the 1,021Ha of biodiversity offset areas and management actions selected to protect and enhance remnant vegetation communities (see Figure 6). The Biodiversity Offset Area (BOA) is protected in perpetuity with the registration on land title of a Conservation Property Vegetation Plan (CPVP) under the *Native Vegetation Act 2003*.

The CPVP was signed by ASM Directors on 22 May 2017 and Central West Local Land Services on 31 May 2017.

A variation to the CPVP was done in the reporting period (October 2022). The changes were made to enhance the management of the CPVP.

Changes included:

- Validation of the description of the land over which the plan applies
- Changes to the authorised activities and management actions of the units of native vegetion
- Increasing the area for management actions for conservation outcomes and the revised area to include a greater proportion of PTWL habitat.

While ASM has already put in place most of the tools to comply with the Australian Government approval (EPBC 2012/6625) for the Dubbo Project, the *Proposed Action* of developing an open cut mine has not yet commenced.

A Conservation Bond will be lodged with DPE prior to commencement of any development. The Department will be advised in writing at least three months prior to construction commencing.

It should be noted that there was significant dieback of trees across the whole project site from 2018 to January 2020. Black and White Cypress pine, Drooping She-oak and even red stringybark have died due to severe drought. With that dieback more sunlight is reaching the ground which has enabled growth of grasses, forbs, trees and shrubs. It has been decades since a recruitment window has occurred at Toongi. Thick stands of pine trees in 2021 and 2022 can now support groundcover up to 100cm high where in a normal season there would be very low and sparse cover.





Regenerating White Box (Eucalyptus albens) Trig Offset, Ugothery. Photo taken 3 October 2022.

5.2.1 Management Measures

Biodiversity management actions for the Dubbo Project are focussed towards protection and enhancement of habitat for the State and Commonwealth listed Pink-tailed Worm-lizard (PTWL) (Aprasia parapulchella).

ASMH has prepared a PTWL Management Plan (Version 2.3) and a PTWL Biodiversity Offset Management Plan, both of which are appendices in the Biodiversity Management Plan (V2.0) which was approved by DPE on 8 February 2017 (see ASM website).

Area Environmental & Heritage Consultants conducted a PTWL survey on 14 January 2023 under good search conditons. One likely PTWL sloughed skin was found at the Glen Idol monitoring site. It was observed that ant numbers under the artificial habitat (roof tiles) have increased considerably in response to successive wet seasons and abundant native grass growth. The PTWL report is contained in Appendix A.

Dubbo Project biodiversity monitoring is reported annually and is based on ecosystem diversity habitat value measurements adapted from the Biometric methodology. ASMH employees record opportunistic sightings of various species of plants and animals.

Four vegetation community benchmarks and one control site were established around and neighbouring the project site in May 2016 using the now superceded Biobanking Assessment Method. From 2021 monitoring switched to the current assessment framework of the Biodiversity Assessment Method (BAM 2020).



The community benchmarks were surveyed on 15 January 2023 by Area Environmental & Heritage Consultants.

In summary, the vegetation integrity score was slightly lower than the June 2022 survey. This result can largely be put down to a different month of survey and different seasonal conditions.



Vegetation plot 2 in Mine South Offset showing regenerating White Box (Eucalyptus albens) Woodland on 11 June 2022. Note winter appearance.





Vegetation plot 2 in Mine South Offset showing regenerating White Box (Eucalyptus albens) Woodland on 15 January 2023. Note pig disturbance in foreground. Summer 2023.

Remnant vegetation monitoring sites are recovering at varying rates, depending on prior grazing and cultivation history.

The ability to turn off watering points (on farmland) and Project-erected electric fencing will discourage kangaroo numbers continuing to build up in the BOAs during dry periods.

Kangaroos, feral pigs, foxes and cats have been the focus of pest control programs during this period.

227 feral pigs were removed (culled) from TPC land during the period. Feral pigs are a recent (within the past ten years) phenomenon in the district.





View north towards Dubbo City (mid skyline) from Northern Tracyhyte (Trig Offset paddock). Photo taken 19 June 2023. Note the very dry winter condions in 2023.

There was a site visit on 29 June 2022 by DPE compliance officers. The purpose of the visit was to verifiy that proposed enviornmental actions listed in the 2021 Annual Review were being carried out.





Flowering Currawang (Acacia doratoxylon) amongst dead White Cypress Pine (Callitris columellaris) in Trig Offset. Photo taken 3 October 2022.





Flowering Spur-wing Wattle (Acacia Triptera) on the summit of Dowd's Hill. Photo taken 28 October 2022.

5.2.2 Proposed Improvements

During the next reporting period;

- TPC will maintain fences around the biodiversity offset areas,
- Livestock grazing will be strictly controlled in the BOAs to allow for natural regeneration,
- White Cypress Pine will be thinned to improve grass cover and reduce rainfall runoff,
- Introduced vertebrate pest (pig, fox, cat and rabbit) control will continue,
- Eastern Grey Kangaroo (Macropus giganteus) will be culled under licence to reduce grazing pressure in the BOAs and across agricultural land,
- Signage in strategic areas will be installed to restrict access to BOAs to authorised personnel only, and



 Vegetation plots will be monitored to assess progress of rehabilitation of degraded (sub-optimal) BOAs toward those benchmark sites.

5.3 Heritage

A Heritage Management Plan (HMP), which outlines measures to manage Aboriginal and Non-Aboriginal heritage sites at Dubbo Project was approved by DPE on 8 February 2017.

The Senior Manager Farming and Business Operations has use of a database to ensure that heritage sites outside of the project footprint and BOAs are not further disturbed by routine agricultural activities.

Additional sites outside the impact footprint have been identified and added to the heritage database.

With all existing or relocated sites adequately maintained, no active cultural heritage management occurred during the reporting period.

Several site visits during the period saw engagement of Wiradjuri Elders to perform Welcome to Country and smoking ceremonies. Locally hand-made gifts have been exchanged between ASM and Korean partners. ASM emphasises the importance of acknowledging cultural heritage while conducting business.

5.3.1 Management Measures

Management of the existing sites consisted of the Farm Manager and Stationhand familiarising themselves with the sites across the land controlled by Toongi Pastoral Company, and when required, inducting site visitors that are likely to be working in culturally sensitive areas of the property.

5.3.2 Proposed Improvements

RAPs will be invited to review heritage sites across the project at an agreed frequency once construction commences.

Cultural heritage inductions will be provided to construction contractors and visitors who will be working in the field around the site. A local cultural awareness trainer has been engaged by ASMH.

Toongi Pastoral Company launched Macquarie Agricultural Pathways Program (MAPP) with Macquarie Anglican Grammar School in July 2023. Following the succes of the first intake of students for MAPP a second year has been added in 2023. Students are provided a cultural heritage induction as part of their immersion in general farm activities. Activities on the farm are linked to the school curriculum.



5.4 Meteorological Monitoring

In March 2022 an ACOEM supplied environmental monitoring shelter was installed at Wychitella. The location of the monitoring equipment was chosen after the local community objected to the shelter being placed at the closest sensitive receptor – Toongi Hall. The monitoring shelter geographical coordinates are 32°27'03.2"S and 148°35'01.8"E at 284.2m above sea level.



Monitoring shelter location marked by red pin. Toongi Hall across the creek at 110'clock and project site the Springs Road.

Rainfall for the period (measured at TA3 on Wychitella) is contained in Appendix B.

A total 974.8mm of rain fell over 96 days in the reporting period (880.6mm over 103 days in the previous 12 months) which concludes an unprecedented 36 months of well above average rainfall. These wet seasons follwed a short but severe drought of well below average rainfall years in 2018-2019. The second half of the reporting period was well below average rainfall which has led to district conditions where handfeeding livestock is widespread as at 30 June 2023.

The BOM are predicting a re-establishment of El Nino event in Spring of 2023.





Figure 8: Monthly and cumulative rainfall on project site to 30 June 2023.

5.4.1 Proposed Improvements

ASM has asked ACOEM to supply monthly data in a dashboard style that will meet the needs for day to day management of the farm and the mine.

Rainfall data going forward will be reported from the Wychitella rain gauge.





6 Water Management

The Dubbo Project Water Management Plan (Version 2.1 dated 16 Oct 2016) was approved by DPE on 12 October 2016. The WMP will be revised to take into account project optimisation and MOD 1 changes.

During the reporting period *Water Performance Measures* were included in the Dubbo Project's project approval, Condition 29 of Schedule 3 of SSD- requires ASMH to comply with these measures. Error! Reference source not found. presents these *Water Performance Measures* and where each measure is addressed in this Water Management section.

As no construction has commenced on site the measures below have not yet been installed.

Redundant farm dams have been filled in and advice has been provided on restoration/rehydation of watercourse B.

Feature	Performance Measure
Water Management – General	Minimise the use of clean water on site. Minimise the need for make-up water from external supplies.
Construction and operation of infrastructure	Design, install and maintain all infrastructure within 40 m of watercourses to: minimise the impact on watercourse water quality, hydrology and function; minimise the impact on the habitat of aquatic species, populations or communities, consistent with the <i>Guidelines for</i> <i>fish habitat conservation and management – Chapter 4</i> (DPI 2013), or its latest version; ensure pipelines across perennial watercourses are installed by directional drilling (under-boring) or attached to rail or road bridge crossings; and be in accordance with DPE Water's <i>Guidelines for Controlled</i> <i>Activities on Waterfront Land</i> (2012), or the latest version(s).
Macquarie River Pumping Station	Design, construct and operate the water intake structure to prevent to the greatest extent practicable the entrapment and/or extraction of aquatic fauna species including juvenile fish and larvae.
Mine Water Management System - General	Design, install and/or maintain mine water storage infrastructure to prevent the discharge of mine water off-site (this does not apply to sediment control structures that can be designed to discharge in accordance with an EPL). On-site storages are suitably designed, installed and/or maintained to minimise permeability. Maintain adequate freeboard at all times to minimise the risk of discharge to surface waters.
Waste Residue Storage Facilities and Salt Encapsulation Cells	Nil discharge from site. Design, construct and maintain:

Table 10: Water management performance measures




	in accordance with the recommendations of the NSW Dam Safety Committee; to be stable over the long term and under all expected loading conditions; in accordance with the standards set out in the Environmental Guidelines – Management of Tailings Storage Facilities (VIC DPI, 2006); and to be lined with HDPE liners or equivalent that complies with a minimum permeability standard of < 1 x 10-9 m/s in accordance with the <i>NSW Environmental Guidelines for Solid</i> <i>Waste Landfills</i> (EPA, 1996), unless otherwise agreed with the EPA; and to ensure the Solid Residue Storage Facility and Salt Encapsulation Cells are double-lined and include an adequate leak detection system. Ensure that at all times a freeboard of at least 600 mm (or 1000 mm for liquid residue storage facility) or a freeboard capable of accommodating a 1 in 100-year ARI, 72-hour rainfall event (or 1 in 10,000 year for the liquid residue storage facility) without overtopping, whichever is greater.
Waste Rock Emplacement	Design, install and maintain the emplacement to encapsulate and prevent: migration of potentially acid forming material, and saline and sodic material; and/or manage long term saline groundwater seepage.
Clean water diversion & storage infrastructure	*Design, install and maintain the clean water diversion system to capture and convey the 100-year ARI flood around the perimeter of the site. Maximise as far as reasonable and feasible the diversion of clean water around disturbed areas on site.
Flood mitigation measures	Design, install and maintain flood mitigation measures ensuring that the Ore Processing Facility, Administration areas, Waste Residue Storage Facilities, Salt Encapsulation Cells and Waste Rock Emplacement are appropriately protected from flooding up to the 1 in 100 ARI. Residual impacts downstream must be managed in an appropriate manner.
Sediment control structures	Design, install and maintain erosion and sediment controls generally in accordance with <i>Managing Urban Stormwater: Soils and Construction – Volume 1</i> and <i>Volume 2E Mines and Quarries.</i>
Chemical and hydrocarbon storage	Chemical and hydrocarbon products to be stored in covered, impervious bunded areas in accordance with the relevant Australian Standards.
Aquatic and riparian ecosystem	Maintain or improve baseline channel stability. Develop site-specific in-stream water quality objectives in accordance with ANZECC 2000 and Using the ANZECC Guidelines and Water Quality Objectives in NSW procedures (DECC 2006), or its latest version

Note *: a diversion system around the project site is not possible nor feasible but clean and dirty water systems will be kept separate through engineering design.



6.1 Water Supply

The principal source of water for the Dubbo Project is the Macquarie River which is seven kilometres north of the processing plant. A pump station within an easement on Mia Mia will supply water via a buried poly pipeline to the plant.

A combination of High and General security Macquarie River water licences will provide the Dubbo Project with processing water. This river water can be supplemented with temporary water (through seasonal purchase) and also with bore water from a licenced bore established on "Sweet Water" 600m northeast of the pump station.

The production bore was established on Sweet Water in October 2016 and was pump tested for seven days in February 2017. A Works Approval has been obtained from Water NSW for 1,250ML/annum. Water will ultimately be pumped to the river pump water supply line and joined.

Maximum Harvestable Rights Dams Capacity (MHRDC) is the volume of water landholders are entitled to capture and use without need for licencing. The maximum capacity of rainfall/runoff captured on ASMH-owned land is 223ML/yr.

Sediment or pollution control structures are exempt from the MHRDC consideration, unless the water captured is to be re-used on the site/property for non-environmental purposes.

An onsite water treatment plant will be used to produce potable water, eliminating the requirement to import potable water.

Water Licences	Water sharing plan, source and management zone (as applicable)	Entitlement (ML)	Active pumping
WALs:19994, 9191, 3396, 36409, 3412	High Security Macquarie/Cudgegong	856	0
WAL30259	General Security Macquarie/Cudgegong	750	0
N/A	NSW Murray Darling Basin Fractured Rock Aquifer	Stock & domestic	Stock & domestic
N/A	Onsite dams, under harvestable rights	223	Stock & domestic
WAL 37691	Upper Macquarie Alluvial Groundwater Source	1402	Nil

Table 11: Water Supply



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6.2 Water Balance

The site water balance was being reviewed during the reporting period in line with a proposed modification of the project.

The water balance indicates that the Dubbo Project will be dependent on a combination of river and bore water and water recycling within the processing plant.

The project is designed for zero discharge of 'dirty water' which will be kept separate from existing 'clean' water discharges from the ephemeral drainage lines that drain the Toongi Pastoral Company property.

6.3 Clean Water Management (Surface)

For reporting purposes, clean water management is divided into:

- onsite management;
- Wambangalang and Cockabroo Creeks; and
- offsite discharge.

6.3.1 Site Water

Clean water consists of through-flow from drainage of the undisturbed Dowd's Hill and water from onsite non-mine disturbed catchments. This water is diverted away from contamination sources (mine disturbance and infrastructure) and directed offsite. Management includes the construction of drains and bunds to collect and divert surface water flow past, or away from, mining disturbed catchments.



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6.3.2 Surface Water Monitoring results

A round of surface water sampling was conducted on 13 July 2022 which adds to the baseline data which has been collected for more than 10 years. Results are contained in Appendix B.

It is expected that all of the data collected to date will enable water quality trigger values for the project to be established in consultation with the EPA.

February 2020 saw the first flows in Wambangalang and Paddy's Creeks since March 2019. The flows were initially terracotta in colour as was the Macquarie River through Dubbo owing to the soil erosion exacerbated by drought condions in the catchments. Large amounts of organic matter were flushed down the creeks and rivers as the drought started to break with thunderstorm events.

The most significant flood event during this reporting period was on 7-8 October 2022. The Wambangalong Creek rose around four metres overnight. Obley Road, Benolong Road and Toongi Road were closed for more than 24 hours.



Wambangalang Creek in flood at Benolong Road bridge looking west 8 October 2022.



6.3.3 Discharge

No licenced discharges occurred during the reporting period.

6.4 Mine Water Management

This section does not apply as no construction has commenced.

6.5 Erosion and Sediment Control

This section does not apply as no construction has commenced.

6.6 Groundwater

By way of background information, sampling and pump testing of the stock and domestic bores around and neighbouring the project site occurred in June 2016. These bores have been established for many years to supply stock and domestic water to several properties.

All Dubbo Project groundwater bores (mostly in the fractured rock aquifers of the Lachlan Fold Belt) provide less than 2L/sec of stock quality drinking water.

Springs in the Springs Offset and Mine South Offset re-commenced flowing in Winter 2020 after two years of zero flow. Springs stopped flowing in early 2023 as the season dried off considerably.

Sample Reference	Bore Name	Location	Total Depth	L/sec	LPM	SWL
GW-001	Ugothery	Shed	67.24	0.37	21.9	11.05
GW-002	GW-002 Grandale West Bore		28.31	0.30	18.1	13.24
GW-003	Toongi Valley 2	Shearing Shed	36.96	0.91	54.6	8.95
GW-004	Wychitella	House	47.33	1.53	91.8	5.4
GW-005	Pacific Hill 1	Shed	48.55	1.40	84.1	18.52
GW-006	Karingle 2	Lane West of House	38.98	1.41	84.6	13.3
GW-007	Toongi Valley 3	Spring	12.86	1.64	98.3	2.61
GW-008	Karingle 1	House	39.66	1.32	79	16.29
GW-009	Toongi Village	Well	15.4	1.43	85.6	7.32

Table 12: Stock and domestic bore depth and yield

Seven geotech bores/piezometres (installed September 2014) were most recently dipped for water levels on 7 August 2023. While there was a noticeable rise in the ground water in 2022 after thirty months of well above average rainfall standing water levels have stabilised over the past 13 months. Four of seven piezos remain dry.



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Bore	Piezo Depth	Wet /Dry	Depth to SWL (m) Aug 2019	Depth to SWL (m) Jul 2020	Depth to SWL (m) Aug 2021	Depth to SWL (m) Jul 2022	Depth to SWL (m) Aug 2023	Reference Point (m above ground level)
С	13.06 Dry Dry		Dry	Dry	Mud	Dry	Dry	N/A
S	15.72	Wet	14.42	14.8	13.28	5.63	7.38	0.75
W	15.27 Wet Mud		Mud	Dry	Mud	15.23	15.26	0.7
Е	14.95 Wet Dry		Dry	Dry	Mud	Dry	Dry	0.9
Q	15.66	.66 Wet 12.34 12.8		12.8	12.58	12.22	11.0	0.85
I	16.3	Dry	Dry	Dry	Dry	Dry	Dry	N/A
Y	11.6	Wet	9.8	9.7	8.97	7.3	7.53	0.9

Table 13: Geotech bores in the Dubbo Project footprint

At the end of the reporting period water tables across the site are generally similar to July 2022. However, the groundwater level in Big Dam paddock has risen 78cm. Rainfall since December 2022 has dropped below the rolling annual average.

6.7 **Proposed Water Management Improvements**

No improvements are proposed to groundwater management at the Dubbo Project in the next reporting period.



7 Rehabilitation

The Dubbo Project has not yet commenced construction.

7.1 Rehabilitation During Reporting Period

Minor rehabilitation activity (tree planting) along watercourse B in Banker Silo Offset of Fuzzy Box (*Eucalyptus conica*) took place in August 2021. The seedlings have grown at an exceptional rate.

7.2 Post Rehabilitation Land Use

Post-rehabilitation land use objectives and targets were contained in the draft 2015-2017 MOP.

