Mindijup Silica Sand Mine

Mine Closure Plan

TT Sand Pty Ltd T/A AustSand Mining

23 December 2021

→ **The Power of Commitment**

Mineral Field Number: M70/793

Revision 5

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Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	**Signature**	**Name**	**Signature**	**Date**
GHD Ref: 61/30701							
	0	P. Fortier	C. Gwynne		C. Gwynne		13/12/12
	1	P. Rokich	D. Todd	On file	D. Todd	On file	1/12/2015
	2	M. Toner	P. Rokich		P. Rokich		23/12/2015
	3	P. Rokich	D. Todd		D. Todd		24/3/2016
GHD Ref: 61/36478							
	4	V. Davies	M. Toner		J. Cramer		20/12/2018
GHD Ref: 12554621							
S4	5	V. Davies	P. Lombard		M. Toner	pp 	23/12/2021

Revision history

Document	Description	DMP Ref
MCP (2012)_Revision 0	Initial MCP prepared to DMP / EPA Guidelines for Preparing Mine Closure Plans (2011)	ID 38128
MCP (2015)_Revision 1	MCP update prepared to DMP / EPA Guidelines for Preparing Mine Closure Plans (2015)	
MCP (2015)_Revision 3	MCP update prepared to DMP / EPA Guidelines for Preparing Mine Closure Plans (2015) incorporating agreed changes with DMP regarding comments on Revision 1	ID 58266
MCP (2018)_Revision 4	MCP update prepared to DMP / EPA Guidelines for Preparing Mine Closure Plans (2015)	
MCP (2021)_Revision 5	MCP update prepared to DMIRS Statutory Guidelines for Mine Closure Plans (DMIRS, 2020) – Current revision	

Mine closure plan checklist

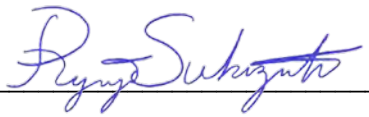
Q No	Mine Closure Plan (MCP) checklist	Y/N /NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
1	Has the Checklist been endorsed by a senior representative within the tenement holder/operating company? (See bottom of checklist.)	Y	vi		Y		*Updated*
Public Availability							
2	Are you aware that all MCPs will be made publicly available?	Y			-		
3	Is there any information in this MCP that should not be publicly available?	N			-		*MCP can be made publicly available*
4	If "Yes" to Q3, has confidential information been submitted in a separate document/section?						
Cover Page, Table of Contents							
5	Does the MCP cover page include: - Project title - Company name/ Contact details (including telephone numbers and email addresses) - Document ID and version number - Date of submission (needs to match the date of this checklist)	Y	Cover page		Y	Cover page	*Updated revision number and date of submission*
Scope and Purpose							
6	State why the MCP is submitted (e.g. as part of a Mining Proposal, a reviewed MCP or to fulfil other legal requirements)	Y	1		N		*Revised MCP*
Project Overview							
7	Does the project summary include: - Land ownership details (include any land management agency responsible for the land/ reserve and the purpose for which the land/ reserve [including surrounding land] is being managed) - Location of the project. - Comprehensive site plan(s). - Background information on the history and status of the project.	Y	6		N		
Legal Obligations and Commitments							
8	Does the MCP include a consolidated summary or register of closure obligations and commitments?	Y	14		N		
Stakeholder Engagement							
9	Have all stakeholders involved in closure been identified?	Y	15		N		
10	Does the MCP include a summary or register of historic stakeholder	Y	16		N		

Q No	Mine Closure Plan (MCP) checklist	Y/N /NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
	engagement with details on who has been consulted and the outcomes?						
11	Does the MCP include a stakeholder consultation strategy to be implemented in the future?	Y	15		N		
Post-mining land use(s) and Closure Objectives							
12	Does the MCP include agreed post-mining land use(s), closure outcomes and conceptual landform design diagram?	Y	31-32		N		
13	Does the MCP identify all potential (or pre-existing) environmental legacies, which may restrict the post mining land use (including contaminated sites)?	Y	17-30		Y	27	*Baseline gap analysis added*
14	Has any soil or groundwater contamination that occurred, or is suspected to have occurred, during the operation of the mine, been reported to DER as required under the Contaminated Sites Act 2003?	NA		No contaminated sites are known or suspected	N		
Development of Completion Criteria							
15	Does the MCP include an appropriate set of specific completion criteria and closure performance indicators?	Y	40-46		Y	42	*Eastern domain closure criteria updated*
16	Does the MCP include baseline data (including pre-mining studies and environmental data)?	Y	17-30		N		
17	Has materials characterisation been carried out consistent with applicable standards and guidelines (e.g. GARD Guide)?	Y	18-20		N		
18	Does the MCP identify applicable closure learnings from benchmarking against other comparable mine sites?	N					
19	Does the MCP identify all key issues impacting mine closure objectives and outcomes (including potential contamination impacts)?	Y	33-39		N		
20	Does the MCP include information relevant to mine closure for each domain or feature?	Y	43-46		Y	43-43	*Eastern domain closure criteria updated*
Identification and Management of Closure Issues							
21	Does the MCP include a gap analysis/risk assessment to determine if further information is required in relation to closure of each domain or feature?	Y	27-30		Y	27-30	*Baseline gap analysis added*
22	Does the MCP include the process, methodology, and has the rationale been provided to justify identification and management of the issues?	Y	33-39		N		

Q No	Mine Closure Plan (MCP) checklist	Y/N /NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
Closure Implementation							
23	Does the MCP include a summary of closure implementation strategies and activities for the proposed operations or for the whole site?	Y	47-54		Y	55-56	*Decommissioning sequence updated*
24	Does the MCP include a closure work program for each domain or feature?	Y	47-54		Y	55-56	*Decommissioning sequence updated*
25	Does the MCP contain site layout plans to clearly show each type of disturbance as defined in Schedule 1 of the MRF Regulations?	Y	10	Figure 6	Y	10	*Figure 6 updated*
26	Does the MCP contain a schedule of research and trial activities?	Y	27-30		Y	27-30	*Baseline gap analysis added*
27	Does the MCP contain a schedule of progressive rehabilitation activities?	Y	47		N		
28	Does the MCP include details of how unexpected closure and care and maintenance will be handled?	Y	53-54		N		
29	Does the MCP contain a schedule of decommissioning activities?	Y	47-54		Y	55-56	*Decommissioning sequence updated*
30	Does the MCP contain a schedule of closure performance monitoring and maintenance activities?	Y	57-59		N		
Closure Monitoring and Maintenance							
31	Does the MCP contain a framework, including methodology, quality control and remedial strategy for closure performance monitoring including post-closure monitoring and maintenance?	Y	57-59		N		
Financial Provisioning for Closure							
32	Does the MCP include costing methodology, assumptions and financial provision to resource closure implementation and monitoring?	Y	60		Y		*Closure cost estimate added to Appendix F*
33	Does the MCP include a process for regular review of the financial provision?	Y	60		Y		*Closure cost estimate added to Appendix F*
Management of Information and Data							
34	Does the MCP contain a description of management strategies including systems and processes for the retention of mine records?	Y	61-62		N		

Corporate Endorsement:

I hereby certify that to the best of my knowledge, the information within this mine closure plan and checklist is true and correct and addresses all the requirements of the Guidelines for the Preparation of a Mine Closure Plans approved by the Director General of the Department of Mines, Industry Regulation and Safety.

Name: Ryuji Sakizaki **Signed:** 

Position: Managing Director **Date:** 8 December 2021

(NB: The corporate endorsement must be given by tenement holder(s) or a senior representative authorised by the tenement holder(s), such as a Registered Manager of Company Director)

Acronyms

Term	Definition
AER	Annual environmental report
AustSands	TT Sands Pty Ltd trading as AustSand Mining
BOM	Bureau of Meteorology
CALM	Department of Conservation and Land Management (former)
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DEC	Department of Environment and Conservation (former)
DER	Department of Environment Regulation (former)
DWER	Department of Water and Environmental Regulation
DBH	Diameter at breast height
DPaW	Department of Parks and Wildlife (former)
DotE	Department of the Environment (former)
DotEE	Department of the Environment and Energy (former)
DMIRS	Department of Mines, Industry Regulation and Safety
DMP	Department of Mines and Petroleum (former)
DPLH	Department of Planning, Lands and Heritage
EAR	Environmental Assessment Report
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area
GHD	GHD Pty Ltd
ha	hectares
IBRA	Interim Biogeographic Regionalisation of Australia
ICPMS	Inductively Coupled Mass Spectrometer
kg	kilogram
km	kilometres
LOD	Limit of Detection
LOI	Loss on Ignition
LOM	Life of Mine
m	metres
mm	millimetres
MCP	Mine Closure Plan
MNES	Matters of National Environmental Significance
MRF	Mine Rehabilitation Fund
NOI	Notice of intent
PMLU	Post mining land use
PEC	Priority Ecological Communities
TDS	Total dissolved solids
TEC	Threatened Ecological Communities

Definitions

Term	Definition
Care and maintenance	Phase following temporary cessation of mining operations where infrastructure remains intact and the site continues to be managed. All mining operations suspended, site being maintained and monitored.
Closure	A whole-of-mine-life process, which typically culminates in tenement relinquishment. It includes decommissioning and rehabilitation.
Completion	The goal of mine closure. A completed mine has reached a state where mining lease ownership can be relinquished, and responsibility accepted by the next land user.
Consultation	A process that permits and promotes the two-way flow of ideas and information. Effective consultation is based on principles of openness, transparency, integrity and mutual respect.
Contaminated	Contaminated, in relation to land, water or a site, means having a substance present in or on that land, water or site at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value. This definition may apply to the artificial concentration (localised accumulation) of natural substances or minerals which have the potential to present a risk of harm to human health, the environment or any environmental value through this accumulation, such as mineral processing sites or tailings storage facilities.
Decommissioning	A process that begins near, or at, the cessation of mineral production and ends with removal of all unwanted infrastructure and services.
Disturbance Type	A feature created during mining or exploration activity as listed in Schedule 1 of the Mining Rehabilitation Fund Regulations 2013, e.g. waste dumps, transport or service infrastructure corridor (haul roads, access roads), ROM pad, plant site, tailings storage facility, borrow pits, land (other than land under rehabilitation or rehabilitated land) that has been disturbed by exploration operations (e.g. drill pads), waste dump or overburden stockpiles, Building (other than workshop) or camp site, etc.
Disturbed	Area where vegetation has been cleared and/or topsoil (surface cover) removed.
Domain	A group of landform(s) or infrastructure that has similar rehabilitation and closure requirements and objectives.
Earthworks	Reshaping, capping, water/wind erosion control, rock armouring.
Ecologically sustainable	Meeting the goal and principles of the National Strategy for Ecologically Sustainable Development, endorsed by all Australian jurisdictions in 1992, to ensure that development improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.
Environment	Living things, their physical, biological and social surroundings and interactions between all of these.
Environmental value	A beneficial use and/or an ecosystem health condition.
Key stakeholders	The term “key stakeholders” refers to post-mining land owners/managers and relevant regulators.
Legal Obligations Register	A register of legally binding conditions and commitments relevant to rehabilitation and closure at a given mine site.
Life of mine	Expected duration of mining and processing operations.
Pits	All open excavations including active mineral rock, gravel, sand, clay, bauxite and salt-pan extraction areas.
Post-mining land use	Describe a land use that occurs after the cessation of mining operations.
Project	The total integrated mining operations in which a number of sites contribute to the overall operation to supply ore, processing facilities and disposal of waste products.
Problematic materials	Materials that have the potential to detrimentally impact on humans and the environment and require careful and appropriate management (e.g. Potential Acid Forming materials, radioactive materials, asbestiform materials, dispersive materials, arsenic etc.).
Rehabilitation	The return of disturbed land to a safe, stable, non-polluting/ non-contaminating landform in an ecologically sustainable manner that is productive and/or self-sustaining consistent with the agreed post-mining land use.

Term	Definition
Relinquishment	A state when agreed completion criteria have been met, government "sign-off" achieved, all obligations under the *Mining Act 1978* removed, and the proponent has been released from all forms of security, and responsibility has been accepted by the next land user or manager.
Revegetation	Establishment of self-sustaining vegetation cover after earthworks have been completed, consistent with the post-mining land use.
Safe	A condition where the risk of adverse effects to people, livestock, other fauna and the environment in general has been reduced to a level acceptable to all stakeholders.
Stable	A condition where the rates of change of specified parameters meet agreed criteria.
Stakeholder	A person, group or organisation who have an interest in a particular decision, either as individuals or representative of a group, with the potential to influence or be affected by the process of, or outcome of, mine closure.
Tenement	Land tenure granted under the *Mining Act 1978* e.g., Mining Lease, Exploration Licence, Prospecting Licence, Miscellaneous Licence and General Purpose Lease.
Unacceptable liability	Closure should not lead to regulators, or the community, or landowners or land managers having to take on responsibility for ongoing management, maintenance or monitoring above that which applied before mining, or that which applied to managing land uses comparable to the agreed land uses.

Contents

Table index

Figure index

1. Introduction

1.1 Background

The Mindijup Silica Sand Mine (the mine) is a silica sand mine owned by TT Sands Pty Ltd trading as AustSand Mining (AustSand). The site is located at Mindijup, 40 km north-east of Albany, Western Australia (Figure 1). Silica sand is extracted from a sandy ridge that is above the water table (dry mining operation), processed on site and transported by truck to the Port of Albany for export. The estimated Life of Mine (LOM) is for approximately a further 11 years (to 2032).

A Notice of Intent (NOI) (Dames and Moore, 1993) was prepared in 1993 that detailed the scope of the initial application to commence mining on the property. Figure 2 shows the approved extraction area and pre-mining contours over the property. Figure 3 shows the proposed post mining finished floor levels and Figure 4 provides a cross section of the pre and post mining contours.

Following approval of the NOI, sand extraction commenced on the property in 1995, beginning in the south-west corner of the nominated extraction area and proceeding in a north and north-easterly direction.

1.2 Purpose of this report

The purpose of this report is to review and update the 2018 Mine Closure Plan (MCP) as per tenement condition 20 of Tenement M 70/793, and Department of Mines, Industry Regulation and Safety (DMIRS) (2020):

"*A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by an Environmental Officer, DMP. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMP's website - 2018".*

As per tenement condition 16, the Annual Environmental Report (AER) is to be submitted each year in December.

It is noted, at time of writing, that the 2018 MCP has not yet been assessed by DMIRS. However, as the MCP is due for updated on a three yearly basis, the update of the current MCP is due in December 2021.

The purpose of this MCP is to:

- Consolidate and document all previous work undertaken relevant to closure planning and rehabilitation
- Provide a framework of closure domains
- Indicate gaps in existing work where further studies, trials, research, assessment and monitoring is recommended or required
- Develop objectives, criteria and post-mining land use(s) and consider closure issues
- Identify risks that could influence successful closure and relinquishment
- Guide future closure planning works by identifying and prioritising tasks using a risk management approach
- Establish indicative closure costs for financial provisioning
- Provide a pathway to tenement relinquishment.

590,000 595,000 600,000 605,000

6,155,000

6,150,000

Armstrong Rd
Faulkner Rd
Mindijup Rd
Riggs Rd
Bennett Rd
Takenup Rd
Lake Warburton Rd
Cumming Rd
Corimup Rd
M 70/793
Carisma Rd
Penn Rd
Jorden Rd
Deep Creek Rd
James Rd
Palmdale Rd
Mount Pleasant Rd
Fish Track Rd
Unnamed Rd

1:50,000 (at A3)

0 250 500 1,000 1,500 2,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Roads

Tenement Boundary M70/793

Austsand Mining

Austsand Mining
TT Sands Pty Ltd 2013 AER

Job Number	61-29878
Revision	1
Date	05 Dec 2013

Location Map

Figure 1

G:\61\29878\GIS\Maps\Deliverables\6129878_G001_Rev1.mxd

Data Source: Landgate: Many Peaks Breaksea 2010 Mosaic - 20121214, MountBaker 2010 Mosaic - 20111214, Road - 20131205; GA: Geodata Topo 250K Series III - 2006; DMP: Tenement Boundary M70/793 - 20130110. Created by: ES

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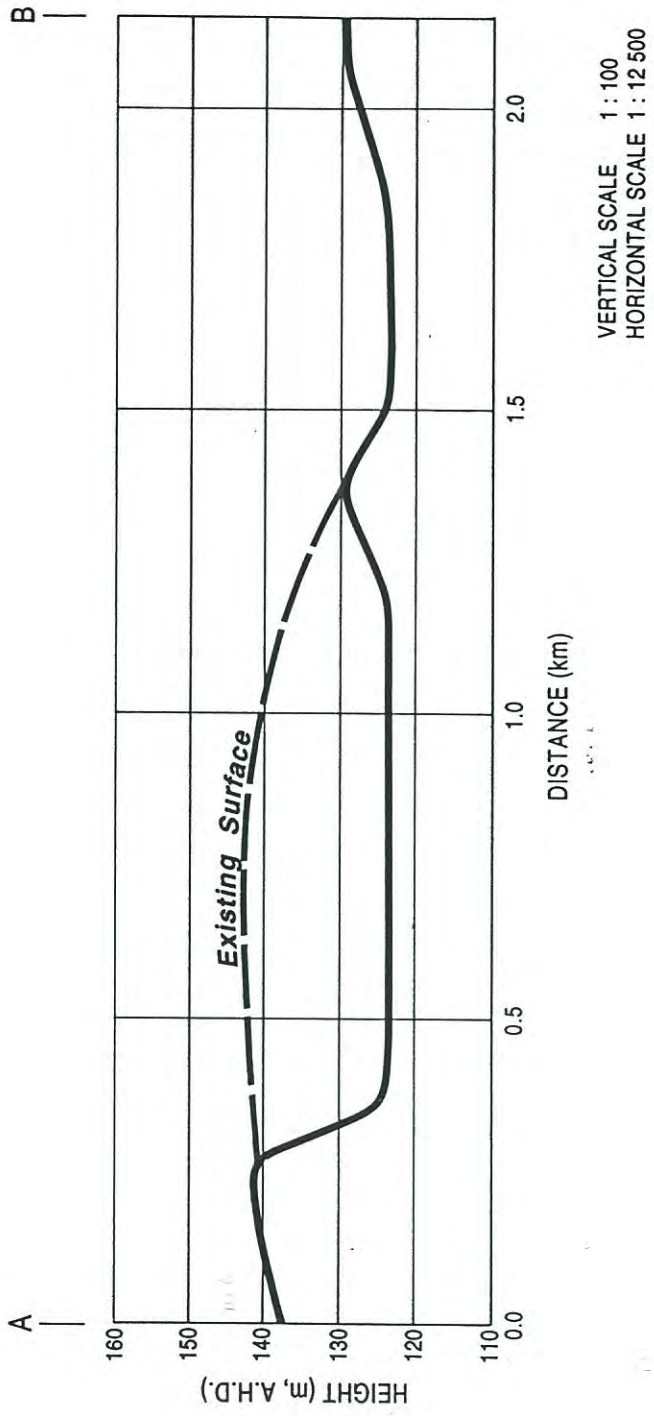
FIGURE 5
DAMES & MOORE

* See contour lines

JOB No. 27421-001-363	DATE
PREPARED BY ERB	01/10/93
APPROVED BY	17/11/93

PROPOSED MINE PLAN
(CONCEPTUAL ONLY)

FIGURE 3
DAMES & MOORE



JOB No. 27421-001-363		DATE
PREPARED BY	ERB	16/11/93
APPROVED BY	ERB	17/11/93

PRE AND POST SURFACE PROFILES

FIGURE 6
DAMES & MOORE

2. Project Summary

2.1 Site ownership details

The proponent for this Project is:

– TT Sand Pty Ltd – trading as AustSand Mining
Suite 5, 363-367 Albany Highway
Victoria Park WA 6100

The contact person for this Mine Closure Plan is:

– Scott Whitbread
Site Manager
570 Mindijup Road, Palmdale WA 6330
Phone: 08 9846 1222
Email: AustSandmining@bigpond.com

2.2 Land tenure

The mine is located on Lot 5 on Diagram 62329, (number 570) Mindijup Road, Palmdale, which is approximately 40 km north-east of Albany, Western Australia (Figure 1). The property is freehold land owned by AustSand and is 260.9789 hectares in area. The project is contained within a single mining tenement, M70/793.

2.3 Surrounding land use and receptors

Surrounding properties are privately owned land used for agricultural purposes such as cropping and grazing. The property is zoned ‘Priority Agriculture’ in the City of Albany Local Planning Scheme No.1 (the Scheme) (DPLH, 2021).