However, a Rehabilitation Management Plan (RMP) and Forward Program will be submitted to the Resources Regulator in the next reporting period. ASM will review, assess and consult with government agencies on agreed rehabilitation objectives and rehabilitation completion criteria as required by clauses 13 and 15 in Schdule 8A of the Mining Regulation 2016.

The objectives in Table 14 will be revised. Some of the targets have already been achieved.

Category	Objective	Target(s)		
	Rehabilitation	BOA		
Ecosystem Development (Final Land Use)	Protect, enhance and extend areas vegetation.	Secure the BOA under PVP or equivalent mechanism.		
	Maintain habitats on the final landforencourage colonisation by native florencouring specific niche requirements.	orm which ora and fauna with	Species diversity and density of rehabilitated landforms equivalent to analogue sites established within the BOA.	
	Extend, improve, protect and link an native vegetation.	reas of remnant	Secure the BOA under PVP or equivalent mechanism. Prepare and implement a Biodiversity Management Plan (BMP).	
	Retain areas on the Dubbo Project Site amenable to future agricultural or industrial activities.	-	Agricultural productivity of land equivalent to pre-mining landforms.	

Table 14: Rehabilitation and BOS Objectives and Targets



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Post-Mining Land Use	Maximise positive and minimise adverse socio-economic outcomes following mine closure.	-	Consult with the community and government agencies in relation to the post- mining land use. Rehabilitate the Mine in accordance with
			Plan 4, unless otherwise agreed.
	Provide rehabilitated woodland communities which adjoin the established Biodiversity Offset Area to maximise the wildlife corridors created within the local setting.	Undertake habitat augmentation to improve and promote corridors for fauna movement linking adjacent remnant woodland vegetation with the rehabilitation of the Mine.	Establish woodland vegetation over the landform equivalent to local analogues of that community. Visual identification of wildlife corridors within the largely agricultural setting. Conserve under a Conservation PVP 1021ha of remnant native vegetation in accordance with a Biodiversity Offset Strategy.
	Integrate areas of biodiversity enha conservation with agriculture.	incement and	Undertake agricultural activities on the Mine Site, including within the BOA in accordance with a CPVP and BMP.
Other	Allow for the relinquishment of the Mining Lease and the return of the security lodged over the Mining Lease within a reasonable time after the end of the mine life.		50% within 5 years of final rehabilitation. 100% within 10 years of final rehabilitation.





Figure 9: MOP Plan 4 showing proposed final land uses at Dubbo Project.



7.3 Trials, Monitoring and Research

No trials nor monitoring of rehabilitation was undertaken during this period. During the 2017 reporting period, four benchmark vegetation communities' benchmarks were identified and described by OzArk as a goal against which to measure rehabilitation success.

TPC has been in discussions with DPI regarding the potential to conduct a woody biomass trial on TPC-owned land. The research is aimed at identifying the species of trees that are the most productive in generating biomass in the Toongi environment. Trangie Agricultural Research Station is already involved in this trial but DPI are seeking addional sites.

Biomass power generation is a potential source of renewable energy to supply some of the Dubbo Project's green energy requirements.

7.4 Key Rehabilitation Risks

A key rehabilitation risk in the next reporting period will be weather related. Stripping and handling topsoil resources should ideally be performed when soils are neither too wet nor too dry.

7.5 Actions for Next Reporting Period

Topsoil stripping and stockpiling will take place during the next reporting period should construction commence. Trials will examine productive pasture establishment techniques on the soil stockpiles. It is intended to establish productive perennial pastures on the soil stockpiles and include those stockpiles as a resource to be opportunely grazed by livestock.

The soil stockpiles will be managed for their long term soil health to ensure they are a suitable medium for the final landform rehabilitation in 20+ years time.

Toongi Pastoral Company has registered parts of the the farm (surrounding the mine site) as a Commonwealth carbon project with the aim of sequestering carbon in the farms soils. A preliminary assessment has been undertaken and the baseline soil sampling was carried out during May 2023. A baseline carbon report is pending.



8 Community

8.1 Consultation

The key channel to ensuring an effective passage of information between ASMH and the surrounding community, is the Community Consultative Committee (CCC). The CCC is an independently chaired member committee representing the Dubbo Project, the local community (including environmental interests) and the Aboriginal community.

At CCC meetings, typically held quarterly, members are updated by ASMH personnel on the progress of current and proposed mining operations and projects. Community representatives are given the opportunity to raise concerns regarding the project and to offer advice regarding consultation with the community. CCC meeting minutes are available via the ASM website (https://www.asm-au.com/).

During the reporting period, the CCC met twice.

CCC meetings were held on 16 August 2022 and 7 December 2022. Minutes are posted on the ASM website.

Dubbo Project Community Updates (newsletter) were published in July 2022, October 2022 and March 2023.

In addition to the CCC, ASM utilised a number of methods of communication/consultation with the community during the reporting period, including:

- ASX announcements (publicly available) and emailed or posted to subscribers;
- Making relevant information regarding mine approvals, operations and environmental monitoring results available to the public on the ASM website;
- Distributing a community newsletter, to provide the Dubbo-Toongi community and any other interested parties with information on the Dubbo Project development;
- Attending vocational and tertiary information days at schools;
- Three-day presence at Dubbo Show;
- Consultation with community, project neighbours, Dubbo Regional Council and government agencies regarding MOD1;
- Providing a 24-hour community information line;
- Responding in person to phone and email enquiries;
- Sending issue-specific letters to members of the public in response to queries regarding the project; and
- Field Days and training days hosted by Toongi Pastoral Company.

These methods of community consultation will continue during the next reporting period as well as targeted consultation for Management Plan updates and the RMP post-MOD1 approval.



8.2 Support

Over the life of the development, ASMH has committed to a Voluntary Planning Agreement with Dubbo Regional Council to contribute annually:

- \$300 000 to the maintenance of Obley/Toongi Road;
- \$42,000 Roads Contributions (to and from work);
- \$42,000 Roads Contributions (other direct vehicle trips for employees); and
- \$230,000 for Boundary Road (Keswick Parkway South to Sheraton Road).

CPI adjustment to apply after year one. VPA contributions to commence on 1 January or 1 July following commencement of Obley/Toongi Road upgrade.

8.3 Complaints and Enquiries

ASMH manages complaints in accordance with the protocols and procedures contained in the EMS. During the reporting period no complaints were received.

ASMH staff will respond to all complainants and conduct investigations into specific concerns. Investigation outcomes consisting of corrective action, where required, and follow-up communication with the complainant will be actioned.

A register of complaints and enquiries received from the community is maintained by ASMH. A modified version of this register (excluding personal details of complainants) is published on the ASM website.

No specific complaints have been received during this reporting period.



9 Independent Environmental Audit

As per Schedule 5 conditions 9 and 10 of the consent condions:

- 1. Within one year of commencing development under this consent, and every 3 years thereafter, unless the Secretary directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
 - (a) be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary;
 - (b) include consultation with the relevant agencies;
 - (c) assess the environmental performance of the development and assess whether it is complying with the requirements in this consent and any relevant EPL or Mining Lease (including any assessment, plan or program required under these approvals);
 - (d) review the adequacy of strategies, plans or programs required under the abovementioned approvals; and
 - (e) recommend appropriate measures or actions to improve the environmental performance of the development, and/or any assessment, plan or program required under the abovementioned approvals.

Note: This audit team must be led by a suitably qualified auditor and include experts in water resource management, ecology, transport and road design and hazardous materials management and any other field specified by the Secretary.

2. Within 6 weeks of the completion of this audit, unless the Secretary agrees otherwise, the Applicant shall submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report, including a timetable for the implementation of any measures proposed to address the recommendations in the audit report. If the Applicant intends to defer the implementation of a recommendation, reasons must be documented.

As construction has not yet commenced, this condition has not yet been triggered.



10 Incidents and Non-Compliances During Reporting Period

This section provides further detail on the incidents and non-compliances reported in Section 1 as well as any other official regulatory interaction that occurred during the reporting period.

10.1 Official Regulatory Interaction

No reportable incidents or warning letters, penalty notices or prosecution proceedings by any NSW Government regulatory agency were received during the reporting period.

Correspondence from DPE and other regulators is contained in Appendix C.



11 Activities to be Completed in Next Reporting Period

Environmental activities and initiatives to be implemented in the next reporting period, should construction commence (ASMH does not anticipate that this will be the case) will focus on reduction of offsite impacts such as noise and dust, management and monitoring of biodiversity offset areas, finalising the final landform plans, and commencing rehabilitation of soil stockpiles and erosion and sediment control structures. Details on these activities are shown in Table 15.

Proposed Activities	Location	Proposed Completion Date			
Fauna monitoring	ASMH site and offset areas	Ongoing			
Control of noxious weeds	ASMH site and offset areas	Ongoing			
Eastern Grey Kangaroo culling	TPC and BOA	Ongoing			
Feral animal control	TPC and BOA	Ongoing			
Fence maintenance in accordance with the Biodiversity Offset Management Plan and PVP	Offset areas	Ongoing			
Pink-tailed Worm-lizard Survey	PTWL Offset areas	Spring 2022			
Analogue vegetation plot monitoring	Obley Road Reserve, Toongi Hall and Project Site	Spring 2022			
Continue weed management and rubbish removal	Biodiversity offset areas	Ongoing			
Environmental monitoring as required by consent conditions and EPL	Site and linear infrastructure activity areas	ТВС			

Table 15: Activities proposed for 2023-2024



2022-2023 Annual Review

APPENDIX A





Australian Strategic Materials, Dubbo Project





Dubbo Regional LGA NSW August 2023



IMAGE: Pink-tailed Worm-lizard monitoring 2023



AREA Environmental & Heritage Consultants (AREA) Ltd ABN:29 616 529 867

- Environmental impact assessment, auditing, and approvals High level preliminary environmental assessment (PEA) \checkmark
- ~
- >>> Review of environmental factors (REF)
- Peer review
- Peer review Community engagement Biobanking and biodiversity offsetting assessments Aboriginal heritage assessments and community walkovers Landscape design Independent environmental auditors ~
- ž

AREA acknowledge Traditional Owners of the country on which we work



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1 Introduction

Pink-tailed Worm-lizard (PTWL) *Aprasia parapulchella* is listed as vulnerable under the Commonwealth *Environment Protection Biodiversity & Conservation Act 1999* (EPBC Act) and the NSW *Biodiversity Conservation Act 2016* (BCA Act).

Roof tile (artificial habitat) monitoring and targeted searches of natural habitat was carried out on 14 January 2023, monitoring has been occurring yearly since 2013. The 2023 assessment team included Phil Cameron and Addy Watson from AREA Environmental & Heritage Consultants.

This monitoring program is underpinned and implemented in accordance with the PTWL Plan of Management (Ozark 2016). The Dubbo Project (DP), operated by Australian Strategic Materials continues to oversee PWTL the monitoring program.

Monitoring of the PWTL is scheduled to occur towards the end of Spring and Autumn each year when weather conditions are suitable. Monitoring did not occur in Spring 2022 due to excessively wet weather. However, monitoring occurred in summer on 14 January 2023 when weather conditions were suitable, and ambient air temperatures were between 21.6 °Celsius and 26.9 °Celsius three or so days after a period of soaking rain.

On average most locations during the January 2023 monitoring recorded ambient air temperature higher than the soil temperature. Soil temperature was mostly in the ideal range for the PTWL with an average of 24.74° Celsius.

The project usually involves monitoring at seven locations: Glen Idol, Ugothery North, Ugothery East Lower, Ugothery East Upper, Ugothery Dowds Hill, Grandale and Ugothery Dam Site. Figure 1-1 shows the location of the monitoring locations surveyed. Due to site accessibility and timing constraints the Grandale, Ugothery Dam site were not surveyed in 2022 or 2023 monitoring events.

One likely PTWL sloughed skin was observed under a set of tiles located at Glen Idol monitoring site.





Figure 1-1: PTWL monitoring locations



2 PTWL monitoring

2.1 Background

The PTWL (Pink-tailed Worm Lizard) monitoring program assesses the habitat attributes of artificial roofing tiles as a proxy for the species' habitat. The primary objective of this program is to identify the key habitat features present in the artificial habitat (roof tiles), ascertain the frequency of species utilisation of these artificial habitats, and evaluate the feasibility of using this method to monitor PTWL populations. The overarching research inquiry pertains to the viability of employing artificial tiles as ecological land bridges to link otherwise isolated PTWL populations or to expand their occupancy within suitable habitat areas.

Monitoring the PTWL poses challenges due to its cryptic behaviours, as it typically resides within ant burrows. While PTWL can be located year-round by searching beneath rocks, detecting them becomes more challenging during periods of high temperature and low humidity (Osborne et al., 1991). Extreme temperature conditions, whether excessively hot or cold, lead the PTWL to retreat below the ground surface within ant burrows beneath rocks. The species' detectability is favoured within temperature ranges between 20°C and 35°C (P. Cameron, personal communication, 2017).

Although the species' ecological behaviours remains poorly understood, peak activity is expected to occur in late spring and early summer, characterised by warm yet adequately humid conditions. During this period, the lizards relocate to the upper periphery of ant burrows, allowing them to regulate their body temperature by basking against the warm underside of rocks (Osborne et al., 1991; Jones, 1999). The PTWL is generally inactive on the ground surface during the day, and its activity is primarily restricted to moving between sheltering sites during nighttime. Weather conditions, and the natural boom/bust population dynamics of the species plays a role in detection of the PTWL. The species is expected to boom after inundating rains and to bust when dryer, hotter seasons occur (Swan pers comm 2020). Dry and hot conditions are attributed to low detection rates. Strong winds, rain or overcast skies may also attribute to low detection rates (DSEWPC, 2011). Time of day also has an effect; diurnal surveys are best conducted between 10 am to 4 pm (DSEWPC, 2011).

Moreover, the observed timeframe during which species identification is attainable remains confined to seasonal convergence spanning from March through to October/November. Given the limitations imposed on detection by these variables, an accurate representation of population density and dispersion emerges when monitoring aligns with favourable climatic conditions. These conditions involve antecedent saturating rains and moderate temperatures coinciding with the recognised periods of identification. Achieving this synchronicity necessitates a flexible approach in terms of timing, survey frequency, and the count of locations surveyed. This flexibility is imperative to ensure that conducive weather conditions are in place.

Cameron (personal communication, 2022) acknowledges the substantial veracity of the abovementioned points. However, in the context of Toongi, he notes an additional observation. Specifically, the species has been sighted during early mornings in late summer

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amid severe drought conditions. This occurrence underscores the intricate influence of minute variations in soil and rock temperatures on the species' detectability, potentially outweighing the significance of seasonal considerations.

2.2 Methods

To ensure the survey took place under optimal conditions, the monitoring program was carried out days suitable for their detection. This monitoring program evaluated artificial tile habitats established in 2013. These locations encompass a total of 50 roof tiles distributed across 10 distinct sets. Each set comprises a cluster of four tiles, juxtaposed with a lone tile. This arrangement is designed to discern whether a group of tiles offers a higher likelihood of serving as PTWL habitat compared to individual tiles. The specific configuration of this set-up is illustrated in Plate 2.1.

The survey occurred on 14 January 2023 & between 8 am and 11 am on a clear day after suitable rainfall had occurred and when temperatures were between 19.8 degrees Celsius and 29.7 degrees Celsius. The survey involved checking under approximately 250 tiles as well as opportunistically under natural rocks at the following locations:

- Ugothery North
- Ugothery East Lower
- Ugothery East Upper
- Ugothery Dowds Hill
- Glen Idol (not surveyed in 2022)

The remaining sites (Ugothery Dam and Grandale) were not surveyed during the 2022 or 2023 monitoring events, these sites will be surveyed during the 2024 monitoring period.

The data collected will show if there is an increase in species detection by decreasing disturbance by the assessors to the monitoring sites. Pigs are another source of tile disturbance.

Data collected for each set consisted of:

- Date and time of assessment
- Ambient air measured with a handheld kestrel weather station
- · Soil temperature measured with a handheld laser device
- Number of ant species and burrows present
- Other insects (type/abundance)
- Other reptiles (species / abundance)
- General comments
- Photos were also taken where appropriate.



Plate 2-1: Tile set configuration





3 Weather

3.1 Preceding weather conditions

The closest weather monitoring station as per the Bureau of Meteorology (BoM) website is situated at Dubbo Regional Airport, approximately 25 kilometres to the north of the DP location (Toongi).

Dubbo's average annual rainfall stands at 589.6 millimetres (BoM, 2022). In the year preceding the survey, Dubbo experienced a notable 1028.8 millimetres of rainfall, marking the highest annual recorded precipitation. Despite this substantial influx of rain, it did not result in waterlogged burrows.

A rainfall of 9.6 millimetres was observed from the 3rd to the 6th of January, though no rainfall was recorded in the week leading up to the January survey.

February's rainfall fell slightly below the average with a total of 45.3 millimetres, while January surpassed the average with 58.4 millimetres. Figure 3.1 illustrates the cumulative rainfall leading up to the monitoring event, comparing these values to the monthly averages.



Figure 3-1: Dubbo Regional Airport rainfall averages and 2022/23 rainfall totals (BoM)

In comparison, the previous 'boom' event, documented through monitoring in 2012 and 2013, witnessed a total of 30 PTWLs, occurring beneath naturally formed rocks after years marked by above-average rainfall (577.2 millimetres in 2011 and 608.6 millimetres in 2012). In 2021, the rainfall significantly surpassed the cumulative figures for both 2011 and 2012.

Monthly rainfall statistics from the Dubbo Airport weather station, obtained via the BoM website, are presented in Table 3.1. The recent inundating rains of 2022, following a severe drought period, substantially increased the likelihood of detecting PTWLs (P. Cameron, personal communication).

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Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1994						4.0	51.0	15.0	8.8	20.0	46.8	20.2	
1995	191.0	7.0		0.6	102.2	13.0	31.2	0.4	52.0	24.4	94.8	58.0	
1996	97.2	30.2	20.6	0.2	74.2								
1997						17.2	23.2	13.8	78.2	30.8	11.4	37.2	
1998	48.0	31.0	10.0	84.4	75.4	82.4	138.0	151.6	111.6	46.4	66.6	5.6	851.0
1999	7.4	9.0	142.2	38.6	8.6	36.6	45.0	75.6	40.2	109.2	68.8	77.2	658.4
2000	35.0	25.6	173.8	105.8	86.8	18.4	28.4	29.4	11.6	77.4	181.8	35.0	809.0
2001	60.2	14.6	77.8	44.8	43.4	59.4	92.0	19.6	31.0	69.0	74.4	25.0	611.2
2002	13.2	218.2	27.0	17.4	17.2	14.6	4.0	2.8	42.8	3.0	0.0	21.6	381.8
2003	41.2	77.4	18.8	60.0	4.2	52.2	37.0	115.4	8.6	67.0	35.8	26.2	543.8
2004	23.6	45.6	13.2	22.0	46.8	44.4	38.2	30.4	10.2	50.6	79.4	65.0	469.4
2005	36.0	25.6	15.0	9.6	5.0	91.0	29.4	18.8	81.8	112.0	92.6	15.2	532.0
2006	37.4	29.0	24.0	10.8	0.6	35.0	39.2	14.4	9.2	1.2	10.6	17.2	228.6
2007	11.6	24.6	48.2	26.6	61.6	122.0	11.2	20.2	0.6	2.6	67.4	169.4	566.0
2008	153.2	43.2	27.4	1.4	7.2	32.0	31.0	33.6	63.8	58.6	110.0	49.2	610.6
2009	3.8	59.0	16.2	57.2	10.0	67.4	25.0	10.0	35.2	54.0	12.8	188.8	539.4
2010	25.6		69.6	62.2	54.6	34.2	64.4	58.4	51.8	54.0	144.0	167.6	
2011	8.6	37.8	49.4	28.4	60.0	11.2	8.4	59.8	81.8	55.4	101.6	74.8	577.2
2012	98.0	118.0	125.0	1.6	85.4	41.6	44.6	9.8	31.6	9.4	38.2	5.4	608.6
2013	63.4	27.8	80.8	0.4	27.0	126.0	23.2	5.4	83.2	5.2	3.0	47.6	493.0
2014	49.8	50.8	142.4	57.8	26.8	57.6	55.6	15.4	15.6	11.6	11.2	77.0	571.6
2015	130.6	31.8	8.4	81.8	47.8	72.2	60.2	39.4	6.8	46.4	66.6	59.6	651.6
2016	122.8	3.2	16.2	25.0	55.4	151.6	105.2	50.4	157.8	56.2	34.0	138.6	916.4
2017	14.8	1.6	223.0	9.4	5.2	9.2	3.0	20.6	5.0	84.6	34.8	54.2	465.4
2018	28.6	2.4	4.0	6.8	13.0	18.6	1.6	36.4	6.8	90.4	68.6	34.4	311.6
2019	64.4	18.4	46.8	0.0	23.4	10.4	6.4	6.8	11.0	1.6	19.4	2.6	211.2
2020	36.0	81.8	145.0		28.8	32.6	82.2	39.0	47.6	60.6	12.6	120.6	
2021	54.0	114.4	187.2	1.8	21.0	93.8	91.8	34.0	36.8	35.4	180.8	73.4	924.4
2022	130.0	41.0	56.4	191.2	75.8	12.8	58.6	112.2	104.8	195.8	43.8	6.4	1028.8
2023	50.6	53.4	20.8	45.0	1.6	40.6	38.2						

Table 3-1: Dubbo Regional Airport weather rainfall statistics (BoM)

Temperatures two weeks prior to the January monitoring (30 December 2022 to 13 January 2023) had an average minimum of 16.9° and an average maximum of 33.9° all temperatures were between 11.1 and 37.8 °Celsius.



Figure 3-2 depicts the minimum and maximum temperatures for January 2023.





Figure 3-2: Dubbo Regional Airport maximum and minimum temperatures for January 2023

3.2 Weather conditions on day of monitoring

Weather on 14 January was clear with no rain occurring during filed survey. The average ambient air temperature on site was 25.3 °Celsius. The highest temperature on site was 29.7° Celsius recorded at 10:28am at the Glen Idol site tile number 3 and the lowest temperature of 19.8 °Celsius was recorded at 8:53am at the Ugothery East Upper site tile number 9.

The highest temperature recorded at Dubbo Airport was 33.3 °Celsius. The temperature was below the maximum average of 33.4 °Celsius. Maximum monthly averages for the previous months preceding the monitoring were also below the average (Figure 3-3).

Air temperature was recorded at each tile set and is compared with soil temperature under each tile set in Section 4.





Figure 3-3: Dubbo Regional Airport 2022/2023 maximum averages & monthly maximum temperature averages.



4 Soil parameters

4.1 Soil type and geology

Subsequent data collection within this region did not occur. Pre-existing determinations have been made regarding soil type and underlying geological composition. Further enhancement of soil and geological insights can be achieved by investigating these aspects during forthcoming monitoring occasions. This endeavour will contribute to a more comprehensive understanding of the interplay between these factors and the habitat selection patterns of PTWLs.

4.2 Soil temperature

Air temperature was recorded at each tile set as well as soil surface temperature under each set of tiles.

The soil temperature ranged from 19.4° Celsius to 33.8° Celsius. The lowest temperature occurred when ambient air temperature was 21.6° Celsius at 8:13am. The maximum soil temperature occurred when ambient air was 26.9° Celsius at 9:54 am.

On average most locations during the January 2023 monitoring recorded ambient air temperature higher than the soil temperature. Soil temperature was mostly in the ideal range for the PTWL with an average of 24.74° Celsius. The averages of soil temperature and air ambient temperatures across all monitoring sites surveyed in 2023 are shown below in Figure 4-1.







4.3 Moisture

Moisture levels were evaluated exclusively through visual examination. A solitary tile and a configuration comprising four tiles were classified as dry, leaving the remaining 96 tiles exhibiting moisture. Notably, data regarding the moisture status of Tile 1 at Glen Idol was not captured.

In the week preceding the monitoring event, a cumulative rainfall of 0.6 millimetres was recorded, while on January 14, 2023, 7.6 millimetres of precipitation was registered at Dubbo Airport AWS, falling within the Dubbo district on the day of monitoring. Despite this, no rain was documented during the actual field survey timeframe. The survey day featured fine and sunny weather conditions.

Although the month of January 2023 experienced below-average rainfall, it's worth mentioning that the subsequent 2022 monitoring event contributed to an increased average rainfall due to notable precipitation periods throughout the year, as depicted in Figure 4.2.



Figure 4-2: Rainfall preceding the 2023 survey period

4.4 Sun exposure

The amount of sun on the tile/tile group at the time of checking was not recorded. Monitoring took place between 8am to 10:54pm when the ambient temperature was between 19.8°Celsius and 29.7°Celsius.



Flora was not surveyed during the March 2023 monitoring program but was above average in both density and diversity reflecting the favourable last 24 months of weather. Examples of flora density at two of the monitoring sites is shown in Plate 5-1 and Plate 5-2.



Plate 5-1: Glen Idol 4 monitoring site

Plate 5-2: Ugothery East lower 2 monitoring site





Flora diversity and overall habitat has improved due to livestock removal and fencing of the biodiversity offset area. Natural regeneration was exceptional across grasslands, although a number of trees on thin skeletal soils died in the severe drought due to severe drought conditions between 2017 until late Summer 2020.

The following photos taken by P. Cameron and M. Sutherland in April 2020 illustrate drought impacts and regeneration.



Plate 5-3: Regenerating Eucalypt on northern offset area Photo taken 1 April 2020

Plate 5-4: Swainsona monticola, commonly known as notched Swainson-pea plants were prolific across the northern offset area 1 April 2020.



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Plate 5-5: Drought affected Callitris and Allocasuarina sp. 1 April 2020.





6 Fauna

6.1 Ants

Ants were assessed by the number of burrows and species. Individual ant or species identification did not occur. Ant burrow density was grouped into three categories. Low = less than five burrows, med = five to eight burrows, high = greater than eight burrows. Figure 6-1 depicts the relationship between ant burrow density and number of ant species.





Ants were present under 97 per cent of tiles. This is a very high level of occurrence to date. In 2020, 54 per cent of tiles were found with ants and 22 per cent with ant burrows. Ant populations have continued to increase since the cessation of drought.

During periods of low rainfall ant numbers were low. Ants were found under 34 per cent of tiles in 2018 (2018 annual rainfall was 311.6 millimeters).

Previous years with above average rainfall have seen large increases in populations. In 2016 ants were present under 90 per cent of tiles and 94 per cent in 2014.

The large per cent of occurrence of ants under tiles is an indication of food being readily available for the PTWL. Plate 6-1displays ant burrows, ant eggs and spider web under a surveyed tile.





Plate 6-1: Ant burrows, ant eggs underneath artificial habitat

6.2 Other invertebrates

Other invertebrates were recorded under 51 per cent of the tiles, a decrease of four per cent from 55 per cent in the 2022 monitoring event for the same number of monitoring sites surveyed.

Majority of the time they occurred in conjunction with ants. Spiders were the most common other invertebrate recorded. Termites, beetles, centipedes, weevils, cockroaches, slaters, a cricket and a mealworm were also present. Invertebrates were also found under tiles disturbed by pigs in 2023 monitoring, a contrast from 2022 monitoring where no invertebrates were found under tiles disturbed by pigs.



6.3 Reptiles and other vertebrates

Six sets of tiles were disturbed by pigs which is an increase on four from the 2022 monitoring.

Nine sets of tiles were found to have large burrows, potentially caused by field mice (*Apodemus sylvaticus*), and exotic species or the native Dunnart (Sminthopsis) or Eastern striped skink (*Ctenotus robusta*). A Dunnart was (Sminthopsis) was recorded under at Ugothery East Upper monitoring site at tile set 9ABCD. 94 per cent of tiles were found to have ant nests and or burrows present.

Other reptiles or evidence of habitation were found under 13 per cent of tile sets. This is an increase from seven per cent in 2022 to nine per cent in 2020. However, nine per cent is a decrease from 18 per cent in 2018. Pig disturbance could have attributed to the low reptile count (Plate 6-2).

Striped skink (*Ctenotus robustus*) was found under three tile sets. Gecko or skink scats were recorded at an additional nine tile sets. No other reptiles or vertebrates were recorded during the survey.

There were no clear indications of reptiles preferring a certain soil temperature or if they prefer single or grouped tiles.



Plate 6-2: Tiles disturbed by pigs

7 Pink-tail Worm-lizard sighting

One likely PTWL skin was observed on January 14 2023 at the Glen Idol monitoring location GDA94/MGA Zone 55 652909E 6406871N under tile set 5ABCD where soil temperature was 24.4 °Celsius (Plate 7-1) (Figure 7-1).

No further PTWL, or signs thereof, were found at other tile monitoring locations.





Plate 7-1: Likely PTWL skin underneath artificial habitat





Figure 7-1: PTWL sighting 2023 (yellow circle)



8 Issues and suggestions for future monitoring efforts

8.1 Climate considerations

The DP PTWL Management Plan (Ozark 2016) states the following:

'The PTWL appears to mimic the same 'boom and bust' detection rates as seen in many western area species of fauna (P. Cameron, pers. comm.). This observation was supported by Gerry Swan (reptile expert) who also has experience with the species (pers. comm.). In favorable seasons, i.e. not long after inundating repetitive rains, 'many' (in context with the population) PTWL will be recorded with the recommended survey effort (P. Cameron pers. comm). This may be followed by subsequent hotter and dryer seasons when few or no PTWL recorded. Evidence available suggests this pattern follows a ten-year cycle related to approximately 10-year interval high rainfall events (P. Cameron and Gerry Swan pers. comm)'.

The last 'boom' was recorded when targeted surveys were undertaken in 2012 and 2013 by Biosphere Environmental Consultants Pty Ltd (Biosphere) and 30 PTWLs (in total) were found in sites within a five kilometre radius of the DP impact footprint. All records were associated with natural rock.

Since then, the area has been through a severe hot and dry 'bust' cycle and a severe wet cycle but few PTWL have been recorded. Rainfall has been well above average since 2020 creating favourable conditions for a 'boom, cycle.

The large rainfall event of 2016 could have inhibited a boom from occurring due to burrow inundation. Since 2020 larger than average annual rainfalls have been occurring. The highest annual rainfall total was recorded in 2021. A similar annual rainfall total was observed in 2016 where burrow inundation occurred. The 2022 March survey did not detect inundated burrows. March 2022 monitoring conditions were ideal with soil temperatures in the suitable range PTWL. Conditions did deteriorate in the afternoon reducing temperatures to a level unsuitable for PTWL monitoring. Preventing two of the survey points from being reached (Grandale and Ugothery Dam). A full dataset was not formed but the recommended survey effort for PTWL was reached. Temperature was also lower than the average for March on the chosen survey day.

The repetitive nature of the current inundating rains may facility a boom for the PTWL population. The climate has allowed for native grasses and food (ants) to become abundant. This fits in well with the hypothesised 10-year cycle as the last boom occurred in 2012-2013.

The January 2023 monitoring conditions were warmer due to occurring in summer. The soil temperature range was 17.9° Celsius to 25.5° Celsius in March 2022 compared to a range of 19.4° Celsius to 33.8° Celsius in January 2023. The day of survey was warm and sunny with soil temperatures and moisture still within an ideal range for PTWL occupancy. The year preceding the survey experienced above average rainfall.

No inundated burrows were detected in January 2023 as the last large rainfall event was experienced in October 2022, two months prior to the 2023 survey. A full dataset was not formed but the recommended survey effort for PTWL was reached.



8.2 Artificial habitat considerations

Previous research indicates preferences for artificial reptile habitats can vary among species and different designs. Reptiles exhibit a discerning approach when selecting retreat sites, considering multiple facets of their environment. They make subtle distinctions among available retreat sites based on factors like structural and thermal attributes, the presence of conspecifics or competitors, and the perceived risk of predation (Thierry et al., 2019).

The January 2023 survey benefited from optimal weather conditions, featuring warm and sunny weather conducive to species detection. While a complete dataset was not gathered, the recommended survey effort for PTWL was successfully carried out. Similar to the experience in March 2022, two survey points, namely Grandale and Ugothery Dam, could not be accessed.

Notably, the January 2023 survey revealed an elevated temperature variation under the artificial tiles. This suggests these tiles might offer only brief periods of habitat suitability for PTWL. They tend to heat up and cool down faster compared to natural rock. Additionally, this year's temperatures were higher than those in March 2022, intensifying the fluctuations in soil temperatures.

Since the introduction of the roof tiles in 2013, two instances of PTWLs being recorded under artificial habitat tiles have been documented. This might indicate these tiles serve as habitats but with very limited periods of suitability. However, this could also be attributed to the species' cryptic nature.

It's logical to assume that given the option, PTWLs will consistently prefer natural habitats over artificial ones. Natural rock might remain irreplaceable. According to the PTWL Plan of Management, prior to the construction of DP's impact footprint, loose surface rocks suitable for PTWL habitats will be gathered and relocated to offset areas. In the interim, the management focus centres on passive translocation and the improvement of habitat guality.

8.3 Native vegetation habitat

The DP PTWL Management Plan (Ozark 2016) states the following:

'The overarching performance target is to increase the area of occupancy for PTWL by restoring native vegetation, connecting adjoining populations though rehabilitated corridors) and providing natural or artificial rock/tile habitat.

The quality of PTWL habitat in DP was assessed on the EPBC Offset Calculator as:

- 30ha of low condition habitat (quality score = 4/10).
- 113.6ha of moderate condition habitat (quality score = 7/10).
- 80.9ha of good condition habitat (quality score = 9/10).

In practical terms the goal will be to achieve a quality score of 8 or higher in all PTWL HA's within 5 years'.



Since conception of the PTWL Management Plan in 2016, the region has been through three significant events impacting the quality of habitat within DP:

- 1. Exclusion of grazing and fencing of the biodiversity offset area (positive)
- 2. An extreme drought (negative).
- 3. Reprieve from drought because of well above average rainfalls (positive).

Habitat re-assessment would be extremely valuable to consider how habitat quality is trending in relation to these three significant events.



9 Conclusions

The focused survey for PTWL took place during the summer season, ensuring temperatures remained within acceptable limits for its detection. This timeframe was chosen due to substantial rainfall occurring two months prior. Unfortunately, the survey had to be curtailed before covering all designated points due to constraints involving site access and time limitations imposed by weather conditions, resulting in an incomplete dataset.

During the survey, one likely PTWL skin was identified, and only a few reptiles were observed utilising the artificial habitat. In the adjacent natural habitat, no PTWLs were encountered despite opportunistic sampling. The presence of the PTWL skin provides further confirmation of its continued presence in the area, particularly as a previous sighting occurred during a cooler survey in March 2022.

The artificial habitat, as a refuge, offers limited windows of suitability for PTWLs. Since the inception of the survey program in 2013, only two instances of PTWLs under tiles have been recorded. Indicators such as ant populations, retained soil moisture, and climate data contribute positively to the potential for a population surge. Notably, ant populations have significantly increased in 2023 compared to previous survey years. This rise in ant populations enhances the probability of a PTWL population boom due to elevated food sources. The substantial rainfall events of 2022 have further supported the recovery of native grasses at the monitoring sites. This recovery has been aided by the exclusion of livestock from the biodiversity offset area and effective land management by the Proponent.

Numerous converging factors are favouring the PTWL. Should a population surge occur, it would provide additional evidence supporting the PTWL's boom-and-bust cycle, which appears linked to high rainfall events recurring at approximately 10-year intervals.

Continued targeted surveys for this species are strongly recommended. Given the recent climatic conditions resulting in well above-average rainfall, future surveys will yield insights into the impact of such abundant rainfall on PTWL populations. Additionally, these surveys will contribute to the understanding of other reptile populations within the area. An intriguing research question to explore involves comparing detection rates for PTWLs beneath natural rock versus under tiles, examining both concurrently. It is suspected that the detection results under natural rock would yield higher rates.

The influence of disturbance to tile sites by feral pig populations is on the rise. Therefore, ongoing targeted pest control measures should be consistently implemented to mitigate the risk of disruption to sites between monitoring events.