The location of the tenement is shown in Figure 5. The tenement is not located near any sensitive receptors.

590,000 595,000 600,000 605,000

6,155,000

6,150,000

Oyster Harbour Kalgan King

Kalgan River

Wongerup Creek

Waychinicup River

1:50,000 (at A3)

0 0.25 0.5 1 1.5 2 2.5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- 5m Contours
- 25m Contours
- Hydrology
- DoW Rivers
- Cadastre
- DoW Hydrographic Catchments
- Site Boundary

Note: Site Boundary equals 0.0875% of the total area of the Oyster Harbour Kalgan King hydrographic catchment.

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Austsand Mining
Mining Proposal

Job Number	61-29621
Revision	0
Date	10 Dec 2013

Site Contours and Hydrology

Figure 5

G:\61\29621\GIS\Maps\MXD\6129621_G003_Fig3_Rev0.mxd

Data Source: Landgate: Many Peaks Breaksea 2010 Mosaic - 20120705, Mt Barker 2010 Mosaic - 20120705, Cadastre - 20091205, Hydrology - 20120706, 5m Contours - 20120709, 25m Contours - 20120709; DoW: DoW - Rivers - 20120706, Hydrographic Catchments - 20120706; GA: Road Names - 2006; GHD: Site Boundary - 20121102. Created by: bflorczak

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2.4 Operations overview

Key process characteristics are provided in Table 1. Figure 6 shows the layout of the Mindijup silica sand mine. The sand mining operation is composed of the following stages.

Pre-strip operation

Native vegetation is required to be cleared in advance of the mining operation. Cleared vegetation and topsoil is stripped and stockpiled for reuse in the rehabilitation process. Topsoil is stripped to an average depth of 150 mm – 200 mm. Where possible, cleared vegetation and topsoil stripped from an area to be mined is directly returned to a completed area undergoing rehabilitation. This 'direct return' method maximises the benefit of seed and biological material present in these components.

Silica sand excavation

There is little, if any overburden. The silica sand resource begins immediately below the depth of topsoil. The sand is excavated to an average depth of six to eight m but can be as deep as 14 m in high dunes.

Sand is excavated using a front-end loader and deposited into a hopper for delivery to the processing plant via a conveyor belt. As the excavation area has expanded over time, the distance from the active mine face to the processing plant has increased. In 2015, Austsand has altered its mining method to include a load and haul system, using a 40 tonne off-highway articulated truck to transport sand to the hopper/ ROM pad.

The operation uses a progressive mining and backfilling process. This process minimises the area of open land. The mine void is progressively backfilled using process residue material, with application of topsoil and vegetation immediately preceding the main winter rehabilitation season.

Sand processing

The process plant first screens the sand to remove organic matter and stones. The sand is then put through a wet gravity process which separates iron, heavy minerals, oversize sand (>800 microns) and undersize sand (<50 microns) from the silica sand product. Approximately 60 % of sand initially extracted is exported as silica sand product.

The remaining 40 %, predominantly the oversize and undersize silica sand fractions are pumped to one of two residue dams where the sand settles out from the water. The water is decanted off the dam and returned to the process plant for reuse. Once the dam fills with resettled sand, process residues are directed to the second dam while the residue sand is excavated from the first dam and returned to a completed mine area as backfill. The two residue dams alternate through this process on a continuous basis.

Water is recycled through the process with additional makeup water required to account for losses in evaporation, conveyance and moisture contained in exported product. The process plant requires approximately 100 kL of water per day (Dames and Moore, 1993). Additional process water is sourced from a bore situated on an adjoining private property.

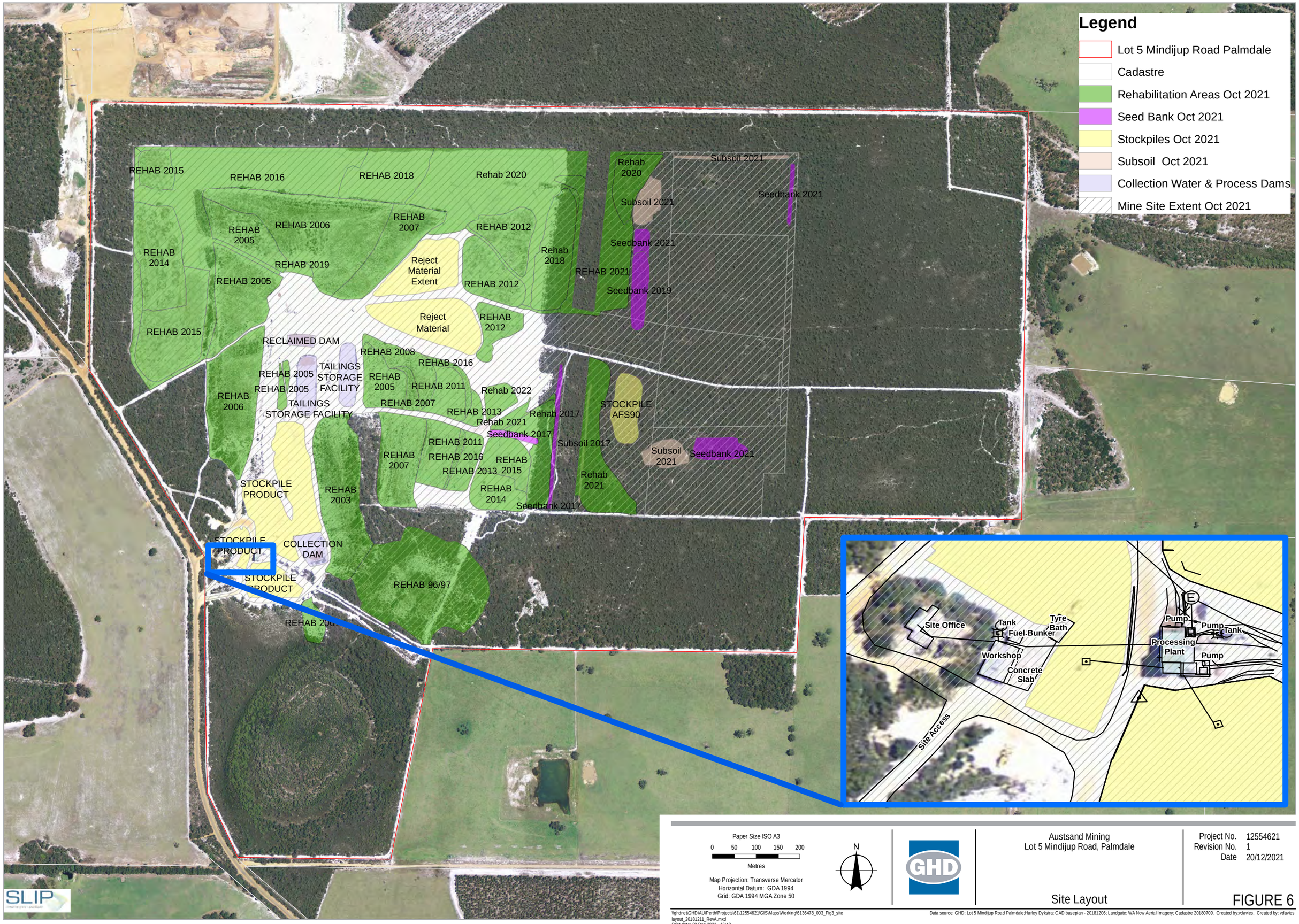
The washed sand product is stored in open product stockpiles for transport to Port of Albany by truck.

Rehabilitation

Completed mine areas are backfilled with available residue sand. Reshaped to blend into surrounding contours, topsoil and vegetation is respread and the ripped and seeded.

Table 1 Key project characteristics

Project component	Characteristics		
Mining production rate	Approximate average from 2004 to 2021 period of: 290,000 tpa (total sand) 170,000 tpa (silica sand product) 120,000 tpa (fine and coarse sand mine waste)		
Size of resource	Approximately 5.16 Mt		
Mine dewatering	No mine dewatering required; groundwater is approx. 36 m bgl		
Residue dam		**Residue dam 1**	**Residue dam 2**
	Maximum volume (approx.)	18,000 m^3	18,000 m^3
	Area	0.59 ha	0.56 ha
	Maximum depth (approx.)	5 m	5 m
Infrastructure on site	Wet processing plant Screening plant Site office Workshop and equipment park-up area Fuel bunker (self-contained drainage area and sump that can contain minor oil and fuel spills) Water treatment plant (rainwater treated with a UV and filter system) Wastewater treatment plant (septic tank and leach drain) Access and haul roads Water collection dam Process water dam		
Stockpiles	Cleared vegetation stockpiles Topsoil and seedbank stockpiles Silica sand product and reject stockpiles		
Water source	Bore on adjoining private property		
Potable water	Treated rainwater		
Power sources	Supplied by Western Power (Austsand is not responsible for dismantling the line)		
Roads	800 m unsealed (approx.)		
Solid waste disposal	Rubbish is disposed off site to an appropriately licenced landfill using the City of Albany rubbish disposal service		


Legend
Lot 5 Mindijup Road Palmdale
Cadastre
Rehabilitation Areas Oct 2021
Seed Bank Oct 2021
Stockpiles Oct 2021
Subsoil Oct 2021
Collection Water & Process Dams
Mine Site Extent Oct 2021
REHAB 2015
REHAB 2016
REHAB 2018
Rehab 2020
REHAB 2005
REHAB 2006
REHAB 2007
REHAB 2012
REHAB 2014
REHAB 2019
Reject Material Extent
REHAB 2005
REHAB 2012
Reject Material
REHAB 2012
REHAB 2015
RECLAIMED DAM
REHAB 2008
REHAB 2016
REHAB 2005
TAILINGS STORAGE FACILITY
REHAB 2005
REHAB 2005
REHAB 2011
Rehab 2022
REHAB 2006
TAILINGS STORAGE FACILITY
REHAB 2007
REHAB 2013
Rehab 2017
Rehab 2021
Seedbank 2017
REHAB 2011
REHAB 2007
REHAB 2016
REHAB 2013
REHAB 2015
REHAB 2014
Seedbank 2017
STOCKPILE PRODUCT
REHAB 2003
STOCKPILE PRODUCT
COLLECTION DAM
STOCKPILE PRODUCT
REHAB 96/97
REHAB 200
Rehab 2020
Subsoil 2021
Seedbank 2021
Subsoil 2021
Seedbank 2021
Rehab 2018
REHAB 2021
Seedbank 2019
STOCKPILE AFS90
Subsoil 2017
Subsoil 2021
Seedbank 2021
Rehab 2021
Site Office
Tank
Fuel Bunker
Tyre Bath
Workshop
Concrete Slab
Site Access
Pump
Pump
Tank
Processing Plant
Pump
SLIP
Paper Size ISO A3
0 50 100 150 200
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50
N
GHD
Austsand Mining
Lot 5 Mindijup Road, Palmdale
Site Layout
Project No. 12554621
Revision No. 1
Date 20/12/2021
FIGURE 6
\\ghdnet\GHD\AU\Perth\Projects\61\12554621\GIS\Maps\Working\6136478_003_Fig3_site layout_20181211_RevA.mxd
Print date: 20 Dec 2021 - 16:49
Data source: GHD: Lot 5 Mindijup Road Palmdale;Harley Dykstra: CAD baseplan - 20181206; Landgate: WA Now Aerial Imagery; Cadastre 20180709. Created by:vdavies. Created by: vdavies

2.5 Closure domains

Figure 7 shows the site has been separated into four domains. The two Western and Eastern domains are the main operating domains of the site. The other two domains are notional domains as described below.

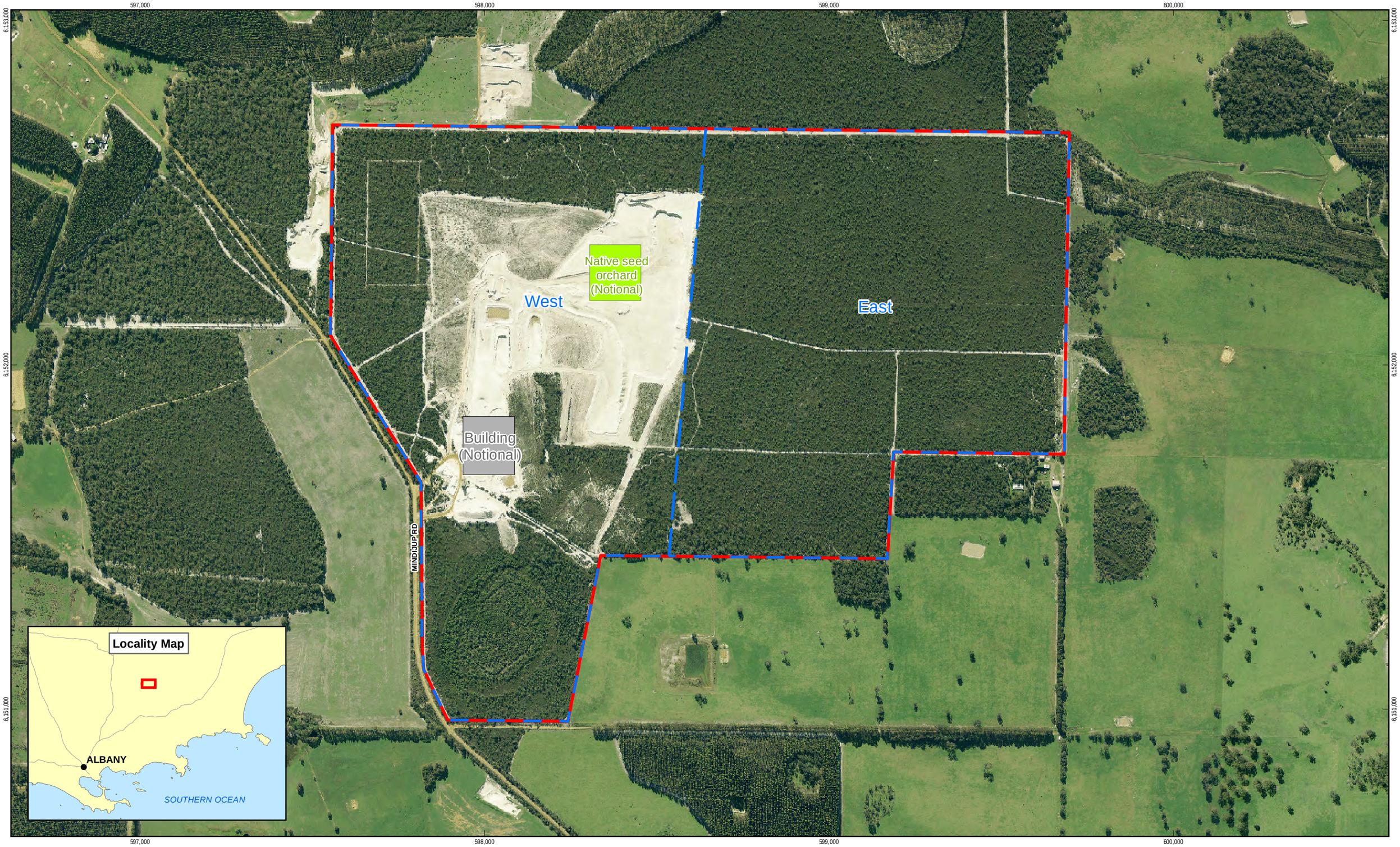
1. **Western domain**. This domain consists of administration, workshop, and process plant areas plus the sand extraction area from commencement of operations (1994) to 2015. This mine area corresponds to disturbance footprints defined in the following documents:
   - Notice of Intent (1993)
   - Mining Proposal (2014)
   - Clearing Permit CPS 4537/3 (expired).
2. **Eastern domain**. This domain consists of the sand extraction area defined in the Commonwealth approval EPBC 2012/6472 and CPS 5511/2 for 70.0 ha.
3. **Building envelope (notional location)**. This notional domain has been included in this document and Figure 7 to identify that future stakeholder consultation is planned that may result in establishing this domain.
4. **Native seed orchard (notional location)**. This notional domain has been included in this document and Figure 7 to identify that future stakeholder consultation is planned that may result in establishing this domain.

2.6 Disturbance

Lot 5 cover approximately 260.9789 hectares (ha), however the total area of activity (as at October 2021) was approximately 119.6767 ha. Figure 8 shows the areas of rehabilitation and disturbance as per the 2021 DMIRS Annual Environmental Report (AER) and is summarised in Table 2.

Table 2 Tenement disturbance areas

Tenement	Disturbance (ha)	Land under rehabilitation (ha)	Total area of activity (ha)
M70/793	52.2246	67.4521	119.6767



Page Size A3

0 200 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Site Boundary
- Domain Boundary
- Building (Notional)
- Native seed orchard (Notional)

Austsand Mining

Clearing Permit Application
Supporting Documentation

Closure Domains

Job Number	61-29625
Revision	0
Date	23 Mar 2016

Figure 7

G:\61\29625\GIS\Maps\MXD\6129625_00X_RevA_ClosureDomains.mxd

Data Source: Landgate: Many Peaks Breaksea 2010 Mosaic - 20160308, Roads - 20111214; GHD: Site Boundary - 20091205, Domains, Building Area - 20160308, Seed orchard - 20160323. Created by: mmikkonen

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3. Identification of Closure Obligations and Commitments

3.1 Applicable legislation

In WA, the key legal and regulatory requirements which are applicable to the Project include the

– *Mining Act 1978* (Mining Act) and the Mining Regulations 1981
– *Mines Safety and Inspection Act 1994* and the Mines Safety and Inspection Regulations 1995
– *Mining Rehabilitation Fund Act 2012* and the Mining Rehabilitation Fund Regulations 2013
– *Environmental Protection Act 1986* (EP Act) and the Environmental Protection Regulations 1987

The first three acts listed above are administered by the DMIRS. All mining operations in WA are also subject to the EP Act and its various regulations. The EP Act overrides all other Acts, including the *Mining Act* and is administered by the Department of Water and Environmental Regulation (DWER). An approval to mine issued under the Mining Act does not override the requirements to obtain an environmental approval under the EP Act. Consequently, the requirements of both Acts and their regulators must be satisfied.

Other applicable legislation which must be considered in closure is listed in Table 3.

Table 3 Other applicable legislation and regulations

Type	Name
Environment	*Biodiversity and Conservation Act 2016 (WA)*
	Conservation and Land Management Act 1984 (WA)
	Contaminated Sites Act 2003 (WA)
	Contaminated Sites Regulations 2006 (WA)
	Environmental Protection Act 1986 (WA)
	Environmental Protection Regulations 1987 (WA)
	Environment Protection and Biodiversity Conservation (EPBC) Act 1999 (Cth)
	Environment and Biodiversity Conservation Regulations 2000 (Cth)
Heritage	*Aboriginal Heritage Act 1972 (WA)*
	Aboriginal Heritage Regulations 1974 (WA)
	Heritage Act 2018 / Heritage of Western Australia Act 1990 (WA)
	Native Title Act 1993 (Cth)
Safety	*Dangerous Goods Safety Act 2004 (WA)*
	Dangerous Goods Safety Regulations (various) 2007 (WA)
	Health Act 1911 (WA)
	Occupational Safety and Health Act 1984 (WA)
Pastoral	*Land Administration Act 1997 (WA)*
Town Planning	City of Albany, Local Planning Scheme No. 1

3.2 Legal obligations register

AustSand's maintains a Legal Obligations Register (also called a Compliance Register) (Appendix B). The register includes licence, permit and tenement conditions, as well as AustSand's voluntary commitments and undertakings. The register is updated with additional requirements as they become available. A summary of the register is provided in Table 4.

Action 1: Review and update the Compliance Register on a regular basis.

Table 4 Obligations register summary

Description	Approval no.	No. of conditions/ obligations/ commitments	Valid from	Valid to
Department of Water and Environmental Regulation (DWER)				
DWER Licence (mine)	L6789/1993/12	9	23/04/2021	08/06/2035
DWER Licence (port)	L8411/2010/2	15	26/07/2013	25/07/2018
DWER Licence (port) amendment notice – 29/04/2016	L8411/2010/2	-	26/07/2013	25/07/2027
DWER Licence (port) amendment notice – 28/03/2017	L8411/2010/2	-	26/07/2013	25/07/2027
Clearing Permit (expired)	CPS 4537/3	~~5~~	3/03/2012	30/04/2016
Clearing Permit (superceded)	CPS 5511/1	~~5~~	15/06/2013	15/06/2028
Clearing Permit	CPS 5511/2	4	15/06/2013	15/06/2028
DMIRS				
Mining Proposal (2014)	ID 38128	9	4/03/2014	End of mine life
Tenement	M70/793	18	9/06/1993	8/06/2035
DotEE - Commonwealth				
EPBC Act	2012/6472	13	27/05/2013	31/12/2031
Legislation				
Other Legislation	-	3		
Total		71		

3.3 Mining rehabilitation fund

The Mining Rehabilitation Fund (MRF) replaced the previous DMP Performance Bond system in 2014. AustSand submits annual MRF reconciliations for its mining envelope.