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Appendix A – Field Data

See following page.



	nent									ded ants	ed ants	ants	ants	ants	ants			30
	comn									Small & N	Big & M	med	med	small	small			
	Other reptiles (Sp / abundance)			Skink/Gecko scats													(Skink) Ctenotus robusta skin	
	Other insects (Type / abundance)												y (beetles)					
	Ants present?	У	У	у	у	У	у	У	y	у	у	У	у	У	У	У	У	
ם במומ	Ant Nests / Burrows Present?	λ	У	y	λ	λ	λ	y	λ	У	у	у	у	Y	у	Y	У	
	Soil Moisture	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist	dry	moist	moist	ust 2023
	Soil Temp	22.4	21.3	24.3	22.9	24.2	21.4	23.4	23.1	19.4	20	22.4	22.5	21.1	21.8	25.7	24.6	eport, Aug
	Air Temp	23	23.2	25.3	22.8	21.8	21.7	22.7	22.7	21.6	21.6	22.3	22.3	23	22.1	22.3	22.4	nitoring R
	Time	8:22	8:22	8:21	8:21	8:20	8:20	8:16	8:16	8:13	8:13	8:10	8:10	8:09	8:09	8:07	8:07	-lizard Mo
	GDAz55 Northing	6407800		6407796		6407792		6407792		6407780		6407772		6407773		6407770		k-tailed Worm
	GDAz55 Easting	652845		652837		652829		652816		652809		652823		652830		652845		o Project: Pinl
	Tile No	+	1ABCD	2	2ABCD	e	3ABCD	4	4ABCD	Q	5ABCD	9	6ABCD	7	7ABCD	æ	8ABCD	erials, Dubbc SW
		Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Australian Strategic Mat

Field Data

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comment		3 burrows, large ants, med termites		4 burrows							All flipped	disturbed	disturbed	disturbed 1 tile in place		
Other reptiles (Sp / abundance)															Ctenotus robusta	
Other insects (Type / abundance)		y (termites)						y (spider)		y (spider)		y (spider 2sp)				y (spider)
Ants present?	у	у	y	y	٨	у	у	у	y	y	Ľ	E	c	у	y	y
Ant Nests / Burrows Present?	y	y	y	у	У	у	у	У	У	у	c	c	c	у	y	у
Soil Moisture	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist
Soil Temp	19.6	19.4	20.7	20	27.2	24.1	26.1	25.3	26.7	27.9	25.6	<mark>23.6</mark>	23.1	23.1	21.4	21.5
Air Temp	21.9	21.9	21.9	21.3	25.2	24.8	25.8	25.9	27.6	27.6	26.8	27.4	27.6	27.6	27.3	27.4
Time	8:04	8:04	8:02	8:01	9:03	9:02	9:06	9:05	9:08	9:07	9:12	9:11	9:14	9:13	9:16	9:15
GDA255 Northing	6407778		6407776		6407563		6407571		6407583		6407589		6407583		6407574	
GDAz55 Easting	652845		652833		652929		652912		652905		652915		652929		652928	
Tile No	6	9ABCD	10	10ABCD	1	1ABCD	2	2ABCD	e S	3ABCD	4	4ABCD	5	5ABCD	9	6ABCD
	Ugothery North	Ugothery North	Ugothery North	Ugothery North	Ugothery East Lower	Ugothery East Lower	Ugothery East Lower									

Australian Strategic Materials, Dubbo Project: Pink-tailed Worm-lizard Monitoring Report, August 2023 Dubbo Regional LGA NSW

Imby Fail Lunge Imby Fail		Tile No	GDAz55 Easting	GDAz55 Northing	Time	Air Temp	Soil Temp	Soil Moisture	Ant Nests / Burrows Present?	Ants present?	Other insects (Type / abundance)	Other reptiles (Sp / abundance)	comment
wyycisticued7860wr.evel<evel<evel<evelevelevelevelevel<	hery East Lower	7	652935	6407562	9:19	26.5	23.9	moist	y	y	y (spider)		
Imply ElectioneEQ:06E0:074E0:03Z:13DentDentDentDentDentDentImply ElectioneBHCDYSecondBHCDSecondBHCDSecondBHCDSecondBHCDSecondBHCDSecondBHCDSecondBHCDSecondBHCDSecondBHCDSecondBHCDBHCDSecondSecondSecondSecondSecondSecondSecondSecondSecondSecondSecondSecondSecondSecondSecondSecond <td>hery East Lower</td> <td>7ABCD</td> <td></td> <td></td> <td>9:18</td> <td>27</td> <td>25.9</td> <td>moist</td> <td>y</td> <td>y</td> <td></td> <td>skink skat</td> <td>disturbed by pigs, mouse burrows</td>	hery East Lower	7ABCD			9:18	27	25.9	moist	y	y		skink skat	disturbed by pigs, mouse burrows
ImplementationModelImplementationModel	hery East Lower	œ	652946	6407541	9:20	27.8	24.2	moist	y	c			mouse burrows
eny Faat Lovee96503479.262.732.04mote7Y (sploter)799eny Faat Lovee9.86 Cb522<	hery East Lower	8ABCD			9:19	26.6	21.6	moist	y	y			disturbed by pigs (2 of 4), mouse burrows
eyb Fast Lovee Jesc 2.5 2.6 2.5	nery East Lower	თ	652947	6407575	9:26	27.8	29.4	moist	у	y	y (spider)		
every East Lower106239436407585224wolswolsyywolswolsyy <th< td=""><td>nery East Lower</td><td>9ABCD</td><td></td><td></td><td>9:25</td><td>26.3</td><td>24.1</td><td>moist</td><td>у</td><td>y</td><td>y (spider, beetle)</td><td></td><td>Branch over tiles</td></th<>	nery East Lower	9ABCD			9:25	26.3	24.1	moist	у	y	y (spider, beetle)		Branch over tiles
evy East Lower10ABCbC21221201moistNN </td <td>hery East Lower</td> <td>10</td> <td>652943</td> <td>6407585</td> <td>9:28</td> <td>27</td> <td>24.1</td> <td>moist</td> <td>λ</td> <td>y</td> <td></td> <td></td> <td></td>	hery East Lower	10	652943	6407585	9:28	27	24.1	moist	λ	y			
rey East Upper 1 652835 6407637 8.29 2.46 most 246 most 247 most 246 most 247 243 244 243 241 most 244 243 241 most 243 241 most 244 243 243 243 244 most 244 24	nery East Lower	10ABCD			9:27	27	29.1	moist	У	у	y (spider)		
eye East Uper1AECb \cdot	nery East Upper	-	652836	6407637	8:29	23.4	24.6	moist	У	У			small ant
ey East Upper 2 652841 6407649 8:31 23.2 55.8 moist y	nery East Upper	1ABCD			8:29	24.2	27.1	moist	х	х	y (insect exoskeleton)		small ant
evel East Upper 2ABCD Image: Same Same Same Same Same Same Same Same	iery East Upper	N	652841	6407649	8:31	23.2	25.8	moist	У	У	y (spider)		
evy East Upper 3 652835 6407657 8:34 23.7 23.5 moist moist y v(ternites) y v(ternites) p p evy East Upper 3ABCD Y Y Y Y Y Y Y(ternites) Iarge burrow evy East Upper 44 652846 6407659 8:35 23.3 moist Y Y Y Y(ternites) Iarge burrow evy East Upper 44 652846 6407659 8:35 23.3 moist Y	iery East Upper	2ABCD			8:30	23	24.8	moist	y	y	y (spider)		1 tile flipped
Image: Name Matching	iery East Upper	3	652835	6407657	8:34	23.7	23.5	moist	Y	у	y (termites)		
Terry East Upper 4 652846 6407659 8:35 23.3 moist y y y Inity East Upper 4ABCD 3:35 21.6 22.8 moist y y y (spider) moist y (spider)	iery East Upper	3ABCD			8:33	23.7	21.1	moist	y	У		Ctenotus robusta	large burrows
ery East Upper 4ABCD 8:35 21.6 22.8 moist y y y (spider)	lery East Upper	4	652846	6407659	8:35	23	23.3	moist	у	Y			
	ery East Upper	4ABCD			8:35	21.6	22.8	moist	х	х	y (spider)		

.

Australian Strategic Materials, Dubbo Project: Pink-tailed Worm-lizard Monitoring Report, August 2023 Dubbo Regional LGA NSW

Time Air S Temp Te	Air Temp Te	° ⊢	soil emp	Soil Moisture	Ant Nests / Burrows Present?	Ants present?	Other insects (Type / abundance)	Other reptiles (Sp / abundance)	comment
8:5	7	23	23.5	moist	٨	У			
8:40 2	~	3.4	25.9	moist	у	у	y (spider x2)		
8:43 23.	23.	4	21.6	moist	y	у	y (spider)		
8:43 23	23		23.6	moist	у	y	y (spider)		Large burrows possible mouse, small and med ants
8:47 24.6	24.6		24.6	moist	E	у			1 tile disturbed
8:46 28.4	28.4		28.4	moist	y	у	y (spider)	Ctenotus robusta	
8:51 22.1	22.1		22.1	dry	y	у			Large possible mouse burrows
8:50 23.8	23.8		23.8	moist	у	y	y (spider)		
8:53 19.8	19.8		19.8	moist	y	c	y (spider)		small ants
8:52 20.3	20.3		20.3	moist	y	У			Dunnart, med ants
8:56 22.7	22.7		22.7	moist	y	у		Reptile Scat on top of tiles	
8:55 22.7	22.7		22.7	moist	Y	y			disturbed

Australian Strategic Materials, Dubbo Project: Pink-tailed Worm-lizard Monitoring Report, August 2023 Dubbo Regional LGA NSW

comment																	
Other reptiles (Sp / abundance)																	
Other insects (Type / abundance)																	
Ants present?																	
Ant Nests / Burrows Present?																	
Soil Moisture																	
Soil Temp						Εİ.											
Air Temp																	
Time																	
GDAz55 Northing	6410852		6410831		6410851		6410856		6410846		6410862		6410870		6410848		
GDAz55 Easting	653549		653541		653537		653525		653518		653507		653499		653504		
Tile No	ę	3ABCD	4	4ABCD	5	5ABCD	9	6ABCD	7	7ABCD	80	8ABCD	0	9ABCD	10	10ABCD	
	Grandale																

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comment			and the second		All flipped					1/4 tiles disturbed by pigs		small ant burrows and other large burrows		1/4 tiles disturbed by pigs		
Other reptiles (Sp / abundance)		Ctenotus robusta skin and burrow												Possible PTWL skin in blacka nt burrow		
Other insects (Type / abundance)		y (spider)		y (spider)		y (mealworn, spider)	y (spider)	y (spider)	y (weevil)	y (slaters)	y (spider)	y (spider)		y (spider)		y (spider)
Ants present?	y	У	у	у	с	у	у	y	y	у	У	У	У	Y	y	y
Ant Nests / Burrows Present?	y	λ	Y	y	c	y	y	y	y	y	c	У	y	Y	y	y
Soil Moisture	moist	moist	moist	maist		moist	moist	moist	moist	moist	moist	moist	moist	moist	moist	moist
Soil Temp	33.1	32.3	28.3	31		25	29.9	31.5	29.4	26.5	30.3	29.8	30.1	24.4	24.1	26.6
Air Temp	27.3	27.3	29.4	28.1	26.2	26.1	27.8	28.4	29.7	28.2	27.5	27	27.7	27.5	27.3	27.6
Time	10:02	10:01	10:05	10:03	10:23	10:23	10:26	10:25	10:28	10:28	10:30	10:29	10:38	10:35	10:40	10:39
GDAz55 Northing	6407011		6407011		6406944		6406954		6406929		6406885		6406873		6406847	
GDAz55 Easting	653646		653660		652877		652903		652896		652888		652909		652923	
Tile No	σ	9ABCD	10	10ABCD	1	1ABCD	7	2ABCD	m	3ABCD	4	4ABCD	Q	5ABCD	9	6ABCD
	Ugothery Dowds Hill	Ugothery Dowds Hill	Ugothery Dowds Hill	Ugothery Dowds Hill	Glen Idol	Glen Idol	Glen Idol	Glen Idol	Glen Idol	Glen Idol	Glen Idol	Glen Idol	Glen Idol	Glen Idol	Glen Idol	Glen Idol

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Australian Strategic Materials, Dubbo Project: Pink-tailed Worm-lizard Monitoring Report, August 2023 Dubbo Regional LGA NSW

comment		Big black ants	Large possible mouse burrows			large burrows										
Other reptiles (Sp / abundance)						Gecko scat										
Other insects (Type / abundance)		y (spider x 2)			y (slaters)	y (slaters, cockroach, spider)	y (spider)	y (spider x 2)								
Ants present?	y	у	у	y	y	y	٨	٨								
Ant Nests / Burrows Present?	λ	у	У	у	y	y	y	λ								
Soil Moisture	moist	moist	moist	moist	moist	moist	moist	moist								
Soil Temp	26.8	26.8	21.1	19.7	20.6	20.9	22.8	26.3								
Air Temp	26.9	26.6	27.8	26.9	27.1	26.9	27.5	26.3								
Time	10:54	10:53	10:43	10:43	10:40	10:40	10:50	10:49								
GDAz55 Northing	6406871		6406896		6406846		6406853		6407990		6408018		6408042		6408060	
GDAz55 Easting	652946		652961		652953		652998		653894		653931		653963		653964	
Tile No	7	7ABCD	œ	8ABCD	6	9ABCD	10	10ABCD	۲	1ABCD	2	2ABCD	3	3ABCD	4	4ABCD
	Glen Idol	Glen Idol	Glen Idol	Glen Idol	Glen Idol	Gien Idol	Glen Idol	Glen Idol	Ugothery Dam Site							

Australian Strategic Materials, Dubbo Project: Pink-tailed Worm-lizard Monitoring Report, August 2023 Dubbo Regional LGA NSW

	Tile No	GDAz55 Easting	GDAz55 Northing	Time	Air Temp	Soil Temp	Soil Moisture	Ant Nests / Burrows Present?	Ants present?	Other insects (Type / abundance)	Other reptiles (Sp / abundance)	comment
Ugothery Dam Site	ŋ	654014	6408118									
Ugothery Dam Site	5ABCD											
Ugothery Dam Site	9	653997	6408121									
Ugothery Dam Site	6ABCD											
Ugothery Dam Site	2	653998	6408134									
Ugothery Dam Site	7ABCD											
Ugothery Dam Site	œ	654014	6408123									
Ugothery Dam Site	8ABCD											
Ugothery Dam Site	თ	654030	6408142									
Ugothery Dam Site	9ABCD						-					
Ugothery Dam Site	10	654035	6408158									
Ugothery Dam Site	10ABCD											

Australian Strategic Materials, Dubbo Project: Pink-tailed Worm-lizard Monitoring Report, August 2023 Dubbo Regional LGA NSW



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Australian Strategic Materials Ltd Dubbo Project Biodiversity Offset Area –analogue vegetation plot monitoring

Biodiversity Offset Area –analogue vegetation plot monitoring Dubbo Regional LGA NSW February 2023





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AREA Environmental & Heritage Consultants ABN:29 616 529 867

- \checkmark
- Environmental impact assessments and approvals High level preliminary environmental assessment (PEA) Review of environmental factors (REF) High level products and the second sec ~

AREA acknowledges Traditional Owners of the country on which we work



EXECUTIVE SUMMARY

AREA Environmental & Heritage Consultants (AREA) was commissioned by Australian Strategic Materials Ltd (the proponent) to complete annual monitoring of five established analogue monitoring points in and nearby the Dubbo Project (previously known as the Dubbo Zirconia Project) Biodiversity Offset Area, Toongi NSW.

The Dubbo Project was approved as SSD-5251 by the NSW Planning Assessment Commission (PAC) on 28 May 2015 assessed under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The 2022 monitoring event was conducted in January 2023 due to site access restrictions imposed by heavy and frequent rainfall events during the second half of 2022.

Annual monitoring of five analogue plots is required by the Biodiversity Management Plan. Prior to 2019 vegetation monitoring was conducted using the now defunct BioBanking Assessment Method. Since that time, monitoring has used the current assessment framework of the NSW government, the Biodiversity Assessment Method (BAM 2020). Data prior to 2019 has been excluded from this monitoring report due to inconsistencies with the data collection method, preventing comparisons to be made.

The 2022 monitoring measured attributes against the Plant Community Type (PCT) benchmarks for an average rainfall year (default benchmark) and wet rainfall year. Plots one and two were assessed against benchmarks for PCT267 *White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion,* Plot three against PCT201 *Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion,* Plot four PCT76 *Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions and* plot five PCT270 *White Box - Tumbledown Red Gum - Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes*

All plots showed one or more attributes below the 25 percent benchmark for both average and wet rainfall year benchmarks, these attributes are listed below:

- Shrub cover for plots 1,2, 4 and 5
- Shrub richness plots 2, 3, 4 and 5
- Fern richness plots 3 and 4
- Other richness for all plots
- Number of large trees for plots 1, 2 and 5
- Litter cover for plots 4 and 5
- Total length of fallen for plots four and 5.

The vegetation integrity (VI) score for all plots have reduced from the previous survey conducted in June 2022. With most plots excluding plot 5 having a vegetation integrity score between 60 and 75. The decrease is likely correlated with the reduction of native species recorded in the Jan 2023 survey.

Plot 5 is the only plot to record scores below 50 with structure, function and VI scores remaining below 50. The decrease in VI scores have reversed the trend of increasing VI with Plots 2, 3 and 4 below the 2019 score, when drought conditions were present.

ASM Dubbo Project : Analogue Vegetation Plot Monitoring Report

Document Controls

Proponent	Australi	an Strategic Mate	rials Ltd (ASM)					
Client	ASM							
Quote number	ТВА							
Project No / Purchase Order No	ТВА							
Document Description	Biodive	rsity Offset Area M	Ionitoring Points January 2022					
Clients Representative Managing this Document	Mike Su	utherland						
AREA Person(s) Managing this Document	Phil Ca	meron						
Cover image	Starting	point of Plot 4 Ja	nuary 2023					
	DOC	UMENT STATUS	: DRAFT					
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V1.1		01/02/2023	Reviewed					
V1.2		13/02/2023	For internal edit					
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V3.0		16/02/2023 AREA to Client						
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Terms and acronyms used in this document

Acronym	Definition	
BOM	Bureau of Meteorology	
BOA	Biodiversity Offset Area	
LGA	Local Government Area	
NSW	New South Wales	
DPE	Department of Planning and Environment	
PCT	Plant Community Types	
VIS	Vegetation Information System	
Project site	The area of which Australian Strategic Materials Dubbo Project vegetation monitoring plots and local plots are located	
VI	Vegetation Integrity	

ASM Dubbo Project : Analogue Vegetation Plot Monitoring Report



1 Introduction

1.1 Background

AREA Environmental & Heritage Consultants (AREA) was commissioned by Australian Strategic Materials (the proponent) to undertake annual monitoring of five established analogue vegetation monitoring points in the Dubbo Project Biodiversity Offset Area (n=3) and local plots (n=2) (Figure 1-1 to 1-3) near Toongi, NSW.

The Dubbo Zirconia Project (now the Dubbo Project) was approved as SSD-5251 by the NSW Planning Assessment Commission (PAC) on 28 May 2015 assessed under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Annual monitoring of five analogue plots is required by the Biodiversity Management Plan. Prior to 2019 vegetation monitoring was conducted using the now defunct BioBanking Assessment Method. Since that time, monitoring has used the current assessment framework of the NSW government, the Biodiversity Assessment Method (BAM 2020). Data prior to 2019 has been excluded from this monitoring report due to inconsistencies with the data collection method, preventing comparisons to be made.

The BAM provides a system for measuring vegetation which is more transparent, repeatable, and objective. The BAM as it pertains to vegetation assessment plots is described in section 2.2.

Data collected using BAM generates four numbers as a score out of 100, which provide a measure of the vegetation quality. These are:

- Composition a measure of the species count / richness
- Structure a measure of the cover provided by each growth form
- Function a measure of the habitat values such as leaf litter, large logs, and tree hollows
- Vegetation Integrity an overall measure of quality based on the results of the above three calculations.

Comparison of these four figures over time can be used to map changes in vegetation quality.

The fieldwork for the 2022 monitoring report was completed on 15 January 2023. High amounts of rainfall had occurred throughout 2022 which prevented and restricted site access causing a delay in vegetation monitoring. The monitoring was therefore completed early in 2023 once the site had dried suitably.

The delayed monitoring event also allows a greater time gap to occur between monitoring events as the previous survey occurred in June 2022.

The Plant Community Type (PCT) within each plot is listed in Table 1-1.



Plot ID	Current classification (BAM 2020)
1	PCT267 - White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion
2	PCT267 - White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion
3	PCT201 -Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
4	PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
5	PCT270 - White Box - Tumbledown Red Gum - Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes

Table 1-1: Plant Community Types

1.2 Locality

The Biodiversity Offset Area is located approximately 20 kilometers south of Dubbo near Toongi, NSW in the Dubbo Regional Local Government Area (LGA). Figure 1-1 to Figure 1-5 show the location and local context of the Biodiversity Offset Area.

Regional context of the study area is provided in Table 1-2.

Criteria	Site context
Interim Biogeographic Regionalisation for Australia (IBRA Region)	NSW South Western Slopes (Inland Slopes) Bioregion
State	New South Wales
Topographical map sheet	Dubbo 8633
Local Government Area	Dubbo Regional
Nearest town / locality	Toongi (locality) Dubbo (Town)
Accessed from nearest town by	Dubbo accessed by Eulandool Road then The Springs Road, then Obley Road.
Land use / disturbance	Historic agriculture. Current agricultural practices occur on land surrounding the BOA.
Nearest waterway (Name, Strahler Order)	No named waterways occur within the Biodiversity Offset Area (BOA). However, within 1500m Wambangalang Creek occurs to the north west, Paddys Creek occurs to the south west. Cockabroo Creek occurs to the south east, and a small section lies within the project boundary. These are all third or higher Strahler Order waterways Numerous unnamed first, second and third Strahler Order
	waterways are mapped within the BOA.
Spot point Australian Height Datum (AHD)	Approximately 280m to 420m
Surrounding land use	Grazing, ploughed agriculture, Biodiversity Offset Area and road reserve

Table 1-2: Regional context of the Biodiversity Offset Area







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Figure 1-2: Biodiversity Offset Area (aerial)

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Figure 1-4: Biodiversity Offset Area (Lots and DPs)


Figure 1-5: Waterways





2 Methods

Field survey was conducted on Saturday 15 January 2023 by two AREA ecologists. The survey included assessment of five established analogue vegetation plots using the BAM (2020) (Figure 2-1).

2.1 Project personnel

This monitoring and preparation of this monitoring report was carried out by appropriately qualified and experienced staff (Table 2-1).

Name	Position	CV Details	Role in this project
Phillip Cameron	Principal consultant	 BSc. Major in Biology. Macquarie University Ass Dip App Sci. University of Queensland Certified Environmental Practitioner (EIANZ) NSW Biodiversity Assessment Method Accredited Assessor (Number BAAS17082) NSW DPIE BioBanking and Bio-certification Assessor: accreditation number 0117 NSW DPIE Scientific License: 101087 NSW DPI Ethics Approval 11/5475 Practicing member of the NSW Ecological Consulting Association Practicing member of the Environment Institute of Australia and New Zealand (EIANZ) WHS White Card and Blue Card Apply First Aid (Parasol) ID: 6007221. 	 Project Management Fieldwork
Addy Watson	Biodiversity Manager	 Grad. Dip. Captive Vertebrate Management, Charles Sturt University Grad. Cert. Social Impact, University of NSW B. Env. Sc. University of New England. Diploma Project Management NSW Biodiversity Assessment Method Lean Six Sigma Certificate (Sydney Uni) WHS White Card Apply First Aid. Certificate number: 07328 	 Fieldwork Report editing
Rohan Saunders	Environmental Consultant (graduate)	 B. Env. Sc. Charles Sturt University WHS – White Card 	• Report writing

Table 2-1: Summary of AREA project teams' qualifications



2.2 Vegetation integrity survey plots

Plot ID	Easting (GDA94 Zone 55)	Northing (GDA94 Zone 55)
1	652443	6405475
2	652671	6406657
3	648685	6408580
4	648035	6407721
5	652722	6407474

Five BAM 2020 plots were monitored within the project site (Table 2-2 and Table 2-3: Coordinates in GDA z55 of the monitoring plots recorded in the field 2023.



Figure 2-1). Plots are not permanently marked with steel posts; however, rock cairns are in place to mark most plots and photos from previous survey years and GPS equipment was used to find the locations.

Plot sheets are provided in Appendix A. The coordinates recorded in the field sheet vary when compared to the coordinates contained in Table 2-2, because of the accuracy of the handheld GPS.

Plot ID	Easting (GDA94 Zone 55)	Northing (GDA94 Zone 55)
1	652426	6405475
2	652663	6406659
3	648677	6408583
4	648032	6407720
5	652722	6407476

Table 2-2: Previous recorded coordinates in GDA z55 of the monitoring plots

|--|

Plot ID	Easting (GDA94 Zone 55)	Northing (GDA94 Zone 55)
1	652443	6405475
2	652671	6406657
3	648685	6408580
4	648035	6407721
5	652722	6407474



Plot 3 Plot4 Plot 5 Plot 2 Plot 1 Legend Boundarles Project Boundary Biodiversity Offset Survey effort Vegetation monitoring plot 750 3000 m 0 1500 2250 AREA

Figure 2-1: Vegetation plot location



The annual monitoring followed the points listed below:

- All five plots were assessed.
- Access to these plots was achieved by vehicle and a short walk.
- Conditions during this monitoring event did not reduce accessibility of the plots.
- All plots are not permanently marked, however plot coordinates, and photos from previous years of monitoring were used to confirm correct location of the assessment in 2023 for the 2022 reporting period.
- The assessors implemented the monitoring using a nested plot around a central 50 metre transect as follows:
 - One 400 square metre plot (standard 20metre by 20 metre) was used to assess the composition (species richness) and structure (percent cover).
 - One 1000 square metre (standard 20metre by 50 metre) plot was used to assess the function attributes: number of large trees, stem size class, tree regeneration and length of logs.
 - Five one square metre sub-plots are used to assess ground cover (leaf litter and other optional groundcover components) for the plot.

Figure 2-2: Nested plot layout (20mx20m = composition and structure plot, 20mx50m = function assessment plot, 1mx1m = ground cover plot)





2.2.1 Composition

- Assessment of composition was based on the number of native plant species (richness) observed and recorded by the assessor within each 20 metre by 20 metre plot for each growth form group shown in Table 2 of BAM (2020)
- To determine growth, form the BAM (2020) native species by growth form query tool was used
- The survey data recorded by the assessor for composition within each of the five 20 metre by 20 metre condition plots was:
 - Scientific name for the native species within each growth form group.
 - Whether each species is native, exotic or high threat exotic.
 - The growth form group to which each native species has been allocated.
 - The composition of each growth form group was assessed by counting the number of different native plant species recorded within each growth form group within each of the five 20 metre by 20 metre condition plots.

2.2.2 Structure

- Structure is the assessment of foliage cover estimates for each growth form group within
 each of the five 20 metre by 20 metre plot boundaries. Foliage cover for a growth form
 group is the percentage of cover of all living plant material of all individuals of the species
 present for that group. This includes leaves, twigs, branchlets and branches as well as
 canopy overhanging the plot even if the stem is outside the plot.
- The assessor recorded an estimate of the foliage cover for each native and exotic species present within the 20 metre by 20 metre plot.
- The structure of each growth form group for the 20 metre by 20 metre plot was recorded by the assessor as the sum of all the individual foliage cover estimates of all native plant species recorded within each growth form group within each Plot.
- The assessor assigned each non-native (exotic) plant species a foliage cover estimates and either E (exotic) or HTE (high threat exotic).

2.2.3 Function

- Function is the assessment of large trees, tree stem size, tree regeneration, fallen logs and leaf litter. Only native species are recorded for these attributes.
- Tree stem size classes was measured at 1.3 metres above ground height, referred to as 'diameter at breast height over bark' or DBH.
- Tree stem size classes are:<5, 5–9, 10–19, 20–29, 30–49, 50–79, and more than 80 centimetres DBH and include all species in the tree growth form group.
- Only living trees contributed to counts for determination of presence and for a multistemmed tree, only the largest living stem is included in the count for determining the presence or absence of stems within each size class.
- The number of large trees is a count of all living stems with a DBH equal to or greater than the large tree benchmark DBH size for that PCT or vegetation class.
- For a multi-stemmed tree, at least one living stem equal to or greater than the large tree benchmark DBH size to count as a large tree was used.
- Stem size classes were based on the presence or absence of living tree stems within size classes that fall between regenerating stems (less than five centimetres DBH) and the large tree benchmark DBH size(s).
- Regeneration was based on the presence or absence of living trees with stems less than five centimetres DBH.
- The length of fallen logs is the total length in metres of all woody material greater than 10 centimetres in diameter that is dead and entirely or in part on the ground within the 20



metre by 50 metre plot. Where logs extend outside of the plot, the assessor only recorded the length of fallen log that is contained within the plot.

- Litter cover is assessed as the average percentage ground cover of litter recorded from five one by one metre plots evenly located along the central transect of each plot,
- Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 centimetres in diameter). The assessment of litter cover included all plant material that was detached from a living plant and forms part of the litter layer on the ground surface.
- Litter cover is the two-dimensional litter layer in contact with the ground surface, including litter under the canopies of erect plants.
- Plant material that is not detached was assessed as growth form foliage cover, regardless of whether it appears alive or dead.
- The number of trees with hollows was determined by counting the number of trees with hollows that are visible from the ground in the 20 metre by 50 metre plot. The number of trees with hollows included native species allocated to the shrub growth form group. It included both living and dead trees.
- A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the entrance width is at least 5 centimetres; (c) the hollow appears to have depth (i.e., solid wood cannot be seen beyond the entrance); and (d) the hollow is at least one metre above the ground.

3 Limitations

There were certain limitations surrounding the completion of this fieldwork in Spring 2022 including higher than average rainfall across the area at the preferred time of the survey, preventing and limiting site access. To overcome these limitations the survey was conducted at the soonest practical date - in summer on 15 January 2023. The change is survey seasons could result in changes in plant composition within the plots.

The plots are not permanently marked with steel posts, not having the plots permanently marked can create inconsistencies or variations with the data when compared to previous years. To overcome the limitation photos from previous years and GPS equipment were used to locate the start and end point of each plot.

Other limitations include reduced visibility from dense vegetation, preventing habitat attributes or species from being located. Not all animals and plants can be fully accounted for within any given study area. The presence of threatened species is not static it changes over time, often in response to longer term natural forces which can at any time be dramatically influenced by human-made disturbance or weather.



4 Results

4.1 Preceding rainfall

Average annual rainfall for Dubbo is 589.6 millimeters, recorded at Dubbo Airport Weather Station which lies about 25 kilometers north of the project site (Bureau of Meteorology¹). Rainfall for 2022 far exceeded the annual average at 1028.8 millimeters (Table 4-1). The monitoring event was undertaken during after a time of increased rainfall for NSW.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2010	25.6		69.6	62.2	54.6	34.2	64.4	58.4	51.8	54.0	144.0	167.6	
2011	8.6	37.8	49.4	28.4	60.0	11.2	8.4	59.8	81.8	55.4	101.6	74.8	577.2
2012	98.0	118.0	125.0	1.6	85.4	41.6	44.6	9.8	31.6	9.4	38.2	5.4	608.6
2013	63.4	27.8	80.8	0.4	27.0	126.0	23.2	5.4	83.2	5.2	3.0	47.6	493.0
<u>2014</u>	49.8	50.8	142.4	57.8	26.8	57.6	55.6	15.4	15.6	11.6	11.2	77.0	571.6
2015	130.6	31.8	8.4	81.8	47.8	72.2	60.2	39.4	6.8	46.4	66.6	59.6	651.6
2016	122.8	3.2	16.2	25.0	55.4	151.6	105.2	50.4	157.8	56.2	34.0	138.6	916.4
<u>2017</u>	14.8	1.6	223.0	9.4	5.2	9.2	3.0	20.6	5.0	84.6	34.8	54.2	465.4
<u>2018</u>	28.6	2.4	4.0	6.8	13.0	18.6	1.6	36.4	6.8	90.4	68.6	34.4	311.6
<u>2019</u>	64.4	18.4	46.8	0.0	23.4	10.4	6.4	6.8	11.0	1.6	19.4	2.6	211.2
2020	36.0	81.8	145.0	N/A	28.8	32.6	82.2	39.0	47.6	60.6	12.6	120.6	N/A
<u>2021</u>	54.0	114.4	187.2	1.8	21.0	93.8	91.8	34.0	36.8	35.4	180.8	73.4	924.4
2022	130.0	41.0	56.4	191.2	75.8	12.8	58.6	112.2	104.8	195.8	43.8	6.4	1028.8

Table 4-1: Rainfall Dubbo Airport Weather Station (065070) Lat: 32.22° S; Lon: 148.58° E; Elevation: 284m

¹http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_st n_num=065070

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Statistic	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	58.7	45.0	68.0	36.4	39.5	48.6	43.9	37.1	43.8	51.2	61.1	59.8	589.6
Lowest	3.8	1.6	4.0	0.0	0.6	4.0	1.6	0.4	0.6	1.2	0.0	2.6	211.2
5th %ile	7.8	2.6	8.8	0.2	4.4	9.6	3.3	3.7	5.6	2.0	5.7	5.5	236.9
10th %ile	10.4	5.1	11.6	0.5	5.1	11.0	5.7	6.4	6.8	2.9	11.0	6.2	325.6
Median	41.2	30.6	47.5	23.5	28.8	35.8	37.6	25.0	36.0	52.3	56.7	48.4	571.6
90th %ile	130.2	98.1	159.4	83.1	79.6	102.3	91.9	86.6	89.7	96.0	120.2	147.3	903.3
95th %ile	146.4	117.1	183.9	100.4	86.4	124.6	100.6	114.3	109.2	111.0	167.9	168.8	923.6
Highest	191.0	218.2	223.0	191.2	102.2	151.6	138.0	151.6	157.8	195.8	181.8	188.8	1028.8

Table 4-2: Rainfall summary statistics for all years at Dubbo Airport Weather Station (BoM,2022)

4.2 Plot data

4.2.1 Plot results compared to benchmarks for the PCT

The results of processed plot data were compared to PCT benchmark information in the NSW VIS database (BioNet Vegetation Classification). Vegetation and habitat parameters recorded in each plot were compared against the default benchmarks and for a wet rainfall year benchmark described by the NSW government for each PCT.

Green shading indicates 75 percent or greater of benchmark (good), blue shading indicates between 25 percent and 75 percent of benchmark (average) and red shading indicates less than 25 percent of the benchmark (poor) value has been recorded.

Table 4-3: January 2023 Individual plot data and default benchmarks (average rainfall year,480- 748 mm) for Plot 1 and 2 (PCT267).

PCT267 - White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion									
Class/IBRA: Western Slopes Grassy Woodlands / NSW South Western Slopes									
Attribute	Benchmark value	25% benchmark	75% benchmark	Plot 1	Plot 2				
Tree Richness	3	0.75	2.25	2	2				
Shrub Richness	3	0.75	2.25	1	0				
Grass and Grass Like Richness	8	2	6	5	12				
Forb Richness	10	2,5	7.5	6	7				
Fern Richness	1	0.25	0.75	1	1				
Other Richness	1	0.25	0.75	0	0				
Tree Cover	19	4.75	14.25	35.2	6				
Shrub Cover	1	0.25	0.75	0.1	0				
Grass and Grass Like Cover	32	8	24	25.5	41.4				
Forb Cover	6	1.5	4.5	48.5	4.8				
Fern Cover	0	0	0	0.5	2				
Other Cover	0	0	0	0	0				
Total length of fallen logs	41	10.25	30.75	17	34				
Litter Cover	55	13.75	41.25	34.4	28				
Number of Large Trees (>50dbh)	4	1	3	0	0				



PCT267 - White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion									
Class/IBRA: Western Slopes Grassy Woodlands / NSW South Western Slopes									
Attribute	Benchmark value	25% benchmark	75% benchmark	Plot 1	Plot 2				
Tree Richness	4	1	3	2	2				
Shrub Richness	4	1	3	1	0				
Grass and Grass Like Richness	9	2.25	6.75	5	12				
Forb Richness	14	3.5	10.5	6	7				
Fern Richness	1	0.25	0.75	1	1				
Other Richness	2	0.5	1.5	0	0				
Tree Cover	24	6	18	35.2	6				
Shrub Cover	1	0.25	0.75	0.1	0				
Grass and Grass Like Cover	52	13	39	25.5	41.4				
Forb Cover	9	2.25	6.75	48.5	4.8				
Fern Cover	0	0	0	0.5	2				
Other Cover	0	0	0	0	0				
Total length of fallen logs	41	10.25	30.75	17	34				
Litter Cover	55	13.75	41.25	34.4	28				
Number of Large Trees (>50dbh)	4	1	3	0	0				

Table 4-4: January 2023 Individual plot data and wet year benchmarks (>748 mm) for Plot 1 and2 (PCT267).

Table 4-5: January 2023 Individual plot data and default benchmarks (average rainfall year 480-748mm) for Plot 3 (PCT201)

PCT201 - Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion								
Class/IBRA: Western Slopes Grassy Woodlands / NSW South Western Slopes								
Attribute	Benchmark value	25% benchmark	75% benchmark	Plot 3				
Tree Richness	3	0.75	2.25	1				
Shrub Richness	3	0.75	2.25	1				
Grass and Grass Like Richness	8	2	6	11				
Forb Richness	10	2.5	7.5	14				
Fern Richness	1	0.25	0.75	0				
Other Richness	1	0.25	0.75	0				
Tree Cover	19	4.75	14.25	15				
Shrub Cover	1	0.25	0.75	20				
Grass and Grass Like Cover	32	8	24	24.9				
Forb Cover	6	1.5	4.5	68.3				
Fern Cover	0	0	0	0				
Other Cover	0	0	0	0				
Total length of fallen logs	41	10.25	30.75	17				
Litter Cover	55	13.75	41.25	16.6				
Number of Large Trees (>50dbh)	4	1	3	3				

PCT201 - Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion									
Class/IBRA: Western Slopes Grassy Woodlands / NSW South Western Slopes									
Attribute	Benchmark value	25% benchmark	75% benchmark	Plot 3					
Tree Richness	4	1	3	1					
Shrub Richness	4	1	3	0					
Grass and Grass Like Richness	9	2.25	6.75	11					
Forb Richness	14	2.5	10.5	14					
Fern Richness	1	0.25	0.75	0					
Other Richness	2	0.25	1.5	0					
Tree Cover	24	6	18	15					
Shrub Cover	1	0.25	0.75	20					
Grass and Grass Like Cover	52	13	39	24.9					
Forb Cover	9	2.25	6.75	88.3					
Fern Cover	0	0	0	0					
Other Cover	0	0	0	0					
Total length of fallen logs	41	10.25	30.75	17					
Litter Cover	55	13.75	41.25	16.6					
Number of Large Trees (>50dbh)	4	1	3	3					

Table 4-6: January 2023 Individual plot data and wet rainfall year benchmarks (average rainfallyear >748mm) for Plot 3 (PCT201)

Table 4-7: January 2023 Individual plot data and default benchmarks for Plot 4 (361-593mm) (PCT76)

PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions								
Class/IBRA: Floodplain Transition Woodlands / NSW South Western Slopes								
Attribute	Benchmark value	25% benchmark	75% benchmark	Piot 4				
Tree Richness	3	0.75	2.25	1				
Shrub Richness	4	1	3	0				
Grass and Grass Like Richness	6	1.5	4.5	6				
Forb Richness	10	2.5	7.5	7				
Fern Richness	1	0.25	0.75	0				
Other Richness	1	0.25	0.75	0				
Tree Cover	31	7.75	23.25	15				
Shrub Cover	2	0.5	1.5	0				
Grass and Grass Like Cover	23	5.75	17.25	71.3				
Forb Cover	5	1.25	3.75	13.4				
Fern Cover	0	0	0	0				
Other Cover	0	0	0	0				
Total length of fallen logs	49	12.25	36.75	13				
Litter Cover	65	16.25	48.75	51.8				
Number of Large Trees (>50dbh)	3	0.75	2.25	1				



PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions					
Class/IBRA: Floodpla	ain Transition Wo	odlands / NSW Sc	outh Western Slo	pes	
Attribute	Benchmark value	25% benchmark	75% benchmark	Plot 4	
Tree Richness	3	0.75	2.25	1	
Shrub Richness	5	1.25	3.75	0	
Grass and Grass Like Richness	7	1.75	5.25	6	
Forb Richness	11	2.75	8.25	7	
Fern Richness	1	0.25	0.75	0	
Other Richness	1	0.25	0.75	0	
Tree Cover	38	9.5	28.5	15	
Shrub Cover	2	0.5	1.5	0	
Grass and Grass Like Cover	35	8.75	26.25	71.3	
Forb Cover	6	1.5	4.5	13.4	
Fern Cover	0	0	0	0	
Other Cover	0	0	0	0	
Total length of fallen logs	49	12.25	36.75	13	
Litter Cover	65	16.25	48.75	51.8	
Number of Large Trees (>50dbh)	3	0.75	2.25	1	