4. Stakeholder Engagement

Stakeholder engagement is a key tool to understand community and stakeholder perceptions about how mine closure will affect the local environment and surrounding communities. AustSand understands that stakeholder consultation is important for building relationships with stakeholders and for generating a sense of trust that issues raised will be addressed in the mine closure planning process.

AustSand has prepared a Mine Closure Stakeholder Consultation Plan_Rev 0 (MCSCP) dated December 2013.

4.1 Stakeholder identification

Two groups of stakeholders have been identified for the Mindijup Silica Sand Mine, as described below.

Internal stakeholders

Internal stakeholders are the staff employed in the management, mining and processing operation.

External stakeholders

External stakeholders include the following:

- Key government stakeholders:
  - DMIRS
  - DWER
  - Commonwealth Department of the Agriculture, Water and the Environment (DAWE) (formally DotE)
  - Southern Ports Authority – Port of Albany.
- Other external stakeholders:
  - Adjacent landowners
  - Contractors that provide goods and services to the operation
  - City of Albany
  - Industry associations.

4.2 Consultation process

To document the contact details of stakeholders, as well as their key areas of interest, AustSand has developed a Stakeholder Register and stakeholder contacts list. This register is routinely updated as new consultation occurs. The register is provided in Appendix C.

The following methodology for stakeholder consultation is being implemented:

- Check stakeholder lists are updated and amend on a regular basis.
- Communicate planned changes to relevant stakeholders to demonstrate an open and transparent approach to consultation and build understanding.
- Check adequate time is invested in considering the needs and interests of stakeholders. This may include face-to-face meetings with stakeholders, where appropriate.
- Encourage feedback from stakeholders and record these when received.
- Record complaints and concerns related to mine closure process and respond to the issues raised.

4.3 Stakeholder consultation to date

AustSand has begun a consultation process to explain and discuss the current MCP with stakeholders, gather feedback and ensure any issues or concerns are understood and addressed early in the mine closure process. Suitable post-mining land uses, and potential landowners/ managers are also being investigated.

In August 2014, AustSand sought involvement from the following stakeholders on the mine closure stakeholder consultation process:

- Department of Biodiversity, Conservation and Attractions (DBCA) (Parks and Wildlife Service) (then DPaW)
- Port of Albany
- Australian Bulk Stevedores
- Belfield and Sons
- CBH
- Commonwealth DAWE (then DotE)
- DWER (then DER)
- DMIRS (then DMP)
- Department of Fire and Emergency Services (DFES)
- Adjacent landowners.

To date no response has been provided from the above stakeholders.

AustSand also met with the Gondwana Link and Oyster Harbour Catchment Group in June 2014 to discuss post – mining land use. Oyster Harbour Catchment group have indicated they would like to undertake some costings for the purpose of ongoing management of the land at mine closure but will undertake this in the future.

It is acknowledged that no further consultation with stakeholders has been undertaken since 2014 regarding suitable post-mining land uses. However, it is considered that, due to the length of time until the mine closes, stakeholders do not have significant interest in the site at this time.

The next phase in the consultation plan is to continue to consult/ seek input from stakeholders on post-mining land use and the key elements of the MCP. This will include further consultation with previously identified stakeholders and identifying new stakeholders that may be interested in acquiring the land post-mining.

Action 2: Review and update the Stakeholder Register on a regular basis.

Action 3: Undertake ongoing consultation with Stakeholders to inform the MCP and identify suitable post-mining land uses.

5. Baseline and Closure Data and Analysis

Collection and analysis of closure data must meet the following minimum requirements (DMIRS, 2020):

– Use of recognised or acceptable methodologies and standards.
– Incorporate appropriate quality management systems and procedures (e.g., ISO9000).
– Consideration of the wider receiving environment, receptors, and exposure pathways.
– Provide a base on which to develop criteria or indicators for closure monitoring and performance.

Information from baseline studies undertaken prior to the commencement of mining operations and on-going monitoring is essential to establish achievable closure outcomes and goals, as well as to identify issues requiring management through the mine closure process (DMIRS, 2020).

AustSand's have gathered (and continues to gather) environmental data to enable planning and monitoring of effective rehabilitation and closure of the site.

This section summarises the baseline information relevant to the closure of the site.

5.1 Baseline data

The following sub-sections describe the available baseline data for the site.

5.1.1 Climate

The Albany region experiences warm summers and cold winters and is broadly described as Mediterranean. Dominant winds are south-easterly in summer and west to north-westerly in winter (Dames and Moore, 1993). The nearest Bureau of Meteorology (BoM) official recording station is Albany (Station No. 9500) however this site is located on the coast compared whereas 570 Mindijup Road is located approximately 40 km inland. A summary of climatic data for this station is provided in Table 5 (BoM, 2021).

Table 5 Climatic data for the Albany (Station No. 9500) for years 1877 to 2021 (BoM 2021)

Climatic variable	Statistic
Mean annual maximum temperature range	15.8°C in July to 22.9°C in February
Mean annual minimum temperature range	8.2°C in July to 15.6°C in February
Mean annual rainfall	925.2 mm
Mean annual rain days per year	103.3

5.1.2 Geology, landforms and soils

According to the NRMInfo search tool, the site is within the Dempster Crest Phase, described as including '*sands and laterite on elongate crests*' and '*Jarrah-Albany Blackbutt-Marri forest*'. The former Department of Environment and Conservation (DEC) completed an Environmental Assessment Report (EAR) of the Mindijup Mine site in 2009 (DEC, 2009). The EAR provides information on the soils within the site and is summarised in this section.

The landform and soils of the area were identified as being within the Stirling Region and is described by Beard (1979) as '*duricrust plateau on the Yilgarn Block, surfaced with iron stone gravels and dissected towards the east with hard-setting loamy soils'*. The region is dominated by yellow duplex soils whilst the Mindijup Mine site is characterised by deep siliceous sands.

5.1.3 Soil and waste materials characterisation

Topsoil

The soils are slightly acidic to neutral, highly water repellent and low in nutrients. The silica deposit is part of a remnant aeolian dune system. The deposit varies in depth from 0 m to 15 m over the site. A sand layer with high clay content defines the bottom of the deposit. This clayey sand has the potential to form a hardpan which may not be suitable for revegetation without a cover layer of growth media.

A layer of topsoil exists in the top 200 mm of the soil profile and is identified by the presence of organic material and a darker colour relative to the siliceous sands (Plate 1).

Plate 1 ***Topsoil and vegetation stockpiles***

Residue sand

Approximately 35-40% of sand extracted for processing does not meet the size specification for the saleable product and is returned to the excavation area as backfill. This residue sand is unchanged from the sand originally extracted and is used as additional fill over the pit floor and as fill against fit faces where required.

5.1.4 Topography

The mine site is situated on elevated ground with elevations ranging from 130 m to 145 m. The wetland area, located in the south portion of the mining tenement, has a lower elevation of 125 m. The topographic contours of the site and the surrounding area are shown in Figure 5.

5.1.5 Geochemical characterisation

In November 2012, two residue samples (13/11/12/TGS/2 0-1MTR, 13/11/12/TGS/2 1-2MTR) taken at depth 0-1 m and 1-2 m were analysed for pH, alkalinity and water extractable sulphate and chloride (Table 6).

These samples and an additional three residue samples from July 2012 (12/7/TGS/2 0-1MTR, 12/7/TGS/2 1-2MTR) and April 2012 (29/3/TGS/1) were also analysed for loss on ignition (LOI) and major elements (Fe_2O_3, Al_2O_3, TiO_2, CaO, MgO, Cr_2O_3, Na_2O, MnO, K_2O and SiO_2) via Atomic Absorption Spectroscopy. Results including limits of detection (LOD) are provided in Table 7.

The samples were also analysed for metals (Hg, Se, As, Ba, Be, Cd, Co, Cu, Ni, Pb, Zn, U and V) and sulfur via Inductively Coupled Mass Spectrometer (ICPMS). Results including LOD are provided in Table 8.

Table 6 Acidity and alkalinity results

Analyte	LOD	13/11/12 0-1MTR	13/11/12 1-2MTR
% Moisture	0.5	<0.5	<0.5
pH	0.1	5.3	5.5
Bicarbonate Alkalinity as HCO_3 in soil (mg/kg)	25	<25	<25
Carbonate Alkalinity as CO_3 in soil (mg/kg)	5	<0.5	<0.5
Hydroxide Alkalinity as OH in soil (mg/kg)	25	<25	<25
Total Alkalinity as $CaCO_3$ in soil (mg/kg)	5	14	7
Sulfate (water extractable) (mg/kg)	5	<0.5	<0.5
Chloride (water extractable 1:5) (mg/kg)	5	19	22

Table 7 Major elements and Loss on Ignition (LOI) results

Major elements/ LOI (%)	LOD	12/7/TGS/2 0-1MTR	12/7/TGS/2 1-2MTR	13/11/12 0-1MTR	13/11/12 1-2MTR	29/3/TGS/1
Fe_2O_3	0.001	0.021	0.021	0.020	0.023	0.026
Al_2O_3	0.001	0.068	0.060	0.040	0.044	0.054
TiO_2	0.001	0.140	0.155	0.145	0.173	0.230
CaO	0.001	0.006	0.006	0.009	0.011	0.007
MgO	0.001	0.006	0.007	0.007	0.008	0.009
Cr_2O_3	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Na_2O	0.001	0.009	0.010	0.006	0.006	0.013
MnO	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
K_2O	0.001	0.006	0.004	0.004	0.004	0.005
SiO_2	0.01	99.67	99.67	99.69	99.66	99.47
LOI	-10	0.069	0.069	0.074	0.072	0.190

Table 8 Metals results

Metals (ppm)	LOD	12/7/TGS/2 0-1MRT	12/7/TGS/2 1-2MRT	13/11/12 0-1MRT	13/11/12 1-2MTR	29/3/TGS/1
Hg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Se	1	<1	<1	<1	<1	<1
As	1	<1	<1	<1	<1	<1
Ba	2	6	5	40	4	6
Be	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Metals (ppm)	LOD	12/7/TGS/2 0-1MRT	12/7/TGS/2 1-2MRT	13/11/12 0-1MRT	13/11/12 1-2MTR	29/3/TGS/1
Cd	0.1	0.5	0.6	<0.1	<0.1	<0.1
Co	0.1	0.1	<0.1	1.5	0.4	<0.1
Cu	2	6	6	7	5	4
Ni	2	<2	<2	<2	<2	<2
Pb	1	3	2	1	<1	2
Zn	5	19	12	11	8	6
V	1	4	4	4	4	5
U	0.05	0.29	0.34	0.29	0.34	-
S (%)	0.005	0.077	0.080	0.016	0.017	-

The geochemical assessment confirmed the primary composition of the material to be quartz (SiO_2), with little organic matter present (based upon low LOI). Analysis of trace elements identified low levels of metals with all elements.

Two samples of the residue material (12/7/TGS/2 0-1MTR, 12/7/TGS/2 1-2MTR) showed a slight elevation of total sulfur, which also corresponded to a low buffering capacity (low Calcium concentrations). Acidic conditions were also observed on site (pH 5.3-5.5). The exceedance of sulfur may suggest the potential for acid forming conditions in the sand. Combined with low buffering capacity (low Ca concentrations), the sand may be classified as being potentially acid forming. The acidity present within the residue samples at the site is likely to be from sulfides which have already been oxidised. Low levels of metals returned in the samples also suggest that there is unlikely to be a risk of metals leaching from these samples.

5.1.6 Surface water and drainage

Surface water receptors

The mine is located within the Oyster Harbour/ Kalgan River/ King River hydrographic catchment. This area has been identified as a sensitive estuarine system prone to eutrophication (DEC, 2010). The site represents 0.09 % of the total catchment area. The nearest major surface water feature to the site is the Kalgan River, located approximately 1 km to the north-west of the mine.

A perched wetland is present in the southern area of the site boundary (DEC, 2010). This wetland is a Conservation Class wetland listed in the DBCA South Coast Significant Wetlands database (GoWA, 2021).

The wetland is being retained and protected by AustSand. Surface water impacts on the wetland from the mine operations are limited, as it is hydrologically separated from the active mining area by a 1-2 m high ridge (DEC, 2010). A buffer of approximately 100 m is maintained between the wetland and mining activities.

Another small wetland is located on the eastern boundary of the site and is protected from the site operations by the vegetative buffer zone. This wetland has been extensively impacted by agricultural activities (DEC, 2010), and is therefore considered degraded.

Site drainage

The site and its immediate surroundings do not have any defined surface drainage lines. The site is located on locally elevated ground and is highly permeable. Rainfall at the site typically infiltrates rather than generating runoff (Dames and Moore, 1993).

Discharges from site

The Mindijup Silica Sand Mine does not discharge processing water directly to the environment. Water is decanted from the residue dams, pumped to the reclaimed water basin and re-used in the wet processing plant.

Potential contaminant sources to soil, surface water and groundwater are hydrocarbons from the workshop and heavy metals resulting from the sand processing. Both contaminant sources represent a low risk of water contamination as:

- Hydrocarbons on site are present in small quantities and are housed in appropriate storages and subject to spill management practices (DEC, 2009),
- There are no known contaminated sites, and
- Analyses of the trace elements identified low levels of heavy metals within residue material (see Section 5.1.5).

In accordance with their initial licence requirements AustSand carried out water quality monitoring from 2003 to 2008 (of which analysis data is available from 2006 to 2008). Two sampling locations were tested: the main storage dam (collection dam) and the reclaimed water basin (process water dam) which sources water from the residue dams. The samples were analysed against a set of water quality parameters specified by the operating licence conditions at that time.

The water quality results from 2003 to 2008 indicated that operational processes did not have a significant impact on water quality. Two pH results of pH 4.2 (September 2003) and pH 5.6 (May 2003) were below the ANZG (2018) guideline pH of 6-9.0 for long term irrigation water quality for surface water.

Based on data presented by AustSand in Annual Environmental Reports (AERs) showing compliance with Licence water quality monitoring DWER (then DEC) removed this requirement from the licence in 2009.

AustSand has continued to monitor water quality as an internal measure from 2014 to 2021 (ongoing). The data continues to show a low risk of potential impact (Appendix E). The pH of the decant dams will continue to be monitored and a decision made by AustSand on some form of lime dosing if it considers this is warranted.

Action 4: Conduct periodic pH and electrical conductivity reading on the decant dams as an indicator of acidity changes that may require active management

Mining activities at the site are considered unlikely to impact upon the Kalgan River and the two wetlands during operations or closure as:

- Water quality monitoring indicates that water quality does not exceed parameters identified by the (ANZG, 2018) guidelines for freshwater
- The vegetative buffer on the site boundary acts as a natural filter for surface runoff
- Incident rainfall is predominantly infiltrated owing to the high permeability of the sand.

5.1.7 Groundwater and hydrogeology

Groundwater on site is scattered and typically of stock drinking water quality (Dames and Moore, 1993). A single low yield bore is situated onsite to provide supply water in addition to the water supply dam. Drill logs for the low yield bore on site indicate that the groundwater level is 36 m below ground level. No dewatering is required on site as the resource occurs above groundwater level.

5.1.8 Environmentally Sensitive Areas

The DWER Clearing Permit System, provides information on the location of Environmentally Sensitive Areas (ESAs), as declared by a Notice under section 51B of the *Environmental Protection Act 1986* (EP Act). No Environmentally Sensitive Areas were identified at, or within 4 km of, the site (DWER, 2021).

5.1.9 Regional vegetation

The site is located within the Jarrah Forest Interim Biogeographic Regionalisation of Australia (IBRA) bioregion, and the Southern Jarrah Forest IBRA subregion. The Southern Jarrah Forest subregion is characterised by Jarrah-Marri Forest on laterite gravels and, in the eastern part, by Wandoo/Marri woodlands on clayey soils (DAWE, 2021).

One vegetation association has been identified at the site, which is Beard Vegetation Association 3 – Medium forest: Jarrah-Marri (Beard, 1979).

Descriptions of parts of Beard Vegetation Association 3 indicate that there are patches of *Banksia attenuata*, *Banksia ilicifolia* and *Nuytsia floribunda* occurring on sand within the system as well as *Eucalyptus staeri* on poor soils (Beard, 1979).

5.1.10 Site vegetation

The vegetation and flora of the Mindijup Mine site has been surveyed by GHD and others over a range of seasons between October 2006 and March 2012 (GHD, 2012).

The vegetation is relatively uniform in floristic composition and structure. It consists of an Open Woodland to Low Open Woodland of *Eucalyptus staeri* with occasional *Eucalyptus marginata* over *Banksia attenuata* and *Allocasuarina fraseriana*. The upper shrub layer varies from Tall Open Shrubland to Closed Heath and is typically dominated by *Jacksonia spinosa, Agonis theiformis* and *Melaleuca thymoides*. The lower shrub layer varies from a Low Shrubland to Low Closed Heath with a dominance of *Leucopogon distans, Lysinema ciliatum, Andersonia caerulea* and *Xanthosia rotundifolia.* The sedgeland is dominated by *Anarthria scabra, Anarthria prolifera, Hypolaena exsulca* and *Lyginia barbata.* Common herb species include *Dasypogon bromeliifolius* and *Johnsonia lupulina* (GHD, 2012).

5.1.11 Vegetation condition

The vegetation is in *Excellent* condition, based on the Keighery (1994) vegetation condition rating scale. There is some evidence of edge effects, with introduced (weed) species noted along existing access tracks particularly in areas abutting agriculture (GHD, 2012). The presence of *Phytophthora* dieback has been indicated on the western side of the mining lease, but the disease does not appear to be widespread.

5.1.12 Threatened and Priority Ecological Communities

No TECs or PECs were recorded within the Mindijup Silica Sand Mine 2012 vegetation survey (GHD, 2012). However, vegetation within the site is now considered likely to meet the criteria for federally listed TEC/ State listed PEC (Priority 3) "*Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia*", which was listed in 2014 (DoE, 2014) after approval was granted for clearing within the site by Commonwealth (EPBC 2012/6472 – May 2013) and State (CPS 5511/2 – June 2013) regulatory authorities.

5.1.13 Conservation significant flora

Flora surveys from 2006 to 2012 have not recorded any EPBC Act or State-listed threatened flora species within the site (GHD, 2012). Spring surveys in 2012 targeting the potentially occurring threatened species Brown's Banksia (*Banksia brownii*), *Centrolepis caespitosa*, Grass Conostylis (*Conostylis misera*), Manypeaks Sundew (*Drosera fimbriata*) and Hook leaf Isopogon (*Isopogon uncinatus*) did not record any of these species in the proposed impact areas, or elsewhere on the site lease.

One Department of Biodiversity, Conservation and Attractions (DBCA) priority species, *Petrophile longifolia* (Priority 3), has been recorded (GHD, 2011; Sandiford, 2011). This species has subsequently been de-listed (no longer a conservation significant species).

5.1.14 Dieback management strategies

One key rehabilitation issue is the presence and potential spread of the root rotting fungi belonging to the genus *Phytophthora* which causes dieback disease in Western Australia. It is present in the south-west corner of the site.

AustSand currently applies dieback hygiene techniques that comply with management strategies described in the Conservation and Land Management's (CALM) Dieback Disease Hygiene Manual (CALM, 1992) to minimise the risk of spreading dieback from infected to healthy areas. Examples of these techniques are:

- Cleaning of earth-moving machinery of soil and vegetation prior to entering and leaving vegetated areas
- Moving soils only in dry conditions
- Storing litter and topsoil on site
- Adapting the mining schedule to facilitate the mining of areas susceptible to infection in the drier summer months
- Ensuring that no dieback or weed-affected soil, mulch, fill or other material is brought into the mine site
- Restricting the movement of machines and other vehicles to the limits of the areas to be cleared and mined.

5.1.15 Invasive species

A number of common weeds species, that are not listed Weeds of National Significance or under the *Biosecurity and Agriculture Management Act 2017*, have been identified across the Mindijup Mine site (GHD, 2018):

- **Aira* species
- **Arctotheca calendula* (Capeweed)
- **Briza maxima*
- **Disa bracteata*
- **Hypochaeris glabra* (flat weed)
- **Orobanche minor* (Lesser Broomrape)
- **Pentameris airoides* (False Hairgrass)
- **Rumex acetosella* (Sorrel)
- **Vellereophyton dealbatum* (White Cudweed)
- **Vulpia bromoides*.

These species area considered likely to be widespread in the local and regional area (GHD, 2011). Other pasture and weed species occur on external firebreaks and in the surrounding farmland.

In addition, the following woody weed control activities have been undertaken for isolated patches of weeds within specific areas of the mine site:

- Removal of *Kunzea baxteri* in rehabilitation area (2003 and 96-97 rehabilitation),
- Removal of *Acacia longifolia* along the eastern boundary, and
- Removal of Victorian tea tree (*Leptospermum laevigatum*) from 96/97 and 2006 rehabilitation areas.

5.1.16 Fauna records and habitat

Several Level 1 reconnaissance fauna surveys have been completed for the site, specifically on 18 October 2006, 29 October 2007, 11 November 2009, 14 and 15 March 2011 and 28 March 2012 (GHD, 2012). These surveys comprised opportunistic searches for fauna across the site.

A total of 42 species of vertebrate fauna were recorded within the site (GHD, 2012) from these surveys. Of these, four are mammals (two introduced), four are reptiles, two are amphibians, and 32 are birds.

One major habitat type is present across the site. This can be described as 'Very Open *Eucalyptus* and *Banksia* Low Woodland over Open Shrubland over Low Shrubland to Low Closed Heath over Sedgeland on sand'. This habitat type is generally well represented within the local area as well as in the broader Southern Jarrah Forest region (GHD, 2012).

A Level 2 trapping survey was undertaken by GHD in October 2012. This survey focused on the large, un-impacted area of habitat in the center of the mining lease and included trap types which targeted potentially occurring conservation significant fauna. The survey identified 52 bird species, 16 reptiles and two native mammals for the site, making a total for all site surveys of: 61 birds, 17 reptiles, 6 mammals (four introduced) and two amphibians.

5.1.17 Conservation significant fauna

A list of the conservation significant fauna species potentially occurring on the site was identified (GHD, 2012) (not including species already recorded on site). A further assessment of their likelihood of occurrence on the mining lease, based on available habitat and other factors, indicated the following:

- One species is likely to occur: *Calyptorhynchus banksia naso* (Forrest Red-tailed Black Cockatoo).
- Eight species could possibly occur: *Dasyornis longirostris* (Western Bristlebird), *Psophodes nigrogularis nigrogularis* (Western Whipbird), *Falcunculus frontatus leucogaster* (Crested Shrike Tit) (Southwest form), *Dasyurus geoffroii* (Western Quoll), *Parantechinus apicalis* (Dibbler), *Pseudocheirus occidentalis* (Western Ringtail Possum), *Phascogale tapoatafa* (Southern Brush-tailed Phascogale) and *Isoodon obesulus fusciventer* (Quenda).
- Seven species are unlikely to occur: *Atrichornis clamosus* (Noisy Scrub Bird), *Botaurus poiciloptilus* (Australian Bittern), *Leipoa ocellata* (Malleefowl), *Galaxias truttaceus hesperius* (Western Trout Minnow), *Galaxias munda* (Western Mud Minnow), *Setonix brachyurus* (Quokka) and *Macropus Irma* (Western Brush Wallaby).

One species occurrence cannot be assessed. The known locations for *Pezoporus flaviventris* (Western Ground Parrot) are not available due to concerns of poaching.

Results of surveys

Surveys of the site have recorded the presence of three *EPBC Act* and *Wildlife Conservation Act 1950* (WC Act) listed species, Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), Baudin's Black

Cockatoo (*Calyptorhynchus baudinii*) and the Forest Red-Tailed Black Cockatoo (*Calyptorhynchus banksia naso*). No other conservation significant fauna species have been recorded or are considered likely to occur due to lack of suitable habitat, and the presence of predators (GHD, 2012).

Black Cockatoos

The GHD (2011) Black Cockatoo habitat assessment concluded that the entire site is considered feeding habitat for Black Cockatoos. Overall, 104 trees with a diameter-at-breast-height (DBH) greater than 500 mm were identified within the site. The majority of these are *Eucalyptus staeri,* which is not considered to provide nesting hollows. None of the jarrah or marri trees of suitable size will be directly impacted by mining with the majority of potential nesting trees being in buffer zones, some distance from existing or proposed mining.

5.1.18 Reserves and conservation areas

There are no DBCA Legislated Lands and Waters intercepted by or located within the vicinity of the site (GoWA, 2021).

5.1.19 European heritage

There are no known European Heritage sites intercepted by or located within the vicinity of the site (GoWA, 2021).

5.1.20 Aboriginal heritage

McDonald, Hales and Associates (1993) conducted a desktop review of Aboriginal heritage issues associated with the site. This investigation indicated that there were no recorded aboriginal sites of archaeological or ethnographic nature.

A search of the Department of Planning, Lands and Heritage (DPLH) Aboriginal Heritage Inquiry System database, in December 2021, did not identify any sites within tenement M70-793 (DPLH, 2021).

5.2 Monitoring data – operational phase

This section of the MCP summarises key monitoring data that is collected during the life of mine. This data adds to the baseline information documented in Section 5.1, to build a library of information that is relevant to rehabilitation and mine closure.

AustSand considers that monitoring parameters required by regulatory agencies during mine operation should form the basis of monitoring requirements post closure for the following reasons:

i. A database of these parameters has been built up during the life of mine

ii. There is little point in beginning to monitor parameters post closure that no regulatory agency has considered significant enough to warrant monitoring during the life of mine

iii. Following on from point (ii), no baseline data has been collected against which new data can be compared.

5.2.1 Materials balance

Having suitable material available for rehabilitation is crucial to successful rehabilitation. Maintaining a materials balance inventory is not specific to a domain and is aimed at securing sufficient resources for rehabilitation and closure works.

AustSand strip and store topsoil for use in rehabilitation as part of the progressive rehabilitation process. Several of the existing topsoil storage areas are greater than ten years in age and have

established substantial revegetation. It is understood that clearing of these areas would require a clearing permit (they are not located in an area subject to a current clearing permit) and given the condition of the revegetation it is believed the better environmental outcome is to retain these storage areas.

On the basis that these stockpile resources are now sterilised for mine rehabilitation purposes, AustSand is in the process of reviewing the materials balance for the Mindijup site. The outcome of the review will establish if sufficient suitable material is available on site. If a deficit of suitable material is identified, AustSand will prepare a contingency plan that will be incorporated into the MCP.

Action 5: If the rehabilitation materials balance audit identifies a deficit of required material, AustSand will prepare a contingency plan to mitigate the material deficit. The plan will be included into the MCP to enable actions contained within it to be progressively implemented through the life of mine.

5.2.2 Water quality monitoring

AustSand undertake a water quality monitoring program is to assist with classifying the potential groundwater acidification risk of the process water samples. Sampling occurs at the two representative locations:

- Collection Dam – the Collection Dam is a farm dam located to the south, within 494 Mindijup Road. The Collection Dam sources water from surface catchment upslope, direct rainfall and groundwater from the adjacent borefield.
- Process Dam –water from processing is decanted from the tailing's residue dams into the Process Dam and pumped to the reclaimed water basin for reuse in the wet processing plant.

Sampling has occurred from 2003 to 2008 and then 2014 – 2021(ongoing).

The monitoring parameters for the collection dam and the process water dam are listed below:

- Acidity, pH, Eh or ORP, conductivity, total dissolved solids,
- Major anions (Cl, sulfate, alkalinity),
- Major cations (Ca, Mg, Na, K), and
- Dissolved metals (Al, Fe, Mn).

The results indicate:

- Results from the two locations in the dams are generally consistent indicating the water bodies are relatively well mixed.
- The general trends in water quality between the two dams are consistent.
- The major ions for both dams are very consistent.
- pH in the collection dam: results indicate that pH is near neutral (pH 7), with values as high as pH 7.7. The conclusion is there is no significant change in pH of the raw water coming into site and that it remains approximately neutral.
- pH in the process water dam: results show a fluctuating pH, with results mainly in the range 4.74 to 6.58 with a generally decreasing trend.
- Conductivity in collection dam: the Total Dissolved Solids (TDS) generally fluctuates between 570 – 968 mg/L. This shows the incoming water is relatively fresh (<1,000 mg/L), but not considered drinking water which is <500 mg/L.
- Conductivity in the process water: the Total Dissolved Solids (TDS) show results fluctuating between 480 – 1,100 mg/L. The conclusion is that the conductivity of the process water is approximately the same as raw water coming in to site. That is sand washing is not significantly increasing the dissolved solids in the process water.

GHD (2015) concluded that pH and TDS (field measured as EC) are regarded as the primary parameters to monitor as indicators of change. In the absence of significant changes in EC and TDS, which are recording the total of dissolved minerals, the levels of individual elements are also not regarded as significant. That is, if the total value remains in the "relatively fresh" range of less than 1,500 – 2,000 mg/L, the influence of an individual element to the total is likely to not be significant.

Action 6: Continue undertake monitoring on an annual basis using hand-held monitoring equipment for pH and TDS

5.3 Other closure related data

AustSand has established a mine closure data register that records data relevant to mine rehabilitation and closure. This 'library' of information is added to as further monitoring data are obtained and investigations undertaken. The register includes the following information:

- Baseline (pre-mining) environmental surveys and investigations
- Monitoring data collected during the life of mine
- Information on progressive rehabilitation methods
- Results of trials and studies
- Relevant industry reports and surveys.

The mine closure information register is provided in Appendix D.

5.4 Data analysis and implications for mine closure

Section 5.1 provides a summary of the baseline environmental data for the site. Section 5.2 adds to this knowledge base by providing a summary of information gathered during the life of mine. This includes surface water and rehabilitation monitoring results.

This combined information database enables AustSand to determine where sufficient information is available to be able to plan and execute rehabilitation and closure strategies with a degree of confidence that the desired outcome will be reached; and where further studies and trials are still required.

A baseline data gap analysis to determine additional data required to enable full planning for decommissioning and closure as is summarised in Table 9.

Table 9 Baseline data gap analysis

Aspect	Summary description	Relevance to closure	Knowledge gaps and actions
Climate	The highest temperatures are in February (mean maximum 22.9°C) and lowest in July (mean minimum 8.2°C). Mean annual rainfall is 925.2 mm.	No specific issues identified	No knowledge gaps identified
Geology and landforms	The landform and soils of the area were identified as being within the Stirling Region and is described by Beard (1979) as '*duricrusted plateau on the Yilgarn Block, surfaced with iron stone gravels and dissected towards the east with hard-setting loamy soils'*. The region is dominated by yellow duplex soils whilst	No specific issues identified	No knowledge gaps identified

Aspect	Summary description	Relevance to closure	Knowledge gaps and actions
	the Mindijup Mine site is characterised by deep siliceous sands.		
Soils and waste materials characterisation	Approximately 35-40% of sand extracted for processing does not meet the size specification for the saleable product and is returned to the excavation area as backfill. This residue sand is unchanged from the sand originally extracted and is used as additional fill over the pit floor and as fill against fit faces where required.	No specific issues identified	No knowledge gaps identified
Topography	The mine site is situated on elevated ground with elevations ranging from 130 m to 145 m. The wetland area, located in the south portion of the mining tenement, has a lower elevation of 125 m.	No specific issues identified	No knowledge gaps identified
Geochemical characterisation	The geochemical assessment confirmed the primary composition of the material to be quartz (SiO2), with little organic matter present (based upon low LOI). Analysis of trace elements identified low levels of metals with all elements. Samples of the residue material showed a slight elevation of total sulphur, which also corresponded to a low buffering capacity (low Calcium concentrations). Acidic conditions were also observed on site (pH 5.3-5.5). The exceedance of sulphur may suggest the potential for acid forming conditions in the sand. Combined with low buffering capacity (low Ca concentrations), the sand may be classified as being potentially acid forming.	The acidity present within the residue samples at the site is likely to be from sulphides which have already been oxidised. Low levels of metals returned in the samples also suggest that there is unlikely to be a risk of metals leaching from these samples.	No knowledge gaps identified
Hydrology	The mine is located within the Oyster Harbour/ Kalgan River/ King River hydrographic catchment. This area has been identified as a sensitive estuarine system prone to eutrophication (DEC, 2010). The site represents 0.09 % of the total catchment area. The nearest major surface water feature to the site is the Kalgan River, located approximately 1 km to the north-west of the mine. A perched wetland is present in the southern area of the site boundary (DEC, 2010). This wetland is a Conservation Class wetland listed in the DBCA South Coast Significant Wetlands database (GoWA, 2021). The wetland is being retained and protected by AustSand. Surface water impacts on the wetland from the mine operations are limited, as it is hydrologically separated from the active mining area by a 1-2 m high ridge (DEC, 2010). A buffer of approximately 100 m is maintained between the wetland and mining activities. Another small wetland is located on the eastern boundary of the site and is protected from the site operations by the vegetative buffer zone. This wetland has	The Mindijup Silica Sand Mine does not discharge processing water directly to the environment. Water is decanted from the residue dams, pumped to the reclaimed water basin and re-used in the wet processing plant. AustSand has continued to monitor water quality as an internal measure from 2014 to 2021 (ongoing). The data continues to show a low risk of potential impact (Appendix E). The pH of the decant dams will continue to be monitored and a decision made by AustSand on some form of lime dosing if it considers this is warranted.	No knowledge gaps identified

Aspect	Summary description	Relevance to closure	Knowledge gaps and actions
	been extensively impacted by agricultural activities (DEC, 2010), and is therefore considered degraded.		
Hydrogeology	Groundwater on site is scattered and typically of stock drinking water quality (Dames and Moore, 1993). A single low yield bore is situated onsite to provide supply water in addition to the water supply dam. Drill logs for the low yield bore on site indicate that the groundwater level is 36 m below ground level. No dewatering is required on site as the resource occurs above groundwater level.	No specific issues identified	No knowledge gaps identified
Vegetation and flora	The site is located within the Jarrah Forest Interim Biogeographic Regionalisation of Australia (IBRA) bioregion, and the Southern Jarrah Forest IBRA subregion. The vegetation is relatively uniform in floristic composition and structure. It consists of an Open Woodland to Low Open Woodland of Eucalyptus staeri with occasional Eucalyptus marginata over Banksia attenuata and Allocasuarina fraseriana. No TECs or PECs were recorded within the Mindijup Silica Sand Mine 2012 vegetation survey (GHD, 2012). However, vegetation within the site is now considered likely to meet the criteria for federally listed TEC/ State listed PEC (Priority 3) “Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia”, which was listed in 2014 (DoE, 2014) after approval was granted for clearing within the site by Commonwealth (EPBC 2012/6472 – May 2013) and State (CPS 5511/2 – June 2013) regulatory authorities.	No specific issues identified	No knowledge gaps identified
Declared or priority flora	Flora surveys from 2006 to 2012 have not recorded any EPBC Act or State-listed threatened flora species within the site (GHD, 2012). One Department of Biodiversity, Conservation and Attractions (DBCA) priority species, Petrophile longifolia (Priority 3), has been recorded (GHD, 2011; Sandiford, 2011). This species has subsequently been de-listed (no longer a conservation significant species).	No specific issues identified	No knowledge gaps identified
Dieback and invasive species	One key rehabilitation issue is the presence and potential spread of the root rotting fungi belonging to the genus *Phytophthora* which causes dieback disease and is present in the south-west corner of the site. Several common weeds species, that are not listed Weeds of National Significance or under the Biosecurity and Agriculture Management Act 2017, have been	AustSand currently applies dieback hygiene techniques that comply with DBCA management strategies (CALM, 1992) to minimise the risk of spreading dieback from infected to healthy areas. Weed assessment is undertaken during the biennial rehabilitation	No knowledge gaps identified

Aspect	Summary description	Relevance to closure	Knowledge gaps and actions
	identified across the Mindijup Mine site (GHD, 2018).	monitoring and weed species are controlled on an as required basis.	
Fauna	Surveys of the site have recorded the presence of three EPBC Act and Wildlife Conservation Act 1950 (WC Act) listed species, Carnaby's Black Cockatoo (Calyptorhynchus latirostris), Baudin's Black Cockatoo (Calyptorhynchus baudinii) and the Forest Red-Tailed Black Cockatoo (Calyptorhynchus banksia naso). No other conservation significant fauna species have been recorded or are considered likely to occur due to lack of suitable habitat, and the presence of predators (GHD, 2012).	The GHD (2011) Black Cockatoo habitat assessment concluded that the entire site is considered feeding habitat for Black Cockatoos. None of the jarrah or marri trees of suitable size will be directly impacted by mining with the majority of potential nesting trees being in buffer zones, some distance from existing or proposed mining.	No knowledge gaps identified
Reserves and conservation areas	There are no DBCA Legislated Lands and Waters intercepted by or located within the vicinity of the site.	No specific issues identified	No knowledge gaps identified
Social	There are no known Aboriginal or European heritage sites intercepted by or located within the vicinity of the site.	No specific issues identified	No knowledge gaps identified

6. Post-mining land use(s)

6.1.1 Closure objectives

The property currently subject to silica sand mining is private property zoned 'Priority Agriculture' in the City of Albany Town Planning Scheme (the Scheme).

The 1993 NOI documented the rehabilitation process to include return of stockpiled topsoil and vegetation matter, to assist native species to re-establish on mined areas. It also documented that supplementary seeding may be required. Completion criteria were stated as "*replace the vegetation with a similar canopy cover and at least 20% of the diversity within a few years of decommissioning.*"

The approved 2014 Mining Proposal did not provide specific detail on rehabilitation methods or completion criteria. Relevant text in the mining proposal is as follows:

> *Current progressive rehabilitation activities that have shown success are expected to continue, in conjunction with regular vegetation and weed surveys*.
>
> *Monitoring sites (transects and quadrats) will be set up on rehabilitated areas as progressive rehabilitation is completed. An analogue monitoring site will be set up in an area near to the site not disturbed by the mining operations. Rehabilitation performance monitoring will include vegetation assessments, EFA, photographic monitoring and opportunistic site inspections.*

The 2012 MCP closure objectives were as follows:

- *Achieve a functional vegetation community with a structure comparable to adjacent native vegetation*
- *Revegetate with species conducive to the provision of feeding habitat for Black Cockatoos*
- *Not be infested by weeds and/or feral animals*
- *Minimise the risk of becoming infected by plant diseases, especially Phytophthora dieback.*

The Commonwealth DotEE clearing approval EPBC 2012/6472, and State CPS 5511/2 only applies to the eastern half of the property. Condition 5 of EPBC 2012/6472 required AustSand to prepare a Rehabilitation and Mine Closure Plan (RMCP), which includes the following:

- *Details of progressive rehabilitation measures for each cell of annual clearing. These details should include commencement timeframes, species to be utilised, stocking rates, measures to be utilised to ensure success, success targets, contingency measures in the case of not meeting targets and monitoring requirements*
- *Measures to exclude weeds and feral animals from rehabilitation areas*
- *Details of rehabilitation and revegetation measures following the completion of mining operations*
- *Strategies to prevent the spread of Dieback.*

The *AustSand Mining, Mindijup Silica Sand Mine, Rehabilitation and Mine Closure Plan 2016 Rev D*, dated 12 April 2017 was approved by the DotEE 10 May 2018 (Appendix A).

6.1.2 End result of current practice

Current rehabilitation practices for the western half of the property aim to return a native vegetation community that is comparable to adjacent undisturbed vegetation. These practices are planned to continue into the eastern half of the property. At the conclusion of mining, the 261-ha property will consist of a perimeter buffer of undisturbed native vegetation, with the bulk of the central portion of the property cleared for sand mining purposes (approximately 140 ha) composed of native species rehabilitation of various ages.

6.1.3 Post-mining land use options

AustSand is keen to engage with relevant stakeholders to establish an agreed post-mining land use that is consistent with the ultimate form of the post-mine property and the land zoning.

As discussed in Section 4, AustSand have commenced consultation with stakeholders to assist in the identification of post-mining land use options. This consultation is still in progress and a final decision on the land use is yet to be determined.

To this end, AustSand proposes the following post mining land use options to be discussed with relevant stakeholders during the term of this MCP.

1. **Option 1 – Retain property as a single lot, zoned Priority Agriculture, mostly covered in native vegetation (in various forms)**

As a private property lot, construction of a single dwelling is a permitted use and a second dwelling may be approved. Up to 8 Chalets may also be approved. Sequential use planning for buildings would include nominated building envelope(s). Final rehabilitation of this domain would then consider elements such as fire management, fire buffer zone, services and access, water storage, and surface stabilisation with a pasture mix rather than native species. A nominal 2 ha building envelope would therefore leave 259 of the 261 hectares (99.2% of the property) covered in native vegetation.