Table 4-8: January 2023 Individual plot data and wet rainfall year benchmarks for Plot 4(>593mm) (PCT76)

Table 4-9: January 2023 Individual plot data and default benchmarks for average rainfall year(462-721mm) Plot 5 (PCT270)

PCT270 - White Box - Tumbledown Red Gum - Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes						
Attribute Benchmark value 25% 75% Plot 5						
Tree Disharas		benchmark	benchmark			
I ree Richness	5	1.25	3.75	3		
Shrub Richness	9	2.25	6.75	0		
Grass and Grass Like Richness	6	1.5	4.50	8		
Forb Richness	8	2	6	5		
Fern Richness	1	0.25	0.75	1		
Other Richness	1	0.25	0.75	0		
Tree Cover	60	15	45	12		
Shrub Cover	10	2.5	7.5	0		
Grass and Grass Like Cover	15	3.75	11.25	43.8		
Forb Cover	4	1	3	4.8		
Fern Cover	0	0	0	5		
Other Cover	0	0	0	0		
Total length of fallen logs	67	16.75	50.25	11		
Litter Cover	66	16.5	49.50	12		
Number of Large Trees (>50dbh)	1	0.25	0.75	0		

Table 4-10: January 2023 Individual plot data and benchmarks for wet rainfall year (>721mm) Plot 5 (PCT270)

PCT270 - White Box - Tumbledown Red Gum - Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes Class/IBRA: Western Slopes Dry Sclerophyll Forests / NSW South Western Slopes						
Attribute	Benchmark value	25% benchmark	75% benchmark	Plot 5		
Tree Richness	5	1.25	3.75	3		
Shrub Richness	10	2.5	7.5	0		
Grass and Grass Like Richness	7	1.75	5.25	8		
Forb Richness	9	2.25	6.75	5		
Fern Richness	1	0.25	0.75	1		
Other Richness	2	0.5	1.5	0		
Tree Cover	74	18.5	55.5	12		
Shrub Cover	12	3	9	0		
Grass and Grass Like Cover	24	6	18	43.8		
Forb Cover	6	1.5	4.5	4.8		
Fern Cover	0	0	0	5		
Other Cover	0	0	0	0		
Total length of fallen logs	67	16.75	50.25	11		
Litter Cover	66	16.5	49.5	12		
Number of large trees	1	0.25	0.75	0		

Variation existed between the plots with most attributes scoring above the 25 percent benchmark for the average and wet rainfall year benchmarks, except for the following:

- Shrub cover for plots 1, 2, 4 and 5
- Shrub richness for plots 2, 3, 4, and 5
- Fern richness for plots 3 and 4
- Other richness for all plots
- Number of large trees for plots 1, 2 and 5
- Litter cover for plots 4 and 5
- Total length of fallen logs for plots 4 and 5

The following attributes exceeded the 75 percent benchmark for both average and wet rainfall year benchmarks:

- Grass and Grass Like Richness for plots 2, 3, 4 and 5 •
- Forb richness for plot 3 •
- Fern Richness for plots 1, 2, and 5
- Tree cover for plot 1
- Shrub cover for plot 3 .
- Grass and Grass like cover plots 2, 4 and 5
- Forb Cover for plots 1, 3, 4 and 5
- Fern Cover for plots 1, 2 and 5
- Litter cover for plot 4 •
- Number of large trees for plot 5

Most attributes passed the same benchmark (75 percent or 25 percent) level for both rainfall categories, expect for Plot three which scored above the 75 percent benchmark for tree cover, grass and grass-like cover for average rainfall year but not wet rainfall year. The



previously mentioned attributes remained above the 25 percent benchmark for wet rainfall year.

A notable observation can be made for shrub cover which increased at plot 3 to above benchmark, a significant increase from last year which was below benchmark.

4.2.2 Photographic record











































Dubbo Regional LGA NSW



4.2.3 BAM calculations

Results from the BAM Calculator (BAMC) are provided in Table 4-13. BAMC is periodically updated which may change the results if the same data is processed later. Plot five continues to record the lowest of all scores measured by the calculator.

Plot number	Composition score	Structure score	Function score	Vegetation integrity score
1	70.2	95.4	50.4	69.7
2	78.1	73.1	57.1	68.8
3	75.6	94.8	52.9	72.4
4	62.4	74.4	54.7	63.3
5	57.1	27.2	30.9	36.3

Table 4-13: BAM results January 2023 data for 2022 reporting period

4.2.4 Comparison of BAM calculations

The data collected under BAM 2020 for the last three survey years has been compiled in comparison tables to demonstrate the overall change in condition for plots one to five.

The composition score has decreased since the survey in June 2022 across in Plots 1,2 and 5 (Table 4-14). This decrease could have occurred from the reduction in forb species recorded across the three plots with decreased scores.

The plots outside of the BOA (Plots 3 and 4) were the only plots to increase in composition score from June 2022 which could be correlated with the increased number of forb species recorded.

Plot number	2019	2020	June 2022	January 2023
1	73.6	65.7	81.5	70.2
2	75.8	79	87.4	78.1
3	67.6	76.7	74.7	75.6
4	74.1	62.7	50.5	62.4
5	41.8	64	65.6	57.1

Table 4-14: Composition score

Plots 1, 2 and 4 decreased in structure from the 2022 June survey. One notable change occurred in plot 4 where the structure decreased by greater than 20 (

Table 4-15). The change could reflect the decrease in tree, grass, and forb cover from the June 2022 survey.

Plot 2 grass cover reduced by 51 percent, this could be correlated with feral pigs impacting approximately 15 percent of the plot.

Plots 5 and 3 increased but the changes in structure score were no greater than six.



Table 4-15: Structure score

Plot number	2019	2020	June 2022	January 2023
1	50.3	43.7	98.2	95.4
2	55.3	66.2	81.7	73.1
3	98.2	89.5	89.4	94.8
4	96.5	73.5	95.2	74.4
5	20.6	21.5	24.3	27.2

Plot 1 was the only plot to increase in function score, although less tree regeneration was observed when compared to the previous survey. All other plots decreased; the decrease could be correlated with the reduced number of fallen logs recorded in the January 2023 survey when compared to the previous survey (Table 4-16). Firewood collection is likely to occur in Plots 3 and 4 which are in land accessible by the public. Plots 2 and 3 reduced in the number of large tress (DBH greater than 50 centimeters) impacting function score.

Plot number	2019	2020	June 2022	January 2023
1	55.8	46.9	48.4	50.4
2	79.3	61.3	80.8	57.1
3	72.2	58.7	79.4	52.9
4	70.6	67.3	71.9	54.7
5	54.3	32.1	38.2	30.9

Table 4-16: Function score

Vegetation integrity scores have decreased from the score in 2022 (Table 4-17). This reflects other measured scores decreasing in the January 2023 survey. The largest drop has occurred in Plot 2 which declined across all calculated scores. The decrease in scores could be correlated with the higher number of invasive species recorded, reduction in large trees or damage caused by feral pigs within the plot.

Table 4-17: Vegetation integrity score

Plot number	2019	2020	June 2022	January 2023
1	59.1	51.3	72.9	69.7
2	69.3	68.4	83.2	68.8
3	78.3	73.9	80.9	72.4
4	79.6	67.7	70.2	63.3
5	36	35.3	39.4	36.3



4.2.5 Invasive species

Vegetation in Plot 2 was observed to be damaged by feral pigs (*Sus scrofa*) within the BOA. Twenty-two weed species were recorded in the January 2023 survey - an increase from the 15 species recorded in June 2022. The higher number of weed species could be correlated with the decrease in composition score across most plots. This increase is likely correlated to increased rainfall across the region, weed numbers are anticipated to decrease upon normal climatic conditions.

Three High Threat Exotic weeds were recorded; an increase from two recorded in June 2022 survey, with Saffron Thistle (*Carthamus lanatus*) recorded in January 2023 (

Table **4-19**).

High Threat Exotic weeds recoded in the plots are listed in Table 4-19.

Scientific name	Common name
Briza minor	Shivery grass
Bromus hordeaceus	Soft Broome Grass
Centaurium erythraea	Common Centaury
Centaurea melitensis	Maltese Cockspur
Capsella bursa-pastoris	Shepherd's purse
Chondrilla juncea	Skeleton Weed
Cirsium vulgare	Spear Thistle
Convolvulus spp	Bind Weed
Conyza sumatrensis	Tall Fleabane
Erodium spp.	Storksbill
Lactuca serriola	Prickly Lettuce
Medicago spp	Clover
Lessingia arachnoidea	Proliferous Pink
Polygonum spp.	Wireweed
Salvia verbenaca .	Wild Sage
Solanum nigrum	Blackberry Nightshade
Taraxacum sp.	Dandelion
Trifolium arvensis	Hares foot clover
Weed sp (Berberidaceae family)	N/A

Table 4-18: Exotic species recorded in the January 2023 survey

Table 4-19: High Threat exotics recorded in the January 2023 survey

Scientific name	Common name
Bidens spp	Cobblers Peg
Carthamus lanatus	Saffron thistle
Paspalum dilatatum	Paspalum



5 Conclusions

This document addressed monitoring actions in the approved Biodiversity Management Plan shown on Table 5-1.

Table 5-1: Projec	t comments agai	nst Development	t Conditions o	f Consent
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Location	Monitoring action	Frequency	Comment
Control Site and Analogue Sites 1 to 5	BioMetric Vegetation Condition Benchmark	Annual	Monitoring completed – January 2023

Plot 5 is in the poorest condition which is demonstrated by its low scores generated by the BAM calculator, as well as the number of attributes which were below 25 percent of the benchmark for PCT270 *White Box – Tumbledown Red Gum – Long-leaved Box shrub/grass woodland on fine-grained sediments of the upper Macquarie River gorge, NSW central western slopes.* The low scores could be correlated to shallow soils which are impacted by the extreme wet and dry. However, regenerating Tumbledown gum (*Eucalytpus Dealbata*) was observed within plot 5, indicating VI may improve in the future.

Plot 2 was the only plot to decline in all four BAM calculator scores, resulting in the decline in vegetation integrity. This decline could be correlated with the increase in invasive species being recorded or damage caused by feral pigs within the plot.

The decrease in VI scores have reversed the trend of increasing VI with Plots 2, 3 and 4 below the 2019 score, when drought conditions were present. Overall vegetation integrity has decreased across all five plots resulting in the vegetation within the plots to be within a moderate condition. The decline in vegetation integrity from June 2022 was not anticipated due to increased rainfall across the region, creating favorable climatic conditions for vegetation growth.

These favorable conditions have likely facilitated the growth of invasive species causing competition for native species, attributing to the reduction of vegetation integrity. Further monitoring would detect if VI is continuing to decline prompting management actions.



Resources 6

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Appendix A - 2023 BAM Plot sheets

Sita sheet #	Date	15/1 /2	Survey name	Dubber	Project	Toonsi	Plot Identifier	1 Pine	4617
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GF Code: see growth form definitions in BAM 2020 Appendix F. N: native, HTW: high threat weed

² Follage cover: 0 1, 0 2, 0 3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ... 100%; Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately $1.4 \times 1.4 m$, and $1\% = 2.0 \times 2.0 m$, $5\% = 4 \times 5 m$, $25\% = 10 \times 10 m$. Note the top 3 dominant native species within each GF group.

Abundance: Count 1, 2, 3 ..., when <10, estimate when >10, 20, 30 ..., 100, 200, 300 ..., 1000, 2000, 3000 (as integer values)

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Site sheet #	Date	15/11	23 Survey name	Detho HIOMIO	Ploject ring 2	Pide 3 ide	ot Plat 3 entifier For 27, 54 Bo
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Total count of native plant species	Trees (TG)	(Sum of ² foliage cover	Trees (TG)	15	80 + cm	must be counted
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(not individual plants within	(GG)	17	group	Grassas etc. (GG)	25	30 - 49 cm	1111 4
each growth form)	Forbs (FG)	14	•	Forbs (FG)	683	20 - 29 om	
	Ferns (EG)			Ferns (EG)		10 – 19 cm	0
	Other (OG)	-		Other (OG)	_	5 – 9 cm	D
			Total high threat	weed cover		S cm S cm Length of fallen log	8
Vegetation Inte	anthe function				0,2	⁶ Hollow bearing tree	
cont. (five 1 m ²) Subplot score (1	plots) Kin each)	⁷ Litter c	over (%)	ELitie (grown	a cosor (6)	оумад ни созот	Cal Rock dover (%)
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T=1=15 5= 20 F-14=68.3 6-11-24.0 400 m² floristics plot: Survey name Plot identifier Recorders Dusha Augrat 5. Toong. Hall Phil Camera Ader, Wetson 15/1/23 Date Mountains 23 N. HTW ? Foliage Abund Species name Full species name. Or a unique means of identifying separate taxa within a survey is mandatory. Data from here will be used to assign growth form richness and cover. GF Visional or non-HTW COVER ance code FULLY BOX L Everlyptus convice N 15 1 Hydrocatyle lawifelic Stinking Pringword S 20 800 L, Myopoium debile F ~ 15 1500 Taracaxursp Bidens 0.3 Denerlow E 90 Colles Pro-6.5 130 1 11 · · · · · · Uniciplacia standes 0-5 150 4 1.1 F Chyciene. N 10 300 alycene clandesta Chile Acchine 3 2 210 Commelina commen 2 200 Savy Werd Brid weed EN 2 150 COAVPLUES SUP – F ¥. 10 Dianella Vevoluta 1 FAGFF NN 10 1 omander fill fermis 2 50 Coley sp A. Digitarie l'aplaira Digit Ginno 3 0.1 λ Pellen have day 15 N Calors 400 15 Culation 400 ~ constation scaling 2 Elymer statis Chondrilla juncea 500 G N Ž. 100 Slidde Werd Č. And de jericoerais Dictoposon structus N 10 400 Panifum decomposition Native Hallet Uncluen servide Prictic Laboration 2 200 3 400 N 4 Prietly Letture e N 1 200 4 2 300 Chloris Verillos N 55 400 Augipale 14 and Vithadina constant Fugg ward N Polygonum spa Engline matrices and and while ward (and it) E Engline matrices and and and and (and it) N Uw 01 50 2 200 Enteropogon acceleris Curly Undert N Sida Romahonyraa Pispalun dilladium Aurill Hite 01 20 14 01 20 0215 1475 Startish.II Courses Couch Erodium SPP. Cyprodon decely and N 01 10 01 N 25 01 (D lind de macra N N 01 5 Armey bionsii Wild Sigo 0.1:35 C Salvia verbenacon Print more copies of this page to allow for higher species counts at a plot. All vascular plant species in a plot meed to be recorded The follow allowing Heresfeed Claner E 01 10 Erice row elector Tall free records 01 40 GF Code: see growth form definitions in BAM 2020 Appendix F. N: native, HTW: high threat weed ² Follage cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ... 100%, Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m. Note the top 3 dominant native species within each GF group. Abundance: Count 1, 2, 3 ..., when ≤10, estimate when >10, 20, 30 ... 100, 200, 300 ..., 1000, 2000, 3000 ... (as integer values) Esterition Connor Contrag 35 Centurian 61 E Euchiton 34 Sphericity Spherille 01 N F plon 6 . 1 20

ASM Dubbo Project : Analogue Vegetation Plot Monitoring Report



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Site sheet #	Date	15/1 /	23 Survey	Monit a	Project 17 23	Plo Ide	t 4.05 ntifler I.C.1	ley R.
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Composition (400 m ² plot)	cture iner	Structure (400	Vegetatio m² plot)	n integrity	Function (1000 m ²)	ect required bining to give a	- 1
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Total count of netive plant	Trees (TG)	1	Sum of I follage cover	Trees (TG)	15	80 + cm	must be counted	
(richness) in each growth	ontude (5G)	_	of native plant species by growth form	Shrubs (SG)	~	50 - 79 cm	\cap	
form group (not individual plants within	Grasses etc. (GG)	6	group	Grasses etc. (GG)	713	30 ~ 49 cm	7	
each growth form)	Forbs (FG)	2		Forbs (FG)	1 4 7	20 - 29 cm	0	
	Fema (EG)	~		Fems (EG)),4	10 - 19 cm	b	
	Other (OG)			Other (OG)		5 - 9 cm	0	
			Total high threat	weed cover	0.	*Tree regeneration <5 cm * Length of failen logs	0	
Vegetation Inte	nnihu - function				\mathcal{O} -	⁶ Hollow bearing trees	s V u	13
cont. (five 1 m ²) Subplot score (%	piots) k in each)	Litter	cover (%)	Bark ground	(Second (Se)	Gryptogam covor T	 Rock cover (%) 	
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Vegetation class			of month on the	*Large tree be	nchmark size	20/ 30/ 50/ 80	DBH Confidence	H/ M/ L
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400 m² (Neristics plet:	SHIVEY Name	Plot identifier	Recorders		
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GF Cod	de: see growth form (definitions in BAM 2020 Ap	pendix F; N: native, H1	W: high threat weed		
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Abund	ance: Count 1, 2, 3	a, when ≤10, estimate wh	en >10, 20, 30 100, 2	200. 300 1000, 200	00. 3000 (as integ	er values)

ASM Dubbo Project : Analogue Vegetation Plot Monitoring Report Dubbo Regional LGA NSW





			Plot 5	Ċ	Krost A
400 m ² fioristics plot	Survey name	Plot identifier	Recorders		
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GF Species name code Full species r mandatory. D	ne name, or a unique means of identi ata from here will be used to assi	ifying separate taxa within a su ign growth form richness and c	N, HTW Irvey is or non- cover. HTW	² Foliage Abund cover -ance	Voucher
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GF Gode: see growth ² Foliage cover: 0.1.	form definitions in BAM 2020 A 0.2, 0.3,, 1, 2, 3, 4, 5, 10, 15	Appendix F N: native, HTW: 5, 20, 25,100%, Note 0 14	high threat weed % cover represents	an area of approxi	mately 63 x
63 cm 6r a olf6le abo 5 m, 25% = 10 x 10 m Abundance: Count 1	ut 71 cm across. 0.5% cover rep Note the top 3 dominant native 2.3 when <10 estimate with	bresents an area of approxim e species within each GF gro hen >10, 20, 30, 100, 200	iately 1,4 x, 1,4 in, a sup 300 1000 2000	nd 1% = 20 x 20 1	1), 5% = 4 x
Abundance, Coulle	, ∠, o , , , when ≥ i0, estimate wi				u vonucaj.

ASM Dubbo Project : Analogue Vegetation Plot Monitoring Report

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2022-2023 Annual Review

APPENDIX B

	22		1.777	1	
A Bold data = c	cumulative 1	otal			
^^ 0.2mm read	lings may be	e dew			

ASM - Enviror	mental Mo	nitoring She	elter at Wyc	hitella, 4R 1	he Springs	Rd, Toongi	32°27'03.2"	S 148°35'01	.8"E, 284.2	2m ASL		Rainfall F	2022-2023
Date	Iul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Date
	mm	mm	mm	mm	шш	mm	mm	шш	mm	mm	mm	mm	
H	5.4	7.0		0.2	16.0								1
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ъ		1.2		33.8			20.4					2.0	S
9	3.4	0.8										3.0	9
7	0.2		2.0	42.2		9.9				5.0	3.0		7
∞			17.8	64.2								17.4	ø
σ			16.6					40.8					6
10			9.0										10
11		1.6			3.0								11
12	2.6	16.0				5.6	3.0			6.2		1.4	12
13		9.6		0.4	20.6		8.4		6.8	0.2		9.6	13
14		6.4		13.4	4.4								14
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16		0.2											16
17													17
18							9.2	6.4					18
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21			33.0	11.0		3.6	0.4	7.0					21
22			1.6	7.0			23.0		5.2			15.8	22
23		5.6		29.2					0.2			14.0	23
24				14.2									24
25									3.8				25
26	10.2												26
27			11.0	3.8	4.2				0.2				27
28			2.0						3.4	1.0		12.4	28
29		5.4					2.0		4.8	51.6			29
30		12.8					3.0			1.2			30
31				27.8		1.0							31
Month Total	89.0	129.2	115.0	271.0	49.6	16.8	72.8	54.2	24.4	68.4	7.2	77.2	TOTAL
No.of days	00	15	6	14	7	4	11	ŝ	7	2	2	6	96
Cum. total	68	218.2	333.2	604.2	653.8	670.6	743.4	797.6	822	890.4	897.6	974.8	974.8

Report No: DAT20054

Australian Strategic Materials Ltd





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Page **24** of **28**

Report No: DAT19900

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99.1% valid data present



Report No: DAT19796

Australian Strategic Materials Ltd





100.0% valid data present

Figure 7: Windrose for April 2023

Report No: DAT19670

Australian Strategic Materials Ltd





99.4% valid data present

Figure 7: Windrose for March 2023

Report No: DAT19543

Australian Strategic Materials Ltd





99.9% valid data present



Report No: DAT19429

Australian Strategic Materials Ltd





98.5% valid data present



Report No: DAT19283

Australian Strategic Materials Ltd





99.9% valid data present



Report No: DAT19192

Australian Strategic Materials Ltd





99.5% valid data present



Report No: DAT19097

Australian Strategic Materials Ltd





100.0% valid data present



Report No: DAT18978

Australian Strategic Materials Ltd





99.0% valid data present



Report No: DAT18855





Figure 7: Windrose for August 2022

Report No: DAT18746

Australian Strategic Materials Ltd



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80.2% valid data present

Figure 7: Windrose for July 2022

Report No: DAT20054





Figure 5: Ambient Temperature for June 2023

Report No: DAT19900

Australian Strategic Materials Ltd



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Figure 5: Ambient Temperature for May 2023

Report No: DAT19796





Figure 5: Ambient Temperature for April 2023

Report No: DAT19670





Figure 5: Ambient Temperature for March 2023

Report No: DAT19543





Figure 5: Ambient Temperature for February 2023

Report No: DAT19429

Australian Strategic Materials Ltd



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Figure 5: Ambient Temperature for January 2023

Report No: DAT19283





Figure 5: Ambient Temperature for December 2022

Report No: DAT19192

Australian Strategic Materials Ltd



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Figure 5: Ambient Temperature for November 2022

Report No: DAT19097





Figure 5: Ambient Temperature for October 2022

Report No: DAT18978

Australian Strategic Materials Ltd



H



Figure 5: Ambient Temperature for September 2022

Report No: DAT18855





Figure 5: Ambient Temperature for August 2022

Report No: DAT18746

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H



Figure 5: Ambient Temperature for July 2022

Dubbo Project Surface Water Sampling – 13 July 2022



SW1- Cockabroo Creek draining from ore body and Dowds Hill



SW2- Ugothery Big Dam


SW3 - Watercourse B (Woolshed dam) Toongi

Valley



SW4-Paddys Creek 13 July 2022.



SW5 - Wambangalang Creek below railway bridge 13 July 2022.



SW6- Railway culvert Toongi siding 13 July 2022



SW7 – Wambangalang Creek Obley Road (upstream of Dubbo Project)



SW9- Dam in Hammonds (Watercourse A) upstream of processing plant 13 July 2022



SW19 -Grandale driveway (Little River Catchment) 13 July 2022.



Little River in flood under newly constructed bridge on Terrabella Road. Photo taken 4 July 2022,



Wambangalang Creek from Tonngi Hall reserve – 9 October 2022.



Karingle driveway after Cockabroo Creek floodwaters passed through 8-9 October 2022.

Work Order	CERT	IFICATE OF ANALYSIS		
	: FS2224876	Page	1 of 6	
Client	Alistral Ian Strategic Material S			
Contact	MR MIKE SLITHER! AND		Environmental Division Syaney	
Address	PO Box 910	Address	277-289 Woodpark Road Smithfield NSW Australia 216-	34
	DUBBO NSW 2830			
Telephone		Telephone	+61-2-8784 8555	
Project	DUBBO PROJECT	Date Samples Received	: 14-Jul-2022 13:00	
Order number	1	Date Analysis Commenced	14-Jul-2022	<
C-O-C number	I.	Issue Date	22-Jul-2022 09:58	
Sampler	MDS & CM		新たまで	NAIA
Site				>
Quote number	SY/363/16		and Charles	>
No. of samples received	0		According for	Accreditation No. 825
No. of samples analysed	6			VEC 17025 - Testing
Quality Review and Sam	perunent to this report will be round in the round ple Receipt Notification.	liowing separate attachments: Quality (control Report, QAQC Compliance Assessment to	assist with
Signatories This document has been	electronically signed by the authorized signatories below. E	:lectronic signing is carried out in compliance	with procedures specified in 21 CFR Part 11.	
Signatories	Position	Accreditation Categ	ory	
Ankit Joshi Wisam Marassa	Senior Chemist - Inorganics Inorganics Coordinator	Sydney Inorganic Sydney Inorganic	s, Smithfield, NSW s, Smithfield, NSW	
	RIGHT SOI	TAAT THAT A LANT PART	NFD	

Page	: 2 of 6
Work Order	ES22248/6
Client	AUSTRALIAN STRATEGIC MATERIALS
Project	DUBBO PROJECT



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Key:

- LOR = Limit of reporting
 - * = This result is computed from individual analyte detections at or above the level of reporting
 - Ø = ALS is not NATA accredited for these tests.
 - Indicates an estimated value.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

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a 3 of 6	Order ES2224876	AUSTRALIAN
Page	Work Order	Client

AUSTRALIAN STRATEGIC MATERIALS DUBBO PROJECT

Analytical Results

Project



And the first	Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SW-1	SW-2	SW-3	SW-4	SW-5
			Sampli	ng date / time	13-Jul-2022 08:00	13-Jul-2022 08:15	13-Jul-2022 09:30	13-Jul-2022 07:40	13-Jul-2022 09:00
Current control mean	Compound	CAS Number	LOR	Unit	ES2224876-001	ES2224876-002	ES224876-003	ES224876-004	ES2224876-005
PLOUGE and Ly Carlingener I <td></td> <td></td> <td></td> <td></td> <td>Result</td> <td>Result</td> <td>Result</td> <td>Result</td> <td>Result</td>					Result	Result	Result	Result	Result
Human Cold Perform Cold Perform Cold Perform Cold Perform Cold Perform Cold Perform Cold Co	EA005P: pH by PC Titrator		~						
Endediction by SFC 1 i	pH Value	ľ	0.01	pH Unit	69.9	7.87	8.11	8.14	8.13
Exertation (accordent) (a) (b)	EA010P: Conductivity by PC Titrator				A NOT STREET				
Constrational distant rate ::	Electrical Conductivity @ 25°C	I	-	hS/cm	78	463	728	1000	879
Cload bisolate gent C 1 mpl 13 14 64 </td <td>EA015: Total Dissolved Solids dried at 180</td> <td>1±5°C</td> <td></td> <td></td> <td>Strategy State</td> <td></td> <td></td> <td></td> <td></td>	EA015: Total Dissolved Solids dried at 180	1±5°C			Strategy State				
E-0.55. Total Suspended Solide offed H1 (A ± 7.2 A E-0.55. Total Suspended Solide offed H1 (A ± 7.2 a a E-0.55. Total Suspended Solide offed H1 (A ± 7.2 a a a E-0.55. Total Suspended Solide offed H1 (A ± 7.2 a a a a E-0.55. Total Suspended Solide offed H1 (A ± 7.2 a a a a a C-0.55. Total Suspende Solide offed H1 (A ± 7.2) b	Total Dissolved Solids @180°C	1	10	mg/L	125	294	414	601	564
Spended solids (s5) 5 m(1 6 9 9 13 13 14 C0035 (5100 Mb)Crations 740-70 1 m(1 1 240 1 m(1 1 240 1 14 240 Reference 740-70 1 m(1 1 240 1 14 2400 2400	EA025: Total Suspended Solids dried at 10	04 ± 2°C	1.	A COLUMN ST					
Elogate Origonet Molor Cattons 740-70 i mg/l i	Suspended Solids (SS)	1	5	mg/L	9	6	œ	13	4
Gene Calcion Zabe.lev 1 mpl. 1 mpl. 1 mpl. 2 2 2 2 2 Representant Zabe.lev 1 mpl. 1 mpl. 1 mpl. 2 3 2 3 2 3 2 3	ED093F: Dissolved Major Cations				THE REPORT OF	But it is a			
Megnesium 730545 1 mg/l 1 mg/l 1 mg/l 2 2 Persistim 740.32 1 mg/l 3	Calcium	7440-70-2	-	mg/L		28	28	38	28
Solum 740-254 1 m(l) 13 37 16 10	Magnesium	7439-95-4	-	mg/L	÷	13	36	33	27
Pertasium 740-05* 1 m0L 3 10 4 3 3 Pertasium 740-05* 1 m0L 2.35 0.01 m0L 2.35 0.05 1.36 1.36 1.36 America 745-05 0.01 mgL 2.35 0.01 mgL 2.36 0.66 0.69 1.36 0.60 1.36 America 743-05 0.01 mgL 2.001 mgL 2.001 0.601	Sodium	7440-23-5	t	mg/L	13	37	56	110	100
Color Total Metab Sy ICP-MS Addition 2.24 0.01 mg/L 2.34 0.05 0.15 1.15 Ateninium 7.29-05 0.01 mg/L <0.001	Potassium	7440-09-7	-	mg/L	m	10	4	3	e
Muminum $I_{2290.6}$ 0.01 mpl $Z_{2390.6}$ 0.01 mpl $Z_{230.6}$ 0.01 mpl $Z_{200.6}$ <t< td=""><td>EG020T: Total Metals by ICP-MS</td><td></td><td></td><td></td><td>BAR LANNING LINE</td><td></td><td></td><td></td><td></td></t<>	EG020T: Total Metals by ICP-MS				BAR LANNING LINE				
Areaic 740.362 0.01 mg/L 6.001 0.001 6.001	Aluminium	7429-90-5	0.01	mg/L	2.36	0.56	0.89	1.38	1.55
Gathium 740.450 0.001 mg/L	Arsenic	7440-38-2	0.001	шg/L	<0.001	<0.001	<0.001	<0.001	0.001
Chornium $740-47.3$ 0.01 mg/L 0.002 0.001 0.002 0.001 0.002 0.001	Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.001	<0.0001
Copper 7440-50 0.01 mg/L 6.001 <	Chromium	7440-47-3	0.001	mg/L	0.002	<0.001	<0.001	0.002	<0.001
Nickel 740-02.0 0.01 mg/L 0.004 0.004 0.001	Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead $732 - 92 \cdot 1$ 0.01 mg/L < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 $< $	Nickel	7440-02-0	0.001	mg/L	0.004	0.004	0.004	0.001	0.001
Seletion 772,492 0.01 mg/L < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 < 0.00 $< $	Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Jinc 140-66 0.05 mg/l 0.09 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 <td>Selenium</td> <td>7782-49-2</td> <td>0.01</td> <td>mg/L</td> <td><0.01</td> <td><0.01</td> <td><0.01</td> <td><0.01</td> <td><0.01</td>	Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Margarese 733-96-5 0.01 mg/l 0.014 0.290 0.042 0.102 0.002 0.003 Thorium 740-52-1 0.01 mg/l <0.01	Zinc	7440-66-6	0.005	mg/L	600.0	<0.005	<0.005	<0.005	<0.005
Thorium 740-29-1 0.001 mg/L < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001 < 0.001	Manganese	7439-96-5	0.001	mg/L	0.014	0.290	0.042	0.102	0.080
Uranium $744-51-1$ 0.01 mg/L < 0.001 < 0.003 0.004 0.004 Boron $740-42-8$ 0.05 mg/L < 0.003 0.003 0.004 0.004 Boron $740-42-8$ 0.05 mg/L < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 <	Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron 7440 42.6 0.05 mg/L <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <0.05 <	Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.003	0.004	0.004
Icon 7439-89-6 0.05 mg/L 1.50 1.02 0.78 1.26 1.68 1.68 EG35T: Total Recoverable Mercury by FIMS A	Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG0351: Total Recoverable Mercury by FIMS Mercury 7439-97-6 0.0001 mg/L <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.001 <0.0001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <td>Iron</td> <td>7439-89-6</td> <td>0.05</td> <td>mg/L</td> <td>1.50</td> <td>1.02</td> <td>0.78</td> <td>1.26</td> <td>1.68</td>	Iron	7439-89-6	0.05	mg/L	1.50	1.02	0.78	1.26	1.68
Mercury 7439-97-6 0.0001 mg/L <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.01 0.01 0.01 0.01 0.01 0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <th<< td=""><td>EG035T: Total Recoverable Mercury by FIN</td><td>MS</td><td></td><td></td><td>A PAPARA NO</td><td>A RULEAU AVENUE</td><td></td><td></td><td></td></th<<>	EG035T: Total Recoverable Mercury by FIN	MS			A PAPARA NO	A RULEAU AVENUE			
EK055G: Ammonia as N by Discrete Analyser Ammonia as N 7564-41-7 D.01 mg/L <0.03 0.02 <0.01 0.01 Ammonia as N 75657G: Nitrite as N by Discrete Analyser 7664-41-7 D.01 mg/L <0.03	Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Ammonia as N 7664.41-7 D.01 mg/L <0.03 0.02 <0.01 0.01 EK057G: Nitrite as N by Discrete Analyser 1778-65-0 0.01 mg/L <0.01	EK055G: Ammonia as N by Discrete Analys	ser							
EK067G: Nitrite as N by Discrete Analyser Nitrite as N by Discrete Analyser 0.01 mg/L <0.01	Ammonia as N	7664-41-7	D.01	mg/L	<0.01	0.03	0.02	<0.01	0.01
Nitrite as N 14797-65-0 0.01 mg/L <0.01 <0.01 <0.01 <0.01 <0.01 <0.01	EK057G: Nitrite as N by Discrete Analyser								
	Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

4 of 6 ES2224876 AUSTRALIAN STRATEGIC MATERIALS DUBBO PROJECT Page Work Order Client Project



Analytical Results

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Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SW-1	SW-2	SW-3	5W4	SW-5
	S	ampling (date / time	13-Jul-2022 08:00	13-Jul-2022 08:15	13-Jul-2022 09:30	13-Jul-2022 07:40	13-Jul-2022 09:00
Compound CAS Num	nber L(DR	Unit	ES2224876-001	ES224876-002	ES2224876-003	ES224876-004	ES224876-005
				Result	Result	Result	Result	Result
EK058G: Nitrate as N by Discrete Analyser - Continue	led							
Nitrate as N 14797-5	55-8 0.	01	mg/L	<0.01	<0.01	0.03	0.07	0.14
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete	e Analyse		TANK I					
Nitrite + Nitrate as N	9	01	mg/L	<0.01	<0.01	0.03	0.07	0.14
EK061G: Total Kjeldahl Nitrogen By Discrete Analys	ser	1000						
Total Kjeldahl Nitrogen as N	-	1	mg/L	0.5	1.0	1.0	0.5	0.7
EK062G: Total Nitrogen as N (TKN + NOx) by Discre	te Analys	er						
A Total Nitrogen as N	•	E.	mg/L	0.5	1.0	1.0	0.6	0.8
EK067G: Total Phosphorus as P by Discrete Analyse	er							
Total Phosphorus as P	ю 	01	mg/L	0.04	0.04	0.08	0.07	0.08
EP025: Oxygen - Dissolved (DO)								
Dissolved Oxygen	• 		mg/L	9.6	8.0	9.9	9.4	9.8