This option allows AustSand to on-sell the property.

2. **Option 2 – Vest / transfer the land to a government agency / organisation**

This option requires approval from the receiving agency / organisation. It would require an assessment of the values of the land that would support the receiving agency agreeing to the transfer, as well as an understanding of any ongoing maintenance costs.

Given that approximately 200 ha of the property will consist of rehabilitated land, AustSand considers the main environmental value on the property is likely to be the wetland area in the southwest corner. Consultation is required to determine if this option has a possibility of proceeding.

If this option were to proceed, it is likely that a requirement of land transfer would be at no cost to the receiving agency. It may also require additional funds to be made available for ongoing maintenance works (e.g., firebreaks, fencing).

3. **Option 3 – Native seed orchard in rehabilitation areas.**

An alternative rehabilitation outcome to ‘native vegetation comparable in diversity to natural analogue sites’ is to develop variations such as a native vegetation seed orchard. Large quantities of seed of native species is required for other mine rehabilitation as well as other land care and native species restoration projects. Sourcing this seed from natural areas is often problematic due to the sparse density of target species in the natural environment. Establishing dedicated monocultures of selected species enables commercial quantities of seed to be collected efficiently. The large size of the AustSand property provides the potential for selected areas to the developed as seed orchards, as well as the more traditional diverse rehabilitation outcomes. Clearly, species diversity completion criteria would not be applicable in seed orchard areas.

This option still provides a native vegetation restoration outcome but also allows a commercial return from the land. This provides greater on-sell options as the property would have a sequential business use.

Action 7: AustSand will conduct specific stakeholder consultation during the period of this MCP on the post-mining land uses

7. Closure Risk Assessment

7.1 Risk management process

Environmental management of impacts are based on the risk management framework. The main objectives of environmental management are:

1. Identify activities that could result in significant environmental impacts to key factors
2. Quantify the relative level of inherent risk from the activity (without control measures applied)
3. Develop processes to reduce the inherent risk to an acceptable level (residual risk)
4. Document these processes so they become part of the Company's environmental management requirements
5. Monitor the effectiveness of implementing these processes.

A key outcome of risk management is to rank impacts and risks, so specific management measures can be developed for high-risk impacts, to reduce the risk to as low as practicable. AustSand adopts the mitigation sequence (EPA, 2006) for environmental management. The mitigation sequence is:

1. Avoid – avoid the impact altogether
2. Minimise – limit the severity of the impact
3. Rectify – rehabilitate affected site as soon as possible
4. Reduce – eliminate impact over time
5. Offset – if significant residual impacts remain to critical value assets.

The function of this risk assessment of closure issues is to identify those issues (if any) that have a high or extreme residual closure risk. These issues, if present, require significant post closure management to ensure these issues ultimately reached agreed standards accepted by stakeholders.

Similarly, closure issues with low or medium residual risk, that have a demonstrated history of effective management through the life of mine and pose little, if any, risk to the environment or the public, should not be elevated to high-risk management issues.

7.2 Risk assessment information

The Australian and New Zealand Standard on Risk Management (AS/NZS 4360) defines risk as the product of the likelihood of an event occurring and the consequence of that event (Standards Australia/ Standards New Zealand, 2004). GHD has developed a risk matrix based on AS/NZS 4360:2004 to assess the level of risk from activities undertaken in this project. To maximise the benefit of environmental management, it is important that human and other resources are allocated to issues on a priority basis. It is normally accepted that the highest risk issues receive the highest priority. Each cell in the risk matrix is assigned a priority number.

The likelihood of a hazardous event occurring is outlined in Table 10.

Table 10 Likelihood of a hazardous event occurring

Descriptor	Details	Frequency	Probability
Almost certain	Likely to occur often during the life of the system (say daily to weekly)	> 1 / week	> 25%
Likely	Likely to occur several times in the life of the system (weekly to monthly)	1/week – 1/month	10 - 25%

Descriptor	Details	Frequency	Probability
Possible	Likely to occur sometime in the life of the system (monthly to yearly)	1/month - 1/year	1 - 10%
Unlikely	Possible to occur sometime in the life of the system (yearly to 10 yearly)	1/year - 1 10 years	0.1 - 1%
Rare	So unlikely to occur in the life of the system that it may be assumed not to be experienced (greater than every 10 years)	> 1/10 years	< 0.1%

The consequence rating provides a qualitative measure of the consequence or impact should the hazardous event occur. The consequence ranking is outlined in Table 11.

Table 11 Consequence of a hazardous event occurring

Descriptor	Environment and heritage	Community
Catastrophic	Impact with potential for severe long-term harm or impact on an area of significance	International repercussions to reputation
Major	Events causing harm which cannot be immediately recovered	Local action that threatens production
Serious	Off-site impact with localised harm	Regional or state media attention
Medium	On-site events with the potential to cause local harm	Repeated community complaints requiring management response
Minor	Single on-site event, causing negligible harm	Single community complaint handled locally

Table 12 illustrates the risk matrix, which combines the likelihood and consequence to determine the level of associated risk. The resultant risk rating is described in Table 13. The environmental impact of each risk is then categorised as extreme (red), high (orange), medium (yellow) and low (green). Management measures for each identified risk is then included and the risk rating is re-categorised. A risk priority is assigned to each of the 25 possible outcomes.

Table 12 Risk matrix

LIKELIHOOD	CONSEQUENCE				
	Minor	Medium	Serious	Major	Catastrophic
Almost certain	Medium (11)	High (16)	Extreme (20)	Extreme (23)	Extreme (25)
Likely	Medium (7)	High (12)	High (17)	Extreme (21)	Extreme (24)
Possible	Low (4)	Medium (8)	High (13)	High (18)	Extreme (22)
Unlikely	Low (2)	Low (5)	Medium (9)	High (14)	High (19)
Rare	Low (1)	Low (3)	Low (6)	Medium (10)	High (15)

Table 13 Risk rating

Risk Level	Priority	Example action
Extreme	1	CEO/COO
High	2	Senior Site Manager
Medium	3	Management Supervision
Low	4	Procedural control

7.3 Closure risk identification

The Mine Closure Plan Guidance (DMIRS, 2020) require a structured risk management process to be undertaken to identify, assess and manage the potential risks associated with closure issues, particularly those listed below:

– Acid and metalliferous drainage
– Dispersive materials
– Contaminated sites
– Rehabilitation (including revegetation)
– Radiation management
– Pit lake and water management.

Of these issues, only contaminated sites, rehabilitation and surface water are considered relevant to this site.

7.4 Site specific assessment

A detailed risk assessment of the operation was undertaken in 2012 for the initial MCP. This risk assessment has been reviewed and updated for subsequent revisions of the MCP. The initial assessment identified key risks for both the operational and closure phases of the mine. Table 14 details the key risks for the closure phase of the Mindijup project. The priority risk rating from this analysis shows a number of activities with an inherent risk level of Medium and High but with management, residual risks are reduced to a Low rating. Key conclusions from the information shown in Table 14 are:

1. No inherent risks ranked as ‘extreme’ have been identified at the site.
2. Implementing management and mitigation measures during mine operations or closure works will reduce all inherent risks to a ‘low’ or ‘medium’ residual risk.

It is considered this outcome is consistent with the nature and scale of the project, which includes factors such as:

1. A ‘benign’ mineral processing circuit that does not use hazardous chemicals.
2. Potential impacts have only a localised affect, usually confined to the mine boundary. In most cases these can be readily controlled or remediated.
3. No critical value environmental assets in close proximity to mine areas (e.g., populations of flora or fauna unique to the project area), eliminating the risk of catastrophic or major consequences to specific environmental factors.

Table 14 Risk assessment

Closure issue	Before management				After management			
	Cause (what causes the closure issue)	C	L	Inherent Risk Level	Mitigation measures	C	L	Residual Risk Level
Public access	Infrastructure is retained onsite that poses a risk to people or animals.	major	possible	**18 – High**	Audit is conducted after infrastructure removal is completed. Sequential use agreement in place for infrastructure retained on site.	minor	rare	**1 – Low**
Rehabilitation	Successful restoration of native vegetation is inhibited by weed infestation or grazed by pest animals.	medium	unlikely	**5 – Low**	Vegetation condition is regularly monitored. Herbicides used to control weeds if necessary. Baiting used to control rabbit population.	minor	unlikely	**2 – Low**
Rehabilitation	Establishment of rehabilitated areas is inadequate and does not meet closure criteria.	major	possible	**18 – High**	Seed selection from local provenance species to increase diversity at initial rehabilitation. Vegetation performance is regularly monitored. Reseeding and reapplication of fertiliser is conducted if required.	minor	unlikely	**2 – Low**
Rehabilitation	Inadequate supply of topsoil for rehabilitation.	medium	unlikely	**5 – Low**	Topsoil stockpile locations selected to minimise wind erosion. Spread available topsoil more thinly. Supplementary seeding.	minor	unlikely	**2 – Low**
Rehabilitation	Incursion of livestock into rehabilitated areas.	minor	unlikely	**7 – Medium**	Communications with adjoining land users are carried out to prevent incursion of livestock. Fences constructed and maintained to prevent access by livestock.	minor	rare	**1 – Low**

Closure issue	Before management				After management			
	Cause (what causes the closure issue)	C	L	Inherent Risk Level	Mitigation measures	C	L	Residual Risk Level
Soil and/ or groundwater impacts	Contaminated sites left after closure.	medium	unlikely	**5 – Low**	Contaminated sites register is regularly updated. Spills and leaks are treated and soils remediated or removed from site. Audit of likely sites undertaken at closure.	minor	rare	**1 – Low**
Stability and rehabilitation	Erosion of pit face.	serious	unlikely	**9 – Medium**	Reshaping face to gentle slopes less than 1:6. Monitoring rehabilitation performance.	minor	unlikely	**2 – Low**
Soil surface/ erosion	Surface water transporting soil as sediment. Wind transporting soil as dust.	medium	likely	**12 - High**	Sand profile is highly porous. Very low likelihood of surface water flow. Likelihood of significant rill erosion by water is negligible. Progressive rehabilitation and rehabilitation of final disturbed areas after closure will result in all disturbed areas being stabilised with vegetation after closure. A low risk of significant dust generation.	minor	unlikely	**2 – Low**
Hydrology	Tailings dams remain at closure: The risk of water ponding if impermeable material is present near the surface.	medium	likely	**12 - High**	Localised impact, confined to the footprint of the dams. Closure action is to dig or drill through the liner and sediment in the base of the dam, to provide a free draining sand profile.	minor	rare	**1 - Low**

Closure issue	Before management				After management			
	Cause (what causes the closure issue)	C	L	Inherent Risk Level	Mitigation measures	C	L	Residual Risk Level
Acid mine drainage (AMD)	Monitoring of the process water dam shows an increasing acidity trend. The nature of recirculating water in the sand washing process has the effect of accumulating salts and any acidity in the process water dam. The operational phase action documented in this MCP is to continue to monitor this aspect. Should acidity levels continue to increase, it may be necessary to lime dose the process water supply.	medium	possible	**8 - Medium**	The Mindijup sand mine has been in operation since 1995. There has been no evidence during the site's operation to indicate that AMD is occurring in the sand extraction area or is likely to be a significant closure issue. The acidity recorded in the process water dam is a processing water circuit issue confined to this specific infrastructure. It is not present in the wider sand extraction area. Treatment (if required) of the water supply will correct the low pH. Monitoring of this parameter is continuing.	minor	unlikely	**2 – Low**
Dust	Large areas of exposed sand. Disturbance (vehicle activity) on exposed areas.	serious	possible	**13 - High**	Visual monitoring during the LOM confirming risk of dust migrating off site is low (worst case / exposed areas). Progressive rehabilitation reducing exposed areas and ultimately, at closure, all disturbed areas will be rehabilitated. Vehicle activity (significant disturbance) ceases after closure.	medium	unlikely	**5 -Low**

7.5 Materials characterisation

As part of risk identification, the Closure Guidelines (DMIRS, 2020) require adequate characterisation of materials including potentially problematic materials (such as acid generating or sulphatic mineral waste, sodic, radioactive and asbestiform materials).

Given there has been no chemical or physical treatment of the overburden and it is from an oxidised geological layer, the characteristics of the overburden are unlikely to change, and it is considered unlikely to contain potentially acid generating materials. It can be utilised as a natural material for use in reshaping to achieve the final landform.

Other problematic materials (sodic, radioactive, and asbestiform materials) are considered unlikely to occur given the geology of hard rock and sand resources, which are considered.

7.6 Contaminated sites

As part of risk identification, the Closure Guidelines (DMIRS, 2020) require the potential for contamination over the life to be considered so that the contamination can be removed, treated, contained or managed to meet the purposes of the agreed post-mining land uses (PMLU) and where practicable, to maximise the beneficial use(s) of the land after mining.

Prior to closure of the site, AustSands will undertake an investigation to identify any potential contamination issues and remedial steps. However, to date there has been no contamination at the site, and it is not expected that any will occur as no further extraction is planned prior to relinquishment.

8. Closure Outcomes and Completion Criteria

8.1 Closure outcomes

The following closure objectives have been developed in consideration of AustSand's environmental policy and regulatory requirements. The general mine closure objectives for the Mindijup operation are as follows:

General (whole site)

- Leave safe and stable final landforms that minimise risk to the environment as well as public health and safety
- Dispose of hazardous material in accordance with applicable Acts and Regulations
- Any contaminated sites will be appropriately managed and remediated as per the *Contaminated Sites Act 2003*
- Remove and dispose of all above-ground rubbish and redundant infrastructure
- Establish vegetation on previously disturbed areas which meets agreed post-mining land use outcomes.

West Domain

- Disturbed areas rehabilitated with native vegetation to attain values comparable to local analogue sites
- Weeds and feral animals not having a detrimental impact on rehabilitation establishment
- Minimise the risk of dieback disease in rehabilitated areas.

East Domain

- Disturbed areas rehabilitated with native vegetation to attain values documented in the approved Rehabilitation and Mine Closure Plan (RMCP) (GHD, 2017)
- Weeds and feral animals not having a detrimental impact on rehabilitation establishment
- Minimise the risk of dieback disease in rehabilitated areas.

Building Envelope(s)

Disturbed areas stabilised with vegetation consistent with agreed sequential land use.

Native Seed Orchard

Selected areas vegetated with monocultures of native species.

8.2 Completion criteria

Completion criteria are necessary to provide the basis on which successful rehabilitation and achievement of closure objectives are determined. Completion criteria have been developed from the objectives outlined in Section 6.1.1 in order to provide distinct and measurable criteria for successful rehabilitation of the Mindijup operation.

Completion criteria allow for verification of environmental outcomes for the project area as well as each feature final design and rehabilitation. Verification methods include monitoring results, management audits, design sign-off and comparison against reference documents.

Measurement tools have been selected to allow quantitative assessment of rehabilitation performance. Completion criteria may be refined as stakeholder consultation continues, further monitoring is undertaken, and more information becomes available. Any changes will be made as part of the three yearly review process of the MCP.

Completion criteria can be determined based on a number of different requirements:

– Project approval conditions may contain a specific requirement for a value to be met
– Project application documents may include values that then become commitments when the project is approved
– Values are agreed in consultation with stakeholders.

Project approval and permit documents for the Mindijup Sand Mine do not contain specific values that can be directly translated to mine closure completion criteria.

Different completion criteria for vegetation establishment are contained in a range of documents and have been summarised in Table 15.

Table 15 Rehabilitation completion criteria for previous documents

Document	Completion criteria
Notice of Intent (Dames and Moore, 1993)	Similar canopy cover and at least 20% of diversity within a few years of decommissioning
Rehabilitation Plan for Ongoing Works (GHD, 2011)	– No specific rehabilitation compliance targets were set within the mine approval conditions; however, the aim of rehabilitation has been to achieve a functional vegetation community with a structure that mimics adjacent native vegetation. This internal report for AustSand has been developed to provide a summary on previous rehabilitation and provide recommendations for improvements into the future. Target criteria for future rehabilitation are stated as being: • Revegetation will consist of representative species from all layers of plants in the surrounding, retained, vegetation. • Representative 10 m x 10 m plots will contain at least 25 native plant species. • Representative 10 m x 10 plots will contain at least 2 established plants per square metre. • There will be minimal vegetation loss through wind blow and rabbit damage. • Monitoring will occur annually for the first 3 years, to ensure that establishment is satisfactory, and thereafter as required. • If the above outcomes of species density and diversity are not met within the first 2 years, or there is an obvious lack of growth, mitigation measures will be undertaken in the next suitable season.
Mine Closure Plan (MCP) Revision 0 (GHD, 2012)	At least 80% of species present in adjacent bushland are represented on site (no time dimension stated)
Mining Proposal (GHD, 2014)	Does not provide specific completion criteria and states that "*current progressive rehabilitation activities that have shown success are expected to continue, in conjunction with regular vegetation and weed surveys*"
Revised MCP Revision 3 (GHD, 2015)	<u>Western domain:</u> Visual monitoring of rehabilitated areas will be conducted to assess: – Any signs of poor rehabilitation development that may require remedial treatment or earthworks – Species recruitment – Stability (erosion) of rehabilitation sites. Areas will be photographed from fixed positions so that changes with time can be clearly observed. For mine areas rehabilitated to native vegetation, botanical monitoring will record species diversity and cover, compared against undisturbed analogue sites, weeds and plant death (that may be attributable to dieback disease). Interim completion criteria is: – Average 75% species diversity of adjacent analogue sites, +/- 5%, for a 5-year period – Average 50% plant cover of adjacent analogue sites, +/- 5%, for a 5-year period. Average weed cover not exceeding analogue sites after 5 years.

Document	Completion criteria
	Visual monitoring of rehabilitated areas not showing significant grazing impact from feral animals Eastern domain: Presence of overstorey species in rehabilitated areas. Average 75% species diversity of adjacent analogue sites, +/- 5%, for a 5-year period, and Average 50% plant cover of adjacent analogue sites, +/- 5%, for a 5-year period. Average weed cover not exceeding analogue sites after 5 years. Visual monitoring of rehabilitated areas not showing significant grazing impact from feral animals
Revised MCP Revision 4 (GHD, 2018)	Western domain: As per Revised MCP Revision 3 (GHD, 2015). Eastern domain: **Completion:** Pre-clearing presence and density of Black Cockatoo foraging species in rehabilitated areas. Overall percentage cover of Black Cockatoo foraging species will ultimately (at maturity) match cover of pre-mining (baseline) quadrat data. Average mature canopy cover is 18% of the ground area. Average weed cover not exceeding pre-mining (baseline) quadrat levels after 5 years. Weed levels must not exceed 5% of ground vegetation cover. **Interim:** Two Black Cockatoo feeding tree species per monitoring quadrat within 2 years following rehabilitation establishment. Weed levels must not exceed 5% of ground vegetation cover.

Interim rehabilitation completion criteria targets for this MCP for the western domain remain consistent with previous MCP versions:

- Average 75% species diversity of adjacent analogue sites, +/- 5%, for a 5-year period
- Average 50% plant cover of adjacent analogue sites, +/- 5%, for a 5-year period.

The Rehabilitation and Mine Closure Plan (GHD, 2017), which was a component of the EPBC Referral and approval, applies to the eastern domain of the mine only (Figure 7).

Interim rehabilitation completion criteria targets for the RMCP were established and these are:

- At least two plants of Black Cockatoo foraging tree species will be present within each quadrat
- 75 % species diversity of baseline sites within 5 years of rehabilitation works
- 50 % plant cover compared to baseline sites within 5 years of rehabilitation works
- <5% weed cover over rehabilitated areas.

Completion objectives and criteria for the site are outlined in Table 16.

Table 16 Completion objectives and criteria

Domain	Closure objectives	Interim completion criteria	Measurement tools / performance indicators
West			
	Leave safe and stable final landforms that minimise risk to the environment as well as public health and safety;	Reshape final landform with embankments at slope of approximately 1V: 7H.	Decommissioning audit. Audit by Austsand to confirm closure scope of works have been constructed according to design. Completion of audit inspection checklist (to be prepared by Austsand).
	Dispose of hazardous material in accordance with applicable Acts and Regulations;	Hazardous materials removed from site to appropriate disposal facility Contaminated sites remediated or removed. If this is not practical, the site is properly defined and registered.	Decommissioning audit. Contaminated sites investigation.
	Remove and dispose of all above-ground rubbish and redundant infrastructure;	Remove all infrastructure not subject to a sequential use agreement.	Decommissioning audit.
	Disturbed areas rehabilitated with native vegetation to attain values comparable to local analogue sites.	Visual monitoring of rehabilitated areas will be conducted to assess: – Any signs of poor rehabilitation development that may require remedial treatment or earthworks – Species recruitment – Stability (erosion) of rehabilitation sites. Areas will be photographed from fixed positions so that changes with time can be clearly observed. For mine areas rehabilitated to native vegetation, botanical monitoring will record species diversity and cover, compared against undisturbed analogue sites, weeds and plant death (that may be attributable to dieback disease). Interim completion criteria is: – Average 75% species diversity of adjacent analogue sites, +/- 5%, for a 5-year period – Average 50% plant cover of adjacent analogue sites, +/- 5%, for a 5-year period.	Rehabilitation monitoring results by inspection and surveys.