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Page Work Order

5 of 6 ES2224876 AUSTRALIAN STRATEGIC MATERIALS DUBBO PROJECT

Analytical Results

Project Client

Antiology of the field of the fie	ub-Matrix: WATER Vatrix: WATER)			Sample ID	SW-6	SW-7	6-MS	SW-19	ł
			Samplin	g date / time	13-Jul-2022 09:50	13-Jul-2022 08:50	13-Jul-2022 07:50	13-Jul-2022 08:30	1
Abbit Total Total <th< td=""><td>punoduo;</td><td>CAS Number</td><td>LOR</td><td>Unit</td><td>ES2224876-006</td><td>ES224876-007</td><td>ES224876-008</td><td>ES224876-009</td><td></td></th<>	punoduo;	CAS Number	LOR	Unit	ES2224876-006	ES224876-007	ES224876-008	ES224876-009	
M Value M Value <t< td=""><td></td><td></td><td></td><td></td><td>Result</td><td>Result</td><td>Result</td><td>Result</td><td>1</td></t<>					Result	Result	Result	Result	1
Interface 0 plut 7.2 1.4 7.3 1.4 1.	A005P: pH by PC Titrator								
Additional contractive by the finance	pH Value	I	0.01	pH Unit	7.62	8.10	7.70	7.47	I
Electrical conductivity @ 35 C 1 jcm 18 770 16 16 17 16 Catal Resource (16.6 ° C 10 mgL 22 47 14 16 16 16 16 Catal Resource (16.6 ° C 10 mgL 22 47 14 16	A010P: Conductivity by PC Titrator			S. Harrison and	- All Landard				
And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Solute ented tot a 5 c And S. Total Dissolved Dissolved Dissolved Ented tot a 5 c And S. Total Dissolved Di	Electrical Conductivity @ 25°C	1	F	µS/cm	188	170	116	187	1
eq:eq:eq:eq:eq:eq:eq:eq:eq:eq:eq:eq:eq:e	A015: Total Dissolved Solids dried at 180)±5°C							
And Stands drind at 104 ± 2.C And Stands drind at 104 ± 2.C Selection Stands drind stands (SS) Colspan="2">Colspan="2">Colspan="2">Colspan="2" Colspan="2">Colspan="2">Colspan="2" Colspan="2">Colspan="2" Colspan="2">Colspan="2" Colspan="2"	Total Dissolved Solids @180°C	1	10	mg/L	292	474	144	185	1
Supended Solids (53) I mgl 37 (4 1 (4 6 Calcium 740-702 1 mgl 5 7 4 9 7 4 9 7 4 9 7 4 9 7 4 9 7 4 9 7 4 9 7 4 9 7 1	A025: Total Suspended Solids dried at 10	04 ± 2°C							
OBSE Disconted Möjor Cattona V40-70 I mg/l S I mg/l S Regretim 740-70 1 mg/l 5 2 3 4	Suspended Solids (SS)	1	ŝ	mg/L	37	14	18	œ	
Galetime 740-70.2 1 mple 7 7 4 4 4 4 4 Ragmeterime 740-70.2 1 mple 5 7 2 4 5 Solution 740-25.5 1 mple 5 7 2 4 5 Solution 740-25.5 0.01 mple 58 15 7 2 5 5 Perssin 740-25.5 0.01 mple 58 16 7 2 5	D093F: Dissolved Major Cations	A CONTRACTOR	SALAN SALAN			A STATE OF THE STA			
Magnetium 743-954 1 mg/l 6 2 3 4 4 4 Magnetium 740-354 1 mg/l 5 3 7 5 5 5 5 Potastium 740-354 1 mg/l 5 3 5 7 5	Calcium	7440-70-2	1	mg/L	5	21	7	4	1
Solution 740.236 1 0pl 9 1 2 2 2 Post Solution 740.245 1 mgl 1	Magnesium	7439-95-4	-	mg/L	IJ	22		4	1
Consisting 740-067 1 mpl 15 3	Sodium	7440-23-5		mg/L	æ	9	7	26	I
Coord Total National Natin Natina Natin National National National National National Nat	Potassium	7440-09-7	-	mg/L	15	3	ø	2	I
Multilitititititititititititititititititi	G020T: Total Metals by ICP-MS		Cida le		Not Shine 24 and	NEW AND	and a start of the		
Calculation 740-36.2 0.01 mg/L 0.002 0.001	Aluminium	7429-90-5	0.01	mg/L	5.92	1.68	1.54	0.79	I
Calentine740.4360.001mg/L <t< td=""><td>Arsenic</td><td>7440-38-2</td><td>0.001</td><td>mg/L</td><td>0.002</td><td>0.001</td><td><0.001</td><td><0.001</td><td>ł</td></t<>	Arsenic	7440-38-2	0.001	mg/L	0.002	0.001	<0.001	<0.001	ł
Thronium 740-47.3 0.01 mg/L 0.007 0.001 mg/L 0.007 0.001 mg/L Copper 740-620 0.01 mg/L 0.007 0.007 0.001 mg/L Copper 744-620 0.01 mg/L 0.007 0.007 0.003 0.001 0.001 Meted 732-492 0.01 mg/L 0.007 0.005 0.001 0.001 0.001 0.001 Belnium 7782-492 0.01 mg/L 0.011 0.011 0.010 0.011 <td>Cadmium</td> <td>7440-43-9</td> <td>0.0001</td> <td>mg/L</td> <td><0.0001</td> <td><0.0001</td> <td><0.0001</td> <td><0.0001</td> <td>1</td>	Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	1
Copper 740-50.6 0.01 mg/L 0.007 6.001 0.002 0.003 0.001 0.003 0.004 <	Chromium	7440-47-3	0.001	mg/L	0.007	0.001	0.002	0.001	I
Webbility 743-0.20 0.001 mg/L 0.002 0.002 0.005 0.004 0.004 0.004 ead 732-342 0.01 mg/L 0.002 0.001 <td< td=""><td>Copper</td><td>7440-50-8</td><td>0.001</td><td>mg/L</td><td>0.007</td><td><0.001</td><td>0.002</td><td><0.001</td><td>I</td></td<>	Copper	7440-50-8	0.001	mg/L	0.007	<0.001	0.002	<0.001	I
edd 733-92.1 0.01 mg/L 0.002 0.01	Nickel	7440-02-0	0.001	mg/L	0.012	0.002	0.005	0.004	I
Belalum 772_49_2 0.01 mg/L 0.01	Lead	7439-92-1	0.001	mg/L	0.002	<0.001	<0.001	<0.001	1
Inc 740-66.6 0.005 mg/L 0.015 0.015 0.015 0.015 0.016 <th< td=""><td>Selenium</td><td>7782-49-2</td><td>0.01</td><td>mg/L</td><td><0.01</td><td><0.01</td><td><0.01</td><td><0.01</td><td>ļ</td></th<>	Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	ļ
Manganese 7339.96.5 0.01 mg/L 0.068 0.071 0.046 0.156 0.166 0.156 0.166 0.156 0.166 0.156 0.166	Zinc	7440-66-6	0.005	mg/L	0.015	<0.005	<0.005	0.006	I
Thorium 740-29-1 0.001 mg/L <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001<	Manganese	7439-96-5	0.001	mg/L	0.068	0.071	0.046	0.136	I
Uranium 740-61-1 0.001 mg/L <0.001 0.003 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.003 <0.001 <0.001 <0.001 <0.001 <0.003 <0.001 <0.003 <0.001 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 <0.003 </td <td>Thorium</td> <td>7440-29-1</td> <td>0.001</td> <td>mg/L</td> <td><0.001</td> <td><0.001</td> <td><0.001</td> <td><0.001</td> <td>I</td>	Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	I
Boron 740-42-6 0.05 mg/L <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <-0.05 <td>Uranium</td> <td>7440-61-1</td> <td>0.001</td> <td>тg/L</td> <td><0.001</td> <td>0.003</td> <td><0.001</td> <td><0.001</td> <td>1</td>	Uranium	7440-61-1	0.001	тg/L	<0.001	0.003	<0.001	<0.001	1
Icon 743-89-6 0.05 mg/L 4.50 1.92 1.02 1.04 605T: Total Recoverable Mercury by FIMS <	Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	1
30351: Total Recoverable Mercury by FIMS 30351: Total Recoverable Mercury by FIMS Mercury 7439-97-6 0.0001 mg/L <0.0001	ron	7439-89-6	0.05	mg/L	4.50	1.92	1.02	1.04	1
Mercury 743-97-6 0.0001 mg/L <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.0001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01	G035T: Total Recoverable Mercury by FI	MS			States and and	And A LEAST			
K055G: Ammonia as N by Discrete Analyser Ammonia as N 7664-41-7 0.01 Minoria as N COSTG: Nitrite as N by Discrete Analyser K057G: Nitrite as N by Discrete Analyser Nitrite as N Anno. An	Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	1
Ammonia as N 7664-41-7 0.01 mg/L <0.02 0.02 0.09 K057G: Nitrite as N by Discrete Analyser 14797-65-0 0.01 mg/L <0.01	K055G: Ammonia as N by Discrete Analys	ser		and the second	Contraction of the second s				
K057G: Nitrite as N by Discrete Analyser Nitrite as N and Discrete Analyser 4797-65-0 0.01 mg/L <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01	Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.02	0.02	0.09	
Nitrite as N 14797-65-0 0.01 mg/L <0.01 <0.01 <0.01 <0.01	K057G: Nitrite as N by Discrete Analyser								
	Nitrite as N	14797-65-0	D.01	mg/L	<0.01	<0.01	<0.01	<0.01	1





Page 6 of 6 Work Order ES2224876 Client AUSTRALIAN STRATEGIC MATERIALS Project DUBBO PROJECT

Analytical Results

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Sub-Matrix: WATER (Matrix: WATER)		Sample ID	SW-6	2-MS	8-WS	SW-19	I
	Sampli	ng date / time	13-Jul-2022 09:50	13-Jul-2022 08:50	13-Jul-2022 07:50	13-Jul-2022 08:30	I
Compound CAS Number	LOR	Unit	ES2224876-006	ES2224876-007	ES224876-008	ES224876-009	
			Result	Result	Result	Result	I.
EK058G: Nitrate as N by Discrete Analyser - Continued							
Nitrate as N 14797-55-8	0.01	mg/L	<0.01	0.18	<0.01	0.07	1
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ana	ilyser						
Nitrite + Nitrate as N	0.01	mg/L	<0.01	0.18	<0.01	0.07	1
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Total Kjeldahl Nitrogen as N	0.1	mg/L	1.9	0.7	1.8	1.2	I
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete A	nalyser						
Total Nitrogen as N	0.1	mg/L	1.9	6.0	1.8	1.3	I
EK067G: Total Phosphorus as P by Discrete Analyser							
Total Phosphorus as P	0.01	mg/L	0.27	0.08	0.15	0.04	Ŀ
EP025: Oxygen - Dissolved (DO)							
Dissolved Oxygen	0.1	mg/L	7.4	10.1	9.4	9.0	I

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2022-2023 Annual Review

APPENDIX C

Section 58(5) Protection of the Environment Operations Act 1997

Licence Variation

Licence - 20702



AUSTRALIAN STRATEGIC MATERIALS (HOLDINGS) LTD ABN 51 091 489 511 ACN 091 489 511 PO BOX 768 WEST PERTH WA 6872

Attention: Mike Sutherland

Notice Number	1621594

File Number EF13/8531

Date 15-Aug-2022

NOTICE OF VARIATION OF LICENCE NO. 20702

BACKGROUND

- A. AUSTRALIAN STRATEGIC MATERIALS (HOLDINGS) LTD ("the licensee") is the holder of Environment Protection Licence No. 20702 ("the licence") issued under the *Protection of the Environment Operations Act 1997* ("the Act"). The licence authorises the carrying out of activities at TOONGI ROAD, DUBBO, NSW, 2830 ("the premises").
- B. On the Environment Protection Authority (EPA) instigated a licence variation.
- C. On 9 August 2022 the EPA sent the licensee a draft copy of the licence variation. The licensee responded to the EPA on the same day regarding the proposed variation.

VARIATION OF LICENCE NO. 20702

- 1. By this notice the EPA varies licence No. 20702. The attached licence document contains all variations that are made to the licence by this notice.
- 2. The following variations have been made to the licence:
 - Fee Based Activity Scale for Extractive Activities was 100,000-500,000 tonne annually extracted or processed.

has been replaced with:

 Fee Based Activity Scale for Extractive Activities was 30,000-50,000 tonne annually extracted or processed. Section 58(5) Protection of the Environment Operations Act 1997

Licence Variation





Damien Robert Rindfleish Unit Head <u>Environment Protection Authority</u> (by Delegation)

INFORMATION ABOUT THIS NOTICE

- This notice is issued under section 58(5) of the Act.
- Details provided in this notice, along with an updated version of the licence, will be available on the EPA's Public Register (<u>http://www.epa.nsw.gov.au/prpoeo/index.htm</u>) in accordance with section 308 of the Act.

Appeals against this decision

• You can appeal to the Land and Environment Court against this decision. The deadline for lodging the appeal is 21 days after you were given notice of this decision.

When this notice begins to operate

- The variations to the licence specified in this notice begin to operate immediately from the date of this notice, unless another date is specified in this notice.
- If an appeal is made against this decision to vary the licence and the Land and Environment Court directs that the decision is stayed the decision does not operate until the stay ceases to have effect or the Land and Environment Court confirms the decision or the appeal is withdrawn (whichever occurs first).



Department of Planning and Environment

Mr Michael Sutherland General Manager NSW AUSTRALIAN STRATEGIC MATERIALS LIMITED Level 2, 88-90 Macquarie Street Dubbo NSW 2830

26/09/2022

Dubbo Project (formerly known as the Dubbo Zirconia Mine) Annual Review 21-22 (SSD-5251)

Dear Mr Sutherland

Reference is made to the Annual Review for the period 1 July 2021 to 30 June 2022, submitted to the Department of Planning and Environment (the department) on 24 August 2022 as required under Condition 4 of Schedule 5 of SSD-5251 (the consent).

The department has reviewed the Annual Review and considers it to generally satisfy the reporting requirements of the consent and the department's *Annual Review Guideline* (October 2015). Please make publicly available a copy of the 21/22 Annual Review on the company website.

Please note that the department's acceptance of this Annual Review is not an endorsement of the compliance status of the project.

Should you wish to discuss the matter further, please contact Michael Wood, on 0459890661 or compliance@planning.nsw.gov.au

Yours sincerely

Lol. 14

Katrina O'Reilly Team Leader - Compliance Compliance As nominee of the Planning Secretary

Mike Sutherland

From:	Post Approval <postapproval@dcceew.gov.au></postapproval@dcceew.gov.au>
Sent:	Friday, 9 December 2022 3:15 PM
То:	Post Approval
Subject:	Offsets register release [SEC=OFFICIAL]

CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Good afternoon

The first stage of the new Offsets register has been released today. This is a register of projects with offset conditions. Approval of this register has been in place since the commencement of the *EPBC Act Environmental Offsets* Policy 2012.

Offset conditions can be viewed by selecting the EPBC number in the Offsets Register tab on the EPBC Act Public Portal. The register will display:

- EPBC Number
- Project title
- Project Approval date
- Project Approval Expiry Date; and the
- Approval Holder information of approved projects with offset conditions.

When a project is selected three tabs relating to the offset will appear:

- 1. Summary, this tab will show the public display for a specific project, but the Offset Name will say Under review.
- 2. Sites will say Under review.
- 3. Conditions, this tab will display the full condition(s) text as it appears on the condition notice. Some offset records have multiple conditions.

Each EPBC project may be linked to none or multiple sites. Similarly, each site may have none or multiple conditions.

Sensitive information

Details for offset names and sites may include sensitive information, such as, indigenous and cultural heritage sites, specific locations of sensitive protected matters, and personal information. If the Department deems the information as non-sensitive, then the information will be released in stages between February to June 2023. If the Department deems the information as sensitive, in accordance with the *Sensitive Ecological Data- Access Management Policy 2016* then it will not be published.

At the commencement of the EPBC Act, there were no standard terms to record offset conditions. As such, the terms have evolved over time. When viewing the offsets register it is important to remember that offset conditions include both:

- Direct: where a physical site is provided as an offset
- Indirect: such as research programs, financial contributions

More information about EPBC Act offsets is available at Environmental offsets guidance.

If you have any questions or would like more information, please contact PostApproval@dcceew.gov.au.

Kind regards Nola

Frequently Asked Questions

Q: Why can't I see the offset name or site/what does "Under review" mean?

A: While all projects with approved offset conditions are published on the Offsets Register, offset names and sites are not included in this first release. Each approval with offset conditions is being manually reviewed to check for sensitivities (as listed below). Offset names and sites will be released in stages between February and June 2023. The only instances where that information won't be published is if the offset condition contains:

- sensitive indigenous and cultural heritage sites
- specific locations of sensitive protected matters; and
- personal information

Q: Why is the Department displaying approval holders' offset conditions?

A: information on offset conditions for projects is readily available and published for every EPBC Act approval through the Department's public notices webpage. The offsets register is a tool that makes offsets data more easily accessible in a centralised location.

Q: When can I see more offsets information?

A: Offsets data will be released in three stages between December 2022 and June 2023 pending the review of sensitive information.

Stage 1: Publish a list of all EPBC Act approvals conditioned to provide an offset

Stage 2: Publish offset site information and offset management documents

Stage 3: Publish an interactive dashboard and spatial display for all EPBC Offsets

Q: Where can I access the Offsets register/approval conditions?

A: The Offsets register can be found on the EPBC Act Public Portal on the "Offsets register" tab. From there you can see:

- EPBC Number
- Project title
- Project Approval date
- Project Approval Expiry Date; and the
- Approval Holder

After selecting a project, you'll be able to see three tabs relating to the offset:

- 1. Summary, this tab will show the public display for a specific project, but the Offset Name will say Under review.
- 2. Sites will say Under review (until review is completed).
- 3. Conditions, this tab will display the full condition(s) text as it appears on the condition notice. Some offset records have multiple conditions.

Each EPBC project may be linked to none or multiple sites. Similarly, each site may have none or multiple conditions. The Offset Name and Sites will not be available on the portal until later stage releases between February to June 2023.

Q: What is an offset?

A: The term 'environmental offsets' refers to measures that compensate for the residual adverse impacts of an action on the environment. Offsets provide environmental benefits to counterbalance the impacts that remain after avoidance and mitigation measures. These remaining, unavoidable impacts are termed 'residual impacts'. For assessments under the EPBC Act, offsets are only required if residual impacts are significant. Offsets can help to achieve long-term environmental outcomes for matters protected under the EPBC Act.

Terminology to describe offsets can vary, for example a condition may refer to "compensate for impacts" rather than "to offset impacts". Offsets can be either:

- Direct: where a physical site is provided as an offset
- Indirect: such as research programs, financial contributions

Nola Sloan

A/g Director Post Approvals | Environment Assessments (VIC TAS) and Post Approvals Branch

Department of Climate Change, Energy, the Environment and Water Ngunnawal Country, John Gorton Building, King Edward Terrace, Parkes ACT 2600 Australia DCCEEW.gov.au | ABN 63 573 932 849

Notice of Decision – Dubbo Project Modification 1 (SSD-5251- Mod-1)

Section 2.22 and clause 20 of Schedule 1 of the Environmental Planning and Assessment Act 1979

Application type	State significant development modification application	
Application number	SSD 5251-Mod-1	
and project name	Dubbo Project (formerly known as the Dubbo Zirconia Mine) Mod-1	
Applicant	Australian Strategic Materials (Holdings) Ltd	
Consent Authority	Minister for Planning	

Decision

The Director, Resource Assessments under delegation from the Minister for Planning has, under 4.55(2) of the *Environmental Planning and Assessment Act* 1979 (**the Act**) modified the consent subject to the recommended conditions.

A copy of the instrument of modification and the consolidated conditions of consent, as modified, are available here: <u>https://www.planningportal.nsw.gov.au/major-projects/projects/mod-1-project-layout-and-processing-changes</u>

A copy of the Department of Planning and Environment's assessment report is available here: https://www.planningportal.nsw.gov.au/major-projects/projects/mod-1-project-layout-and-processing-changes

Date of decision

2 March 2023

Reasons for decision

The following matters were taken into consideration in making this decision:

- the relevant matters listed in section 4.15 of the Act and the additional matters listed in the statutory context section of the Department's assessment report;
- the prescribed matters under the Environmental Planning and Assessment Regulation 2021.
- the objects of the Act;
- all information submitted to the Department during the assessment of the modification application;
- the findings and recommendations in the Department's assessment report;
- the views of the community about the project (see Attachment 1).

The findings and recommendations set out in the Department's assessment report were accepted and adopted as the reasons for making this. The decision maker was satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted was modified.

The key reasons for granting the modification are as follows:

- the modification would provide improved operational efficiencies and substantial benefits, including an
 optimised project site layout with improved processing efficiencies including increased water recovery for
 beneficial re-use onsite. The proposal would also result in an overall net reduction in biodiversity impacts.
- the modification is permissible with consent, and is consistent with NSW Government policies including the State Environmental Planning Policy (Planning Systems) 2021 and State Environmental Planning Policy (Resources and Energy) 2021;
- the impacts on the community and the environment can be appropriately minimised, managed or offset to an
 acceptable level, in accordance with applicable NSW Government policies and standards;
- the issues raised by the community during consultation and in submissions have been considered and adequately addressed through existing and recommended conditions of consent;
- engagement on the project is considered to be in line with the Undertaking Engagement Guidelines for State Significant Projects, including the community participation objectives outlined in these guidelines; and
- weighing all relevant considerations, the modification is in the public interest.

Attachment 1 – Consideration of Community Views

The department exhibited the modification from 30 March 2022 until 19 April 2022 and received a total of 5 submissions including 1 from a special interest group (comment) and 4 from members of the general public (1 in support, 1 objection and 2 comments).

The one public submission in objection raised concerns regarding amenity impacts in relation to the proposed extended construction hours and consequent noise impacts. The Department imposed strict noise limits and restricted out of hours operations to ensure there would be no significant increase in noise impacts.

The existing conditions of consent provide a robust framework for the management of environmental and social impacts, in accordance with best practice and a comprehensive suite of management plans. The Department has taken the opportunity to update these conditions to reflect its current standards. The modified conditions also require the preparation of an updated suite of management plans following approval Modification 1.