Domain	Closure objectives	Interim completion criteria	Measurement tools / performance indicators
	Weeds and feral animals not having a detrimental impact on rehabilitation establishment.	Average weed cover not exceeding analogue sites after 5 years. Visual monitoring of rehabilitated areas not showing significant grazing impact from feral animals	
	Minimise the risk of dieback disease in rehabilitated areas.	Vehicle hygiene procedure compliance Soil movement compliance.	Records of vehicle entry washdown procedure. Records of topsoil movement (in Rehabilitation Notes file)
East – The *Austsand Mining, Mindijup Silica Sand Mine, Rehabilitation and Mine Closure Plan 2016 Rev D, dated 12 April 2017* was approved by the Commonwealth DotEE on 10 May 2017. The completion criteria proposed in the DotEE approved RMCP for this domain are included below:			
	1. Leave safe and stable final landforms that minimise risk to the environment as well as public health and safety;	**Completion**: Residue sand is returned to completed excavation areas and shaped to blend in with adjacent natural contours. Closure scope of works have been constructed according to design. **Interim**: Residue sand is returned to completed excavation areas as available and shaped and prior to ongoing rehabilitation works.	Periodic and decommissioning audits. Audits by Austsand to confirm closure scope of works have been constructed according to design. Completion of audit inspection checklist (to be prepared by Austsand).
	2. Establish vegetation on disturbed areas that meets agreed post-mining land use outcomes and approval requirements (in particular as future foraging habitat for Black Cockatoos)	**Completion**: Pre-clearing presence and density of Black Cockatoo foraging species in rehabilitated areas. Overall percentage cover of Black Cockatoo foraging species will ultimately (at maturity) match cover of pre-mining (baseline) quadrat data. Average mature canopy cover is 18% of the ground area. **Interim**: – At least two plants of Black Cockatoo foraging tree species will be present within each quadrat – 75 % species diversity of baseline sites within 5 years of rehabilitation works – 50 % plant cover compared to baseline sites within 5 years of rehabilitation works.	Ongoing rehabilitation monitoring results by inspection, photographic record and surveys. Records of vehicle entry washdown procedure.
	3. Dispose of hazardous material in accordance with applicable Acts and Regulations;	**Completion**: No contaminated sites left after closure or, if present, are effectively contained. **Interim**: Contaminated sites are dealt with as per applicable Acts and Regulations	Contaminated sites investigations and periodic audits.

Domain	Closure objectives	Interim completion criteria	Measurement tools / performance indicators
	4. Weeds not having a detrimental impact on rehabilitation establishment;	**Completion**: Average weed cover not exceeding pre-mining (baseline) quadrat levels after 5 years. Weed levels must not exceed 5% of ground vegetation cover. **Interim**: Weed levels must not exceed 5% of ground vegetation cover.	Ongoing rehabilitation monitoring results by inspection, photographic record and surveys.
	5. Remove and dispose of all above-ground rubbish and redundant infrastructure	**Completion**: Mine infrastructure required by other parties is to have a formal sequential use agreement in place prior to mine closure. **Interim**: Roads not subject to a sequential use agreement are ripped and rehabilitated. Roads required for monitoring and maintenance are in useable condition.	Periodic and decommissioning audits. Audits by Austsand to confirm closure scope of works have been constructed according to design. Completion of audit inspection checklist (to be prepared by Austsand).
Building Envelope(s)			
	Leave safe and stable final landforms that minimise risk to the environment as well as public health and safety;	Residue sand is returned to completed excavation areas and shaped to blend in with adjacent natural contours. Reshape final landform with embankments at a slope of approximately 1V:7H.	Decommissioning audit. Audit by Austsand to confirm closure scope of works have been constructed according to design. Completion of audit inspection checklist (to be prepared by Austsand).
	Dispose of hazardous material in accordance with applicable Acts and Regulations;	Hazardous materials removed from site to appropriate disposal facility. No contaminated sites left after closure or, if present, are effectively contained.	Decommissioning audit. Contaminated sites investigation.
	Remove and dispose of all above-ground rubbish and redundant infrastructure;	Mine infrastructure required by other parties is to have a formal sequential use agreement in place prior to mine closure. Roads not subject to a sequential use agreement are ripped and rehabilitated. Roads required for monitoring and maintenance are in useable condition.	Decommissioning audit.
	Disturbed areas stabilised with vegetation consistent with agreed sequential land use.	Average 75% plant cover of adjacent analogue sites after 2 years. No visible dust from the building envelopes leaving the boundary of the property.	Rehabilitation monitoring results by inspection and surveys.

Domain	Closure objectives	Interim completion criteria	Measurement tools / performance indicators
Native Seed Orchard			
	Leave safe and stable final landforms that minimise risk to the environment as well as public health and safety;	Residue sand is returned to completed excavation areas and shaped to blend in with adjacent natural contours. Reshape final landform with embankments at a slope of approximately 1V:7H.	Decommissioning audit. Audit by Austsand to confirm closure scope of works have been constructed according to design. Completion of audit inspection checklist (to be prepared by Austsand).
	Dispose of hazardous material in accordance with applicable Acts and Regulations;	Hazardous materials removed from site to appropriate disposal facility. No contaminated sites left after closure or, if present, are effectively contained.	Decommissioning audit. Contaminated sites investigation.
	Remove and dispose of all above-ground rubbish and redundant infrastructure;	Mine infrastructure required by other parties is to have a formal sequential use agreement in place prior to mine closure. Roads not subject to a sequential use agreement are ripped and rehabilitated. Roads required for monitoring and maintenance are in useable condition.	Decommissioning audit.
	Disturbed areas stabilised with vegetation consistent with agreed sequential land use.	Average 75% plant cover after 5 years. No visible dust from the seed orchard site leaving the boundary of the property.	Rehabilitation monitoring results by inspection and surveys.

9. Closure Implementation

9.1 Progressive rehabilitation

9.1.1 Progressive rehabilitation sequence

The silica sand mining process involves a continuous clearing-mining-rehabilitation cycle which aims to rehabilitate completed mine areas on a progressive basis. A rehabilitation program has been implemented since the mining operations commenced in 1995. Rehabilitation has commenced over approximately 67.4521 ha of disturbed land within the site.

A summary of the key actions of the progressive rehabilitation sequence is outlined in Table 17.

Table 17 Summary of progressive rehabilitation sequence

Stage	Task	Action	Outcome	Timing
1	Survey	Mark out (peg) clearing area for new mine extension.	Ensure compliance with clearing permit area.	Pre-mining.
2	Vegetation removal	Standing remnant vegetation to be pushed into windrows for stockpiling for later respreading on rehabilitated areas.	Ensure vegetative material is retained.	Up to one year prior to mining.
3	Topsoil stripping	Progressively remove topsoil to a minimum depth of 150 mm. Direct return to an area undergoing rehabilitation, if scheduling allows.	Maximum retention of soil fertility and existing seed bank, as well as retention of the organic matter within the topsoil.	Up to one year prior to mining.
4	Topsoil stockpiling	Topsoil to be stockpiled to a maximum depth of 2 m.	Reduction in change of the physical structure of the topsoil as a result of compaction and change in the moisture content. Retention of preferred growth media to support plant growth in rehabilitated areas.	Prior to mining.
5	Backfill pit with residue sand	Residue sand to be returned to complete mine voids as soon as practicable.	Backfilling of completed pit areas.	Continuous progression of the trailing edge of excavations.
6	Landform shaping	Contouring/ re-profiling of completed mining areas.	Contouring of post-mining landform to provide an undulating post mining profile that matches into adjacent topography.	Following completion of return of overburden (typically within 12 months of mining).
7	Topsoil return	Topsoil is placed over residue sand to a minimum depth of 150 mm.	Construction of post-mining landform to match into surrounding contours. Return of seed bank to landform.	Prior to the first winter rain following the completion of backfill.
8	Return of vegetative material	Respread windrowed material over topsoiled area.	Minimise risk of erosion by wind and water and adds organic material.	Immediately following topsoil return.

Stage	Task	Action	Outcome	Timing
9	Soil treatment (if required)	Addition of fertilisers suitable for native plant growth (if required).	Create conditions suitable for native plant growth, but minimising weed growth. The requirement of this stage will be assessed through trials.	Immediately following topsoil return.
10	Seeding (if required)	Apply seed to treated area.	Provide additional/ supplementary seed source, to increase diversity and establishment.	As required, following topsoil seedling establishment results
11	Monitoring and Management	Establish monitoring sites. Maintenance where required. Could include weed management and additional planting.	Allows for assessment of rehabilitation success.	Following completion of seeding. Period to be agreed with the DMIRS.

9.1.2 Rehabilitation areas

Figure 8 shows the distribution of rehabilitation areas on the Mindijup site, a summary of the amount of rehabilitation undertaken by year is provided in Table 18. These areas have been calculated based on the feature survey undertaken in October 2021 by Harley Dykstra on behalf of AustSands.

Table 18 Rehabilitation undertaken by year with the western domain

Year	Area of rehabilitation (ha)
1996/ 1997	5.6703
2003	3.3899
2005	8.3879
2006	5.0405
2007	4.6577
2008	0.9041
2011	1.9302
2012	3.6076
2013	0.8198
2014	3.4019
2015	4.2453
2016	7.4801
2017	1.3405
2018	4.0265
2019	0.1395
2020	6.8645
2021	5.5458
Total (ha)	**67.4521**

The process for progressive rehabilitation is as follows:

– The vegetation (timber and standing vegetation) is cleared using a bulldozer with rake attachment. The vegetation is stockpiled on the boundary of the cleared area for future use. It is spread over the rehabilitated areas to provide seeds, fauna habitat and assist erosion control.

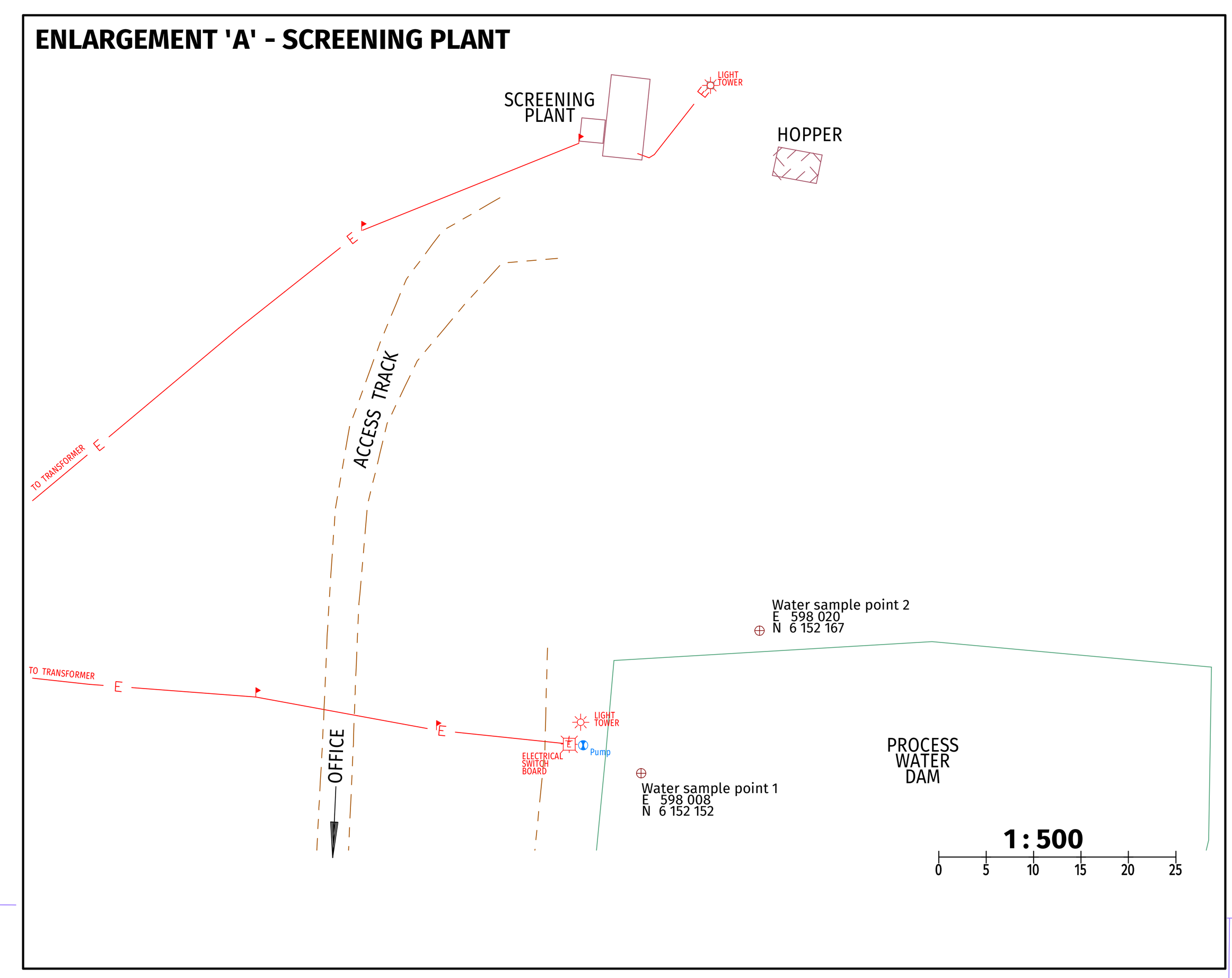
– The top 200 mm to 250 mm of the soil profile containing the topsoil and seed bank is removed using a scraper and stockpiled to a height of 500 mm – 700 mm. Once mining is complete in an area, the topsoil is respread.
– Rehabilitated landforms have a gentle slope of approximately 1V:7H. To date, this slope has been successful in limiting runoff and soil erosion from the landforms.

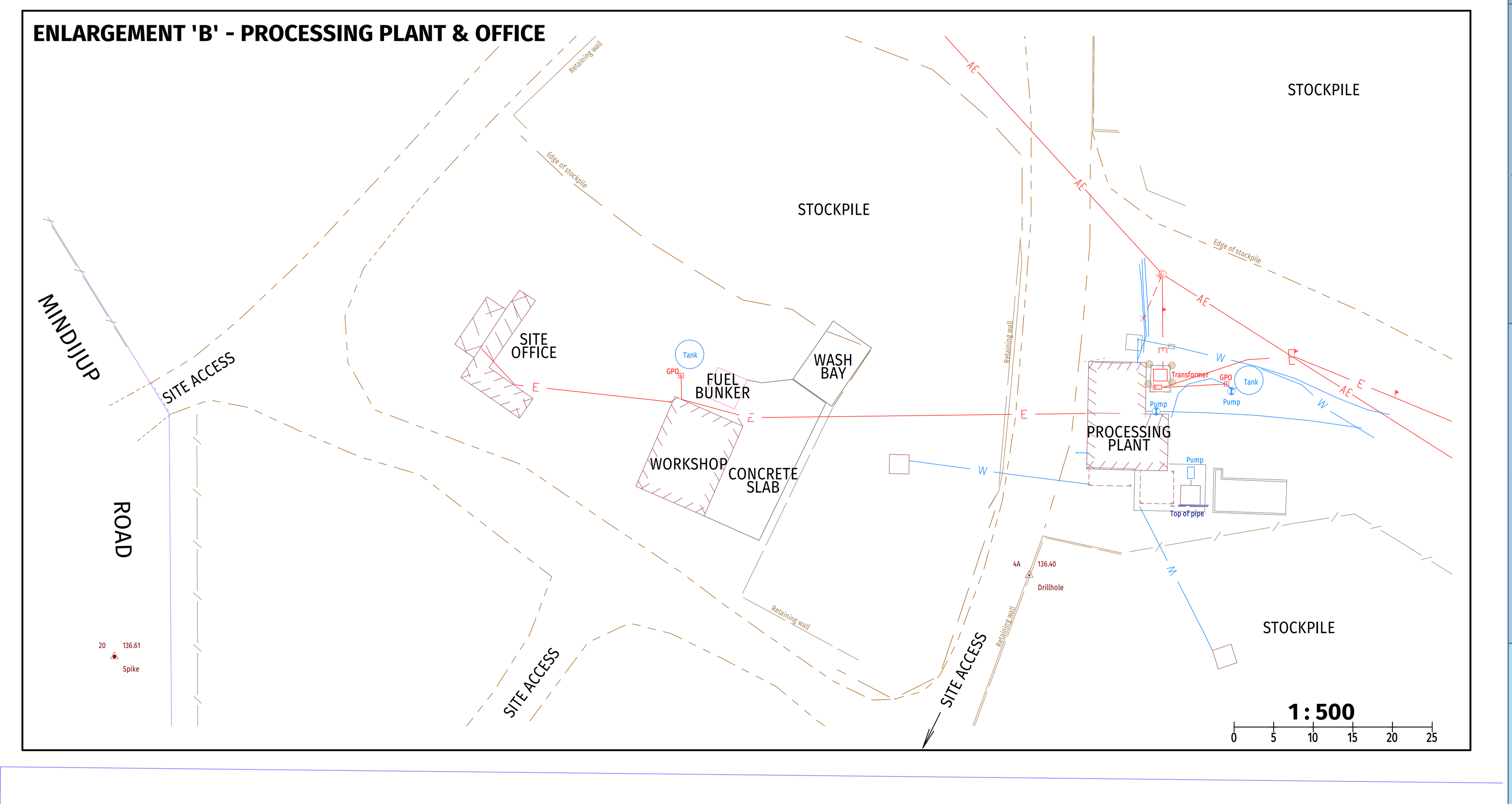
Images in Plates 2 and 3 of developing rehabilitated vegetation is shown below from the 2021 rehabilitation monitoring.

Plate 2 ***Rehabilitation date 2017 (MQ17 2021)***

Plate 3 ***Rehabilitation date 2012 (MQ08 2021)***

102
2141.54
Firebreak
3
REMNANT VEGETATION
REHAB 2015 0.6696ha
REHAB 2016 7.0917ha
REHAB 2018 2.0685ha
REHAB 2020 5.8562ha
REHAB 2020 1.0083ha
SUBSOIL 2021 0.2320ha 2000m³
Excavation 1.25ha into new area
2020 CLEARING (6ha)
SEED BANK 2021 0.1441ha 1070m³
6ha
SUBSOIL 2021 0.5246ha 8792m³
REHAB 2014 2.4434ha
REHAB 2005 1.4522ha
REHAB 2007 1.9887ha
REHAB 2006 5.0405ha
REHAB 2012 1.3274ha
REHAB 2018 1.9580ha
REHAB 2021 2.5524ha
SEED BANK 2019 & 2021 0.8286ha 2004m³
Future clearing area – not yet cleared
4.623ha
REJECT MATERIAL 24 654m³ 1.1357ha
EXTENT 1.6839ha
REHAB 2019 0.1395ha
REHAB 2012 1.4607ha
REHAB 2005 2.4161ha
SCREENING PLANT
See enlargement 'A'
REJECT MATERIAL 51 139m³ 2.1483ha
Haul Road
REHAB 2012 0.8195ha
REHAB 2015 2.6213ha
RECLAIMED DAM 0.1710ha
REHAB 2005 3.1945ha
TAILINGS STORAGE FACILITY (2) 16,137m³ 0.5591ha
TAILINGS STORAGE FACILITY (1) 17,195m³ 0.5919ha
REHAB 2005 0.2236ha
REHAB 2008 0.9041ha
REHAB 2005 1.0965ha
REHAB 2007 0.2631ha
REHAB 2011 0.8412ha
REHAB 2016 (Previous Seedbank) 0.2393ha
REHAB 2021 0.4390ha
REHAB 2013 0.2223ha
REHAB 2021 0.2538ha
Backfill Face 20-10-2021
2021 CLEARING (6ha)
STOCKPILE AFS90 (2021) 30060m³ 0.9396ha
Existing track
6ha
5.9477ha
SEED BANK 2017 1519m³ 0.1735ha
REHAB 2017 1.3405ha
SEED BANK 2017 2539m³ 0.3223ha
REHAB 2021 2.3006ha
SUBSOIL 2021 0.5366ha 7499m³
SEEDBANK 2021 0.5731ha 7651m³
Pit face 18-10-2021
REMNANT VEGETATION
STOCKPILE (PRODUCT)
REHAB 2007 1.9934ha
REHAB 2011 1.0890ha
REHAB 2016 (Previous Seedbank) 0.1491ha
REHAB 2013 0.5975ha
REHAB 2015 0.9544ha
REHAB 2016 0.9585ha
2019 CLEARING (6ha)
Backfill face 21-10-2021
Pit face 18-10-2021
580.08
353.08
496.56
612.03
500.73
MINDIJUP
REHAB 2003 3.3899ha
REMNANT VEGETATION
STOCKPILE (PRODUCT) 3.2203ha
OFFICE
STOCKPILE (PRODUCT) 0.3471ha
PROCESSING PLANT
COLLECTION DAM 0.4340ha
See enlargement 'B'
SHED
FUEL BUNKER
STOCKPILE (PRODUCT) 0.8063ha
Heavy Vehicle Access Rd
REHAB 96/97 5.6703ha
LOT 5
260.98ha
REMNANT VEGETATION 141.30ha
6
309.99
REHAB 2007 0.4125ha
832.47
50
ROAD
480.65
REMNANT VEGETATION
490.9
WATER COLECTION DAM 300m
Water sample point 1
Water sample point 2
62.62
163.02
349.48





LAND UNDER REHABILITATION

Rehab 1996/97	5.6703ha
Rehab 2003	3.3899ha
Rehab 2005	8.3879ha
Rehab 2006	5.0405ha
Rehab 2007	4.6577ha
Rehab 2008	0.9041ha
Rehab 2011	1.9302ha
Rehab 2012	3.6076ha
Rehab 2013	0.8198ha
Rehab 2014	3.4019ha
Rehab 2015	4.2453ha
Rehab 2016	7.4801ha
Rehab 2017	1.3405ha
Rehab 2018	4.0265ha
Rehab 2019	0.1395ha
Rehab 2020	6.8645ha
Rehab 2021	5.5458ha
TOTAL REHAB	67.4521ha

Total area of Lot 5	260.98ha
Existing cleared mining area	52.2246ha
Existing rehabilitated area	67.4521ha
Total Area of Activity	119.6767ha

1:2500 METRES

Harley Dykstra
PLANNING & SURVEY SOLUTIONS

rev	details		date
L	Stockpile volumes added	AJE	21-12-21
K	AFS90, pit faces & tracks modified	AJE	21-10-21
J	New rehab, clearing, tracks, stockpiles	AJE	20-10-21
I	2021 clearing area updated		5-07-21
H	Labelling changes		14-06-21
G	2021 Rehab, seedbank & subsoil		8-06-21
F	Various labelling changes changes		22-04-21
E	Bore and electrical cable removed near screening plant		19-01-21
D	ROM Area Amended		15-12-20
C	New rehab and pit face added		30-09-20
B	New rehab and pit face added		8-04-20
A	See 12993-11 for older revisions		13-11-19

survey: COMPILED	cad file: 12993-32L.lcd
drawn: AJE 20-10-2021	checked: SD 20-10-2021
horiz datum: MGA94	level datum: AHD
scale at A0: 1 : 2500	all distances are in metres

SITE PLAN

client
AUSTSAND MINING

description
LOT 5 MINDIJUP ROAD
PALMDALE
2021 UPDATE SURVEY

drawing no
12993-32L

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ALBANY | DENMARK | BUNBURY | BUSSELTON | FORRESTDALE | PERTH

9.1.3 Rehabilitation results

The re-use of stripped vegetation and topsoil on mined out areas has provided generally good revegetation results over a number of years. It must however be noted that slightly different rehabilitation techniques have been applied over the years.

In some areas, planting of native species (in revegetation prior to 2011) and additional seeding has occurred. This has involved seeding with a range of species, with seed collected on the site or from within 15 km, where collection at site is not possible. A total of nine over-storey plant species were planted and seeded in some rehabilitated areas, in order to address the general lack of over-storey species establishment. An additional five shrub species were also seeded. Total seeding rates were approximately 0.5 kg per hectare. Seeds were pre-treated with suitable treatments for particular species, including heat treatment, smoking or scarifying.

GHD (2011) conducted a rehabilitation performance survey. At this time areas rehabilitated in 1996/97 (13-14 years old), 2003 (8 years old), 2005 (6 years old), 2006 (5 years old) and 2007 (4 years old) were surveyed and compared against adjacent undisturbed areas. This survey also included the wetland area in the south of the property. GHD (2011) identified that total species present in analogue (bushland) sites was 120 and the total present in rehabilitation areas was 99, resulting in an overall species return in rehabilitation areas of 82.5%.

Further rehabilitation monitoring occurred in November 2014, August 2015, October 2017, October 2019 and September/ October 2021. In total 19 permanent quadrats (including three analogue sites) and photographic reference points have been established/ assessed in different rehabilitation years (three- to 25-year-old rehabilitation) and remnant vegetation.

The report for the 2021 monitoring round is currently in preparation therefore 2019 rehabilitation monitoring results are summarised in Table 19. Rehabilitation across the site has shown a marked increase in species diversity throughout all rehabilitation years. As shown in Table 19, monitoring quadrats are currently at or exceeding the baseline and achieving at least 73 % of the analogue site diversity.

The cover in the ground and mid layers has improved but is still below 50% of the analogue sites for much of the rehabilitation area. Given the diversity and counts it is expected that cover will continue to improve over time. This will continue to be monitored, and corrective actions implemented if continued improvement in cover is not observed in future monitoring rounds.

The monitoring rounds have detected a lack of upper storey species, in particular *Banksia attenuata* and *B. ilicifolia* and *Eucalyptus staeri.* To improve the density of these species additional tube stock planting will be undertaken in 2022 and the survival rate will be monitored as part of the 2023 rehabilitation monitoring round.

Table 19 2019 Rehabilitation diversity

Rehabilitation year	Current Age of Rehabilitation (years)	Native Taxa 2014	Native Taxa 2015	Native Taxa 2019	% Ave. 2019 Analogue Site returned
2016 (MQ15)	5	-	-	27	73
2015 (MQ14)	6	-	-	40	108
2014 (MQ12)	7	-	-	39	105
2013 (MQ06)	8	-	27	34	92
2012 (MQ08)	9	-	29	43	116
2011 (MQ01)	10	32	33	49	132
2008 (MQ07)	13	-	27	45	122
2007 (MQ02)	14	17	24	37	100
2006 (MQ04)	15	18	-	34	92

Rehabilitation year	Current Age of Rehabilitation (years)	Native Taxa 2014	Native Taxa 2015	Native Taxa 2019	% Ave. 2019 Analogue Site returned
2005 (MQ04)	16	22	25	42	114
2003 (MQ03/MQ11)	18	20	-	43	162
1996/97 (MQ09)	25	-	18	34	92

The interim 2021 monitoring results indicate that across the rehabilitation area the extent of plant loss has either improved (on average between 5-10 %) or remained consistent with previous years. Similarly, the overall projected foliar cover in mid and ground-strata has either remained consistent or increased since the previous monitoring round.

Weed species have increased in both the number of taxa present and the number of individuals within the quadrats (count). However, weeds have not been a detrimental factor in the success of the rehabilitation, as they have been recorded at less than 2 % cover within the monitoring quadrats. Three woody weeds, **Acacia longifolia,* **Leptospermum laevigatum* and **Kunzea baxteri*, were noted within the site. Surveys for these are undertaken as part of the rehabilitation monitoring. The **Acacia longifolia* and **Leptospermum laevigatum* are largely restricted to the outer perimeter. The locations have been removed and treated and the density and number of locations are reducing. The **Kunzea baxteri* is restricted to a patch within the 2003/ 2007 rehabilitation and is being actively managed. The extent and density of this patch is reducing.

Factors that influence success of rehabilitation include the season and quality (age) of topsoil. Species included in the rehabilitation process have included feeding resources for Black Cockatoos such as *Banksia attenuata*, *Banksia ilicifolia*, *Allocasuarina fraseriana*, *Eucalyptus marginata* and *Corymbia calophylla*.

Based on the 2021 monitoring results additional tube stock planting of the Black Cockatoo feeding trees will be undertaken in 2022. This will focus on the Banksia species, which are noted as being under-represented in the rehabilitation areas.

Of note, a number of often difficult-to-grow species have re-established, including orchids, *Epacrid* species, *Drosera* species and a range of sedges and lilies. Weed species have not been a detrimental factor in the success of the rehabilitation.

Review and improvements to rehabilitation is ongoing, in order to be able to consistently re-establish an overstorey layer and increase presence of species with longer life spans.

Action 8: Continue rehabilitation monitoring on a biennial basis. Add additional rehabilitation plots and analogue sites to the study over time

9.2 Early closure – permanent closure or suspended operations under care and maintenance

Unexpected or temporary closure may occur due to local and external factors. For the purposes of this MCP, temporary closure is assumed to be for a period of up to 5 years, while unexpected closure relates to the sudden cessation of mining operations and permanent closure of the facility. In the event of permanent closure, the current mine closure plan will apply.

If an unexpected or temporary closure occurs, all relevant legal obligations will be complied with. AustSand will ensure that the relevant DMIRS inspector is notified before any action is taken.

Circumstances may eventuate that require a temporary suspension of mine operations, and entry into a "care and maintenance" period. Provisions in the *Mines Safety and Inspection Regulations 1995* govern care and maintenance periods. The provisions in the Regulations (in part below) would form the basis of a suspension plan to be implemented in such a situation.

> *Notification of the suspension of mining operations at a mine must, in addition to the details set out in regulation 3.12, include the following details —*
>
> *a) the reason for the suspension and the planned duration of the suspension; and*
>
> *b) whether the closure is total or whether access to underground and/or pit workings is to be maintained; and*
>
> *c) if underground and/or open pit access is to be maintained, details of the arrangements that have been made for the provision of regular services and emergency services to ensure the safety of employees engaged in maintaining the mine; and*
>
> *d) the measures that have been taken to prevent unauthorised access or entry to the mine; and*
>
> *e) the precautions that have been taken to protect underground equipment and service installations; and*
>
> *f) any plans required to be prepared under section 88 of the Act.*

Section 88 of the *Mines Safety and Inspection Act (1994)* states:

> *Plans of mine at its abandonment or suspension.*
>
> *1) Where mining operations are about to be abandoned or suspended, the principal employer, or if a receiver has been appointed in respect of a principal employer, that receiver, or the manager must cause to be prepared to the satisfaction of the district inspector for the region in which the mine is situated an accurate plan or plans of the mining operations to the time of abandonment or discontinuance and must furnish that plan or those plans to the State mining engineer in accordance with the regulations before the mining operations are abandoned or suspended.*

Table 20 summarises the key closure tasks to be undertaken in the event of temporary suspension of operations.

Table 20 Temporary suspension of operations tasks

Key suspension tasks	Timeframe
Notify DMIRS before the mining operation is suspended or abandoned.	As soon as possible, but ideally 1 month prior to unplanned closure.
Ensure all safety obligations are met.	During unplanned closure works.
For unexpected closure – immediate review of MCP to include detailed decommissioning plan.	Within 3 months of notification to DMIRS.
For temporary closure – prepare a detailed care and maintenance plan.	Within 3 months of notification to DMIRS.

In the event of temporary closure, the functionality of the site for future mining operations must be maintained while making the site safe, limiting access for unauthorised persons and minimising environmental impacts. Necessary tasks to be implemented in the event of temporary closure are presented below:

- Remove all fuel, oils, hazardous materials, chemicals and consumables that are not required for care and maintenance activities.
- Remove redundant infrastructure, mobile plant, unnecessary equipment and any rubbish from site.
- Empty all tanks not required for care and maintenance and dispose of contents appropriately.
- Clean and decontaminate all workshops, sheds, fuel bays, tanks and any facilities used for storage of chemicals.
- Site facilities are secured to limit access to unauthorised persons.
- Site facilities not required for care and maintenance are electrically isolated.
- Construct vehicular access barriers and abandonment bunding.
- Reshape borrow pits to minimise the risk of falls.
- Backfill costeans and other disturbances to the land surface caused by exploration.
- Cap holes drilled for exploration.
- Entry to underground operations including shafts, portals, declines and vents is secured, sealed, fenced and signposted appropriately to exclude unauthorised access and minimise harm to wildlife.
- Implement the dust management plan.
- All groundwater, surface water, stability, ecology, public safety etc. monitoring requirements are to be defined and scheduled.
- Water management infrastructure including diversions and culverts to be inspected and maintained.
- Conduct a security inspection to identify access controls are in good working order and that there are no signs of unauthorised entry to facilities.

9.3 Decommissioning

A detailed decommissioning plan will be developed at least two years prior to closure. The plan will detail how process infrastructure will be decommissioned, resale or repurposing of any infrastructure with value, disposal of hazardous waste, remediation of contaminated sites. High-level requirements to be addressed in detail in the decommissioning plan are discussed below.

9.3.1 Infrastructure inventory

For decommissioning and demolition planning purposes, site infrastructure will be divided into the six domains outlined below. An infrastructure inventory will be prepared to identify and list all assets. The infrastructure inventory will include the surface area of all fixed infrastructure by domain. Location plans will be developed to identify the assets and work scopes will be developed for decommissioning and demolition activities with associated cost estimates. The infrastructure inventory will include the following for each structure:

- Construction methods
- Existing building condition
- Quantification of volumes of material in the interiors and exteriors of structures
- As-built drawings
- A structural and derelict conditions audit
- A visual review of structural and access (stairs, handrails, elevated walkways) elements.

9.3.2 Hazardous materials assessment

A hazardous materials (HAZMAT) assessment will determine if there are any hazardous materials such as lead paint, poly-chlorinated biphenyls, ozone depleting substances and asbestos on site. If required a HAZMAT register will be prepared to confirm location and volumes of hazardous materials to confirm suitability of proposed demolition methodologies and waste strategies.

9.3.3 Decommissioning and demolition sequencing

An initial review of major laydown areas for material and equipment storage will be conducted to assess the requirements for material sorting, processing and disposal. The proposed approach to decommissioning and demolition for all buildings and infrastructure will follow a specific sequence of events.

This will involve the deployment of specialised teams equipped with appropriate demolition and processing equipment to isolate, confirm a zero-energy state, structurally demolish, remove foundations, process waste streams and grade the site to a self-draining condition for future revegetation. Consideration must also be given to site services that will be impacted during the decommissioning and demolition. Specific tasks will include:

- Delineation of specific work areas (e.g., fencing) to provide a working environment delineated from the other site activities.
- Removal of dangerous goods and flammable liquids (fuels, greases and oils). These items may be used for other purposes, resold back to the provider or disposed at licensed waste facilities.
- Removal of salvageable materials.
- Removal of other contents that could be reused or sold.
- Ensuring each area is in a zero-energy condition through positioning equipment in a zero potential energy state, electrical service isolation and air-gapping of in-feed conductors at transformers, switch gear and/or pull boxes outboard of the work scope.
- Cutting and capping of water services and sewer services.

- Isolation of storm water management infrastructure around the project/work scope.
- Removal/ isolation of communications networks.
- Removal/ isolation of other site services such as air, process water.
- Removal of inert interior contents from buildings prior to demolition without damaging or disturbing potential asbestos containing materials (if applicable) or other designated substances identified.
- Removal of all hazardous building materials once inert materials have been removed.
- Executing structural demolition of buildings and structures using cranes or excavators.
- Removal/demolition of slabs and foundations to a depth of 500 mm to allow for backfilling and grading of the site to a self-draining condition to minimise the risk of long-term ponding post-closure.
- Final clean-up by removal of any debris before revegetation commences.
- Amelioration of dust generation during demolition and rehabilitation activities.

9.3.4 Waste Management, disposal and transport

A waste management, disposal and transport strategy will be prepared to account for the waste resulting from the demolition of infrastructure associated with the mine closure. Waste streams will be segregated at the site of each demolition to facilitate management and/ or disposal.

All waste categories that have been deemed not feasible to recycle shall be disposed of as non-recyclable wastes. It is anticipated that all categories of waste are likely to be generated throughout the demolition of the mine infrastructure. It is also anticipated that waste transportation and segregation shall occur throughout this work and that stockpiling of waste will be temporary and minimised.

The sequencing of the demolition activities and handling of resultant waste materials will be carefully planned to maximise productivity and minimise overall costs.

10. Closure Monitoring and Maintenance

10.1 Monitoring

Monitoring results must substantially demonstrate that closure objectives and completion criteria have been met or are trending towards completion, in order to successfully relinquish the tenement post-closure.

Monitoring will be undertaken to measure progress of mine features against specific completion criteria (Section 8.2). It is envisaged that monitoring will continue for a period of six years following closure. The frequency of monitoring is envisaged to be annual for the first two years and then biennial (in years 4 and 6). This provides four monitoring events in the six-year period.

AustSand will then compile all monitoring results into a report on performance against closure criteria. This report will form the basis of consultation with the DMIRS on the need for further monitoring and if so, what closure criteria remain unsatisfied and what further monitoring is required. If monitoring indicates that completion criteria are not being met, or are not likely to be met, remedial actions will be implemented as described in Section 10.2.

Closure monitoring will generally be a continuance of monitoring undertaken during the life of mine. AustSand considers that monitoring parameters required by regulatory agencies during mine operation should form the basis of monitoring requirements post closure for the following reasons:

i A database of these parameters has been built up during the life of mine

ii There is little point in beginning to monitor parameters post closure that no regulatory agency has considered significant enough to warrant monitoring during the life of mine

iii Following on from point (ii), no operational phase data has been collected against which closure data can be compared.

Further to point (i) above, the considerable mine life of the AustSand mine (approximately 35-40 years) enables a comprehensive monitoring database to be established for key closure issues. Data on issues such as rehabilitation performance, weed presence, dieback presence, erosion and dust, can be compiled to be able to confidently predict whether these issues are likely to be significant issues post closure or not.

Simply put, if 35 years of monitoring data shows a history of these issues being adequately managed over the site and that completed mine areas are safe, stable, have developed (or are developing) self-sustaining vegetation communities and are meeting completion criteria, then the likelihood of these issues becoming significant risks at closure must be considerably reduced. Monitoring for monitoring's sake should not occur, nor should monitoring low risk factors that a history of monitoring shows has not caused a detrimental environmental impact.

For this reason, post closure dust monitoring has been removed from this revision of the MCP. No quantitative environmental dust monitoring (dust deposition or TSP) has been undertaken at the mine during operation. There are no current statutory requirements to monitor this parameter. AustSand considers this is not a significant post closure risk that warrants a post closure monitoring program.

Table 21 summarises the proposed monitoring and maintenance requirements for each domain.

Table 21 Closure monitoring requirements

Domains	Rehabilitation performance	Decommissioning audit	Justification for monitoring parameters
Sand excavation areas	x	x	Closure and rehabilitation work implemented as per design. Rehabilitation performance.
Processing and support infrastructure areas	x	x	Closure and rehabilitation work implemented as per design. Rehabilitation performance.

10.1.1 Decommissioning audit

A decommissioning audit will be conducted after decommissioning and closure works in order to confirm all work has been completed as per design. These include:

- Site does not contain redundant infrastructure and is free of rubbish
- Contaminated sites audit has been completed for suspected or known contaminated areas
- Earthworks and rehabilitation works have been completed.

10.1.2 Rehabilitation performance

The progress of revegetation establishment will be monitored through a combination of visual inspection and botanical survey.

Visual monitoring

Visual monitoring of rehabilitated areas will be conducted to assess:

- Any signs of poor rehabilitation development that may require treatment, supplementary seeding or earthworks
- Species recruitment
- Stability of rehabilitation sites.

Areas will be photographed from fixed positions so that changes with time can be clearly observed.

Native species restoration

For mine areas rehabilitated to native vegetation, botanical monitoring will record species diversity and cover, compared against undisturbed analogue sites, weeds and plant death (that may be attributable to dieback disease. The previous MCP included ecosystem function analysis (EFA) as a rehabilitation monitoring tool. The EFA methodology was initially developed for elevated mine landforms such as waste rock dumps in more arid climate zones. The methodology is not considered applicable for the flat sand mine profile of completed mine areas in the Albany region. Quadrat botanical assessment has been selected as the method of choice for the Mindijup site.

Of note, the earliest rehabilitation is now 25 years old and there is a regular age range from the present back to 10+ years old. Monitoring of this rehabilitation continues on a regular basis. The data collected will provide invaluable benchmark information to enable trend assessment of rehabilitation performance over time. This will allow realistic and achievable specific completion criteria to be developed in successive versions of MCPs.

Building envelopes (possible)

For mine areas rehabilitated to a building envelope for sequential use, native species is not considered an appropriate rehabilitation objective. A stable, non-eroding surface can be provided by pasture species, which also allow easy management to sustain a low fuel fire precinct.

10.2 Remedial actions

Should visual inspections or monitoring results indicate the need for maintenance works or remedial action to be undertaken, AustSand will mobilise contractors to site to undertake these works. Such maintenance works may include revegetation. If revegetation is failing to establish, additional application of fertiliser, additional seeding or planting will be implemented. Control of weeds by spraying will be implemented if required.

10.3 Tenement relinquishment

Any application for tenement relinquishment will be accompanied with a report showing evidence of successful rehabilitation. This would show rehabilitation meeting or trending towards completion criteria.

11. Financial Provisioning for Closure

AustSand maintains an internal closure cost estimate calculated using quantity schedules and unit rates for specific tasks (Appendix F). Unit rates have been calculated from various sources, including:

- AustSand operational fleet rates
- Equipment requirements for rehabilitation works (including load and haul, shaping, seeding, topsoil and vegetation return)
- Rates of current AustSand contractors
- Industry cost estimation reference texts (Rawlinson's cost guides)
- Indirect costs have been included in the closure cost estimations, including items such as:
  - Post-closure monitoring
  - Mobilisation and demobilisation of contractors
  - Post closure management /consulting services.
- A contingency of 30% of the total estimated costs has been applied.

The MRF provides an annual review mechanism to record the current status of disturbed land and land under rehabilitation. These calculations provide the basis for MRF fee payment and update of AustSand's rehabilitation cost estimates.

12. Management of Information and Data

This plan is not confidential and may be made publicly available in accordance with the Mine Closure Plan Guidance – how to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans (DMIRS, 2020).

12.1 Review of the closure plan

This Closure Plan will be reviewed every three years or as per Tenement Conditions.

12.2 Records and data management

AustSand has implemented a closure information data management system that consists of Registers that record relevant details and where the complete reference is stored and have been outlined in Table 22.

These Registers are intended to provide a simple and concise method of documenting information relevant to mine closure and rehabilitation. They provide a cross reference to where the complete digital or hardcopy version of each reference is stored. This system allows the site to maintain its closure information system in a timely and cost-effective manner.

Table 22 Mine closure registers

No.	Item	Inclusions
1	Compliance (Obligations) Register	Approvals, licences, permits, tenements; their conditions and expiry dates.
2	Closure Information Register	Baseline reports and studies. Monitoring reports during operations. Relevant industry reports.
3	Stakeholder Engagement Register	Record of correspondence and meetings.
4	Document Register	Approvals and permits. DMIRS – MP, NOI, MCP, AER, MRF etc. DWER – AER DAWE – EPBC Act Clearing permit Management Plans Site Plans Forms and Checklists

12.3 Accountability and responsibility

Closure is an integral part of project planning and AustSand assigns clear accountability to the Mine Manager for site closure. The key closure accountabilities for the site are:

- Regularly review and update the information data system as new information becomes available
- Integrate closure management into operational actions and processes
- Incorporate closure considerations into mine planning
- Store and maintain closure documentation and data to be readily retrievable and protected against damage, deterioration or loss.

12.4 Priority actions in this MCP

Table 23 provides a summary of priority actions contained in this MCP for implementation during the term of this MCP. The table includes a column to be updated in the next MCP that documents when these actions were completed. Future versions of the MCP may also add new actions to this table, for implementation during the term of those documents. In this way, Table 23 becomes a register of key closure actions implemented over time for the Mindijup sand mine.

Table 23 Summary of actions in the MCP

Action	Description	Status (next MCP)
Action 1	Review and update the Compliance Register on a regular basis	The Legal Obligations Register is updated with additional requirements as they become available.
Action 2	Review and update the Stakeholder Register on a regular basis	It is acknowledged that no further consultation with stakeholders has been undertaken since 2014 regarding suitable post-mining land uses. However, it is considered that, due to the length of time until the mine closes, stakeholders do not have significant interest in the site at this time.
Action 3	Undertake ongoing consultation with Stakeholders to inform the MCP and identify suitable post-mining land use	
Action 4	Conduct periodic pH and electrical conductivity reading on the decant	Austsand has continued to monitor water quality as an internal measure from 2014 to 2021 (ongoing). The data continues to show a low risk of potential impact (Appendix E). The pH of the decant dams will continue to be monitored and a decision made by Austsand on some form of lime dosing if it considers this is warranted.
Action 5	If the rehabilitation materials balance audit identifies a deficit of required material, Austsand will prepare a contingency plan to mitigate the material deficit. The plan will be included into the MCP to enable actions contained within it to be progressively implemented through the life of mine	Austsand is in the process of reviewing the materials balance for the Mindijup site. The outcome of the review will establish if sufficient suitable material is available on site. If a deficit of suitable material is identified, Austsand will prepare a contingency plan that will be incorporated into the MCP.
Action 6	Continue undertake monitoring on an annual basis using hand-held monitoring equipment for pH and TDS.	Austsand has continued to monitor water quality as an internal measure from 2014 to 2021 (ongoing). The data continues to show a low risk of potential impact (Appendix E). The pH of the decant dams will continue to be monitored and a decision made by Austsand on some form of lime dosing if it considers this is warranted.
Action 7	Austands will conduct specific stakeholder consultation during the period of this MCP on the post-mining land uses	The next phase in the consultation plan is to continue to consult/ seek input from stakeholders on post-mining land use and the key elements of the MCP. This will include follow-up consultation closer to mine closure with previously identified stakeholders and identifying new stakeholders that may be interested in acquiring the land post-mining.
Action 8	Continue rehabilitation monitoring on a biennial basis. Add additional rehabilitation plots and analogue sites to the study	Further rehabilitation monitoring occurred in November 2014, August 2015, October 2017, October 2019 and October 2021. Across the rehabilitation area the extent of plant loss has either improved (on average between 5-10 %) or remained consistent with previous years. Similarly, the overall projected foliar cover in mid and ground-strata has either remained consistent or increased since the previous monitoring round. Review and improvements to rehabilitation is ongoing, in order to be able to consistently re-establish an overstorey layer and increase presence of species with longer life spans.

13. Reviewed Mine Closure Plans

13.1 Revision summary

The current MCP has been updated as per the DMIRS (2020) Mine Closure Plan Guidance, therefore there have been changes to the order and additional sections added of the document. The key changes between the 2018 and 2021 MCPs are listed in Table 24.

Table 24 Key changes between 2018 and 2021 mine closure plans

Section in 2018 MCP	2021 MCP change	Reason for change
Section 1 Introduction	GHD document history section moved to the Revision History page	Formatting
	GHD limitations section moved to the Document Status page	Formatting
NA	Section 2.6 Disturbance added	To give a more detailed view of disturbance and rehabilitation areas within the site.
Section 3 Identification of closure obligations and commitments	Added Section 3.1 Applicable legislation	Additional legislation information
Section 5 Post-mining land use and closure objectives	Moved to Section 6 Post-mining land use(s)	As per DMIRS (2020) Mine Closure Plan Guidance
Section 5 Completion Criteria	Moved to Section 8 Closure outcomes and completion criteria Updated Eastern Domain completion criteria	Updated based on the findings of the 2021 interim rehabilitation monitoring results.
Section 7 Collection and analysis of closure data	Moved to Section 5 Baseline and closure data ana analysis Baseline gap analysis table added Water quality monitoring data updated	As per DMIRS (2020) Mine Closure Plan Guidance Updated based on the findings of the 2021 monitoring results.
Section 8 Identification of closure issues	Moved to Section 7 Closure risk assessment	As per DMIRS (2020) Mine Closure Plan Guidance
Section 9 Closure implementation	Updated rehabilitation results Decommissioning section added	Updated based on the findings of the 2021 interim rehabilitation monitoring results.
Section 10 Closure monitoring and maintenance	Rehabilitation performance information expanded	Additional information
Section 12 Management of information and data	This section has more headings added and priority actions in this MCP moved to this section	Formatting
	Section 13 added	As per DMIRS (2020) Mine Closure Plan Guidance

13.2 DMIRS comments on the 2018 MCP

It is noted, at time of writing, that the 2018 MCP has not yet been assessed by DMIRS. However, as the MCP is due for updated on a three yearly basis, the update of the current MCP is due in December 2021.

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Appendices

Appendix A

External Agency Audits

Australian Government
Department of the Environment and Energy

Mr Scott Whitbread
Site Manager, Mindijup Silica Sand Mine
Austsand Mining
PO Box 1373
ALBANY WA 6331

Dear Mr Whitbread

EPBC 2012/6472: Extension of existing Silica Sand Mine, Mindijup – revised Rehabilitation and Mine Closure Plan

I refer to the letter dated 16 September 2016, from GHD Pty Ltd to the Department, seeking on behalf of Austsand Mining approval of the revised Rehabilitation and Mine Closure Plan.

Officers of this Department have evaluated the revised Rehabilitation and Mine Closure Plan, with particular regard for the approval conditions for EPBC 2012/6472. On the Department's advice, and as a delegate of the Minister for the Environment and Energy, I have decided to approve the following plan in accordance with condition 10 of the approval:

- *Austsand Mining, Mindijup Silica Sand Mine, Rehabilitation and Mine Closure Plan 2016* Rev D, dated 12 April 2017 and declared to be accurate by Ryuji Sakizaki of Austsand Mining.

In accordance with condition 5 of EPBC 2012/65472, the *Austsand Mining, Mindijup Silica Sand Mine, Rehabilitation and Mine Closure Plan 2016* Rev D, dated 12 April 2017 must now be implemented in place of the Rehabilitation and Mine Closure Plan approved by a delegate of the Minister for the Environment on 17 March 2014. If Austsand Mining wishes to implement the approved action in a manner other than in accordance with the approved Rehabilitation and Mine Closure Plan, Austsand Mining must submit a revised Rehabilitation and Mine Closure Plan for approval.

The Department is continuously seeking opportunities to reduce regulatory burden, with a recent initiative being to only require approval of revised management plans where implementing the revised plan may result in a new or increased impact. Please see attached guidance on the "Revised Management Plan" condition and, if you might be interested, submit a request to the Department to vary the conditions of approval for EPBC 2012/6472.

Should you require further information on any of the above please contact Vaughn Cox on 02 6274 2005 or by post.approvals@environment.gov.au.

Yours sincerely

Monica Collins
Assistant Secretary
Compliance & Enforcement Branch
Environment Standards Division

10 May 2017

CC: Anna Napier, GHD Pty Ltd.
Enc. Guidance on new or increased impact

Government of Western Australia
Department of Mines and Petroleum

Our ref: Registration ID: 58266
Enquiries: Jessica Allen (08) 9222 3102
Email: jessica.allen@dmp.wa.gov.au

The Registered Manager
TT Sand Pty Ltd
PO Box 786
VICTORIA PARK WA 6979

Attention: Mr Scott Whitbread

Dear Sir

APPROVAL FOR MINE CLOSURE PLAN - MINDIJUP SILICA SAND MINE REVISED MINE CLOSURE PLAN 2015 - M70/793
REGISTRATION ID: 58266

I refer to your Mine Closure Plan dated 24 March 2016, for the Mindijup Silica Sand Mine, which has been assessed by this Department. The document satisfies the Schedule of Conditions associated with the tenements for this project.

Approval is hereby given for the Mine Closure Plan to be implemented. This plan is to be reviewed and lodged with the Department in accordance with revised conditions.

Please note the following points, which should be considered before resubmission of the Mine Closure Plan in 2018:

Section of the Mine Closure Plan	Comments
Water quality monitoring	pH in the process water dam (p 38) – the monitoring results show that there has been an increase in acidity. Action 8 is to continue to undertake monitoring on an annual basis using hand-held monitoring equipment for pH and TDS. DMP support this and if the trend continues then AustSand should consider if additional actions are required.
Gap analysis	The gap analysis from the 2013 MCP identified geochemistry and water quality as areas where further investigation would be beneficial. These investigations were undertaken and are summarised in the 2015 MCP. AustSand is to be commended and the results from these investigations will assist with closure. The gap analysis from the current 2015 MCP was also well done. DMP concurs that further investigations into establishment of upper-storey species and consistency in obtaining increased plant diversity and cover will assist in improving revegetation criteria.

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I advise that I intend to recommend to the Minister responsible for the *Mining Act 1978* that he impose further conditions on the tenements linked to this project under the provisions of Section 84 of the *Mining Act 1978*. A schedule of further conditions is attached.

Should you have any queries regarding the recommended condition(s), please contact Environment Officer Jessica Allen (Environmental Officer) on (08) 9222 3102.

Yours faithfully

_____

Phil Gorey | Executive Director
Environment
30 May 2016

Attach: Recommended Further Conditions

RECOMMENDED FURTHER CONDITIONS
FOR MINING LEASE 70/793

Please ADD the following document to Condition 8:

- (Reg ID:58266) *"AustSand Mining - Mindijup Silica Sand Mine - Revised Mine Closure Plan 2015"* dated 24 March 2016 signed by Scott Whitbread, and retained on Department of Mines and Petroleum file no. EARS-MCP-58266 as Doc ID 4165229.

Please REMOVE the following document from Condition 8:

- (Reg ID:38128) *"AustSand Mining - Mindijup Silica Sand Mines - Mine Closure Plan"* dated 3 April 2013 signed by Scott Whitbread, and retained on Department of Mines and Petroleum file no. EARS-MCP-38128.

Please alter existing Mine Closure Plan Condition 17 to read 2018 in place of 2015.

[MTSD: Note Non-Standard Condition]

Paul Rokich

From: Paul Rokich
Sent: Thursday, 25 February 2016 10:05 AM
To: 'jessica.allen@dmp.wa.gov.au'
Cc: Scott Whitbread (InTouch); Jeff Foley; Anna Napier
Subject: ID 58266_Austsand MCP 2015_ response to DMP comments
Attachments: 155044.pdf; Austsand response to DMP comments.pdf

Hello Jessica,

Please find attached for further discussion Austsand's responses to your questions on the MCP 2015.

I'd be happy to come down and go through the responses with you.

Regards

Paul Rokich
Principal Environmental Scientist

GHD
T: 08 6222 8207 | M: 0439 952 595 | E: paul.rokich@ghd.com
999 Hay Street Perth WA 6004|
WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

Paul Rokich

From: ALLEN, Jessica <Jessica.ALLEN@dmp.wa.gov.au>
Sent: Friday, 4 March 2016 6:55 PM
To: Paul Rokich
Subject: Revised MCP and closure criteria

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Paul,

Completion Criteria
Yes, the completion criteria needs to be maintained long enough to show that the rehabilitation is capable of sustaining an agreed post-mining land use. As an example the "average species diversity of 75% of analogue sites" may be recorded one year within a few years of monitoring. However, there are common revegetation failures that can show several years after planting, both natural (drought, fires) and as a result of the mining (the soil profile contains a compacted layer that tree roots cannot penetrate); and it needs to be demonstrated the vegetation will survive long term. This can translate to "this value +/- 5% is maintained for 5 years".

Including the length in time the values must be maintained in the wording, as you suggest below, is a good approach to completion criteria. Both the measurement and time maintained would be further refined during the MCP process and as closure of the mine approached final values for both would be agreed to. This is what relinquishment would be based on. The values would be site specific and based on the baseline data, monitoring results and any relevant literature.

Revised Mine Closure Plan
Thank you for your response provided on 25 February to DMP's request for further information and the subsequent meeting today. In summary:

- Item 3.2 (Water Quality Monitoring Results) was addressed in the response table provided and no change in the MCP is required.
- As per our discussions today, Items 3.1 (Identification of Closure Issues Hydrology), 5.2 (Acidity), and 5.3 (Dust monitoring) can be addressed through Section 8 (Identification of Closure Issues) of the MCP to describe either how it is a low risk because mitigation measures are in place or why it is not considered a closure risk. A short explanation should also be included in Section 10 of the MCP as to why dust monitoring was removed.
- The other items were not adequately addressed through the response table itself; however, discussions in the meeting indicated they could be addressed through better defining the domains.

Please provide a revised MCP to address these concerns within 20 working days (1 April 2016). I will send a Communications through DMP's EARS system that you can attach the document to as it is likely to be larger than 10 MB (our email size limit). Please ensure that the requested response is accompanied by the *Cover Letter Proforma: Submission of New/Revised Information* that will be attached to the Communication.

If you have any questions or if it is not possible to provide the revised MCP within 20 working days, please let me know.

Kind regards,
Jessica

Jessica Allen | Environmental Officer | Operations, Environment

Department of Mines and Petroleum

Tel: +61 8 9222 3102 | jessica.allen@dmp.wa.gov.au
www.dmp.wa.gov.au

From: Paul Rokich [mailto:Paul.Rokich@ghd.com]
Sent: Friday, 4 March 2016 11:47 AM
To: ALLEN, Jessica
Subject: closure criteria

Hi Jessica,

Many thanks for the meeting this morning. I will revise the document accordingly.

On the walk up the terrace, I considered our discussion on closure criteria (cc) for veg/rehabilitation and what/when the DMP would consider the condition satisfied.

You stated that just meeting a documented cc (we discussed "average species diversity of 75% of analogue sites") would NOT be considered as 'criteria met' by the DMP. There would need to be data showing that this value was maintained over a period of time (you acknowledged that it doesn't need to be perfectly flat and some minor fluctuation would be acceptable, as long as there was not a significant downward trend.

The key issue for DMP clarification is the duration of this period of time and documenting this parameter in the MCP.

As it currently stands, this parameter is not documented in our cc and needs to be, so all parties see the quantitative criteria that are measured and then, once attained, DMP relinquishment is forthcomming.

Thinking through your comments, having any quantifiable number in the cc column, whether %diversity, % cover, % weed cover, number of weed species etc etc is meaningless if DMP will not sign off on the attainment of this value unless (for example) "*this value +/- 5% is maintained for 5 years*"

THIS is the critical cc. Unless this criteria is met, the other numbers are meaningless. As you stated, even if we achieved 75% diversity, DMP would not sign off the criteria. If this is the case, 75% diversity is NOT the COMPLETION criteria.

Happy to phone you to talk about this.

Regards

Paul

Paul Rokich
Principal Environmental Scientist

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DMP Correspondence ref: ID 38128, dated 18/9/2013

Item Number	DMP Comment	Austsand Response	Outcome / Actions
Collection and analysis of closure data – other closure related data	The final landform is not clear from the data provided in the MCP. It is assumed that the export of an average production rate of 150,000tpa (since 2004) would result in a significant depression. From the information provided it would seem that the potential implications of a 162-ha depression has not been assessed sufficiently to adapt and plan the future land use accordingly The department would expect this issue to be addressed as part of the next MCP submission	Figures showing the pre-existing and post-mining contours were provided in the original NOI (1993). For clarity, these are reproduced as Figure 2, Figure 3 and Figure 4 of this MCP. As can be seen, the silica sand resource is located in a hill / ridge. Extraction will result in a level final landform rather than a hole.	Action complete
Collection and analysis of closure data – waste material characterisation	Analysis of trace elements in residue sand material from November 2012 tests indicate low levels of heavy metals. The department supports the proposed further testing to ensure future contamination is avoided.	Further water sampling has not identified significant elevation in concentration levels of metals in solution. Future monitoring is proposed to be confined to pH and EC. These two metrics record total acidity and ions in solution. If significant changes are noted in these two 'surrogates', detailed analysis to identify individual components would be undertaken.	Periodic monitoring on an ongoing basis
Stakeholder consultation	Completion of the MCP identified a number of shortcomings with Austsand's current levels of stakeholder consultation. The suggested completion and implementation of a formal Stakeholder Consultation Plan should include concerns raised by stakeholders and the outcomes of consultation. Stakeholder consultation must also be focused on determining the post mining land use by identifying the potential owners/managers of the site post closure. The department would expect stakeholder consultation improvement to be addressed as part of the next MCP submission	The stakeholder consultation plan has been prepared. Letter correspondence to all stakeholders occurred in July 2014 (including DMP and DER). No response was received from either agency. See Section 6.	Action undertaken and more scheduled
Completion criteria	The department advises that the existing completion criteria be further developed in order to make them more measurable	See: Section 8 and Section 9.1.3	Action undertaken and more scheduled

Appendix B

Legal obligations register

Mine
Number of compliances 9
NA items 0
Number of conditions 9

Port
Number of compliances 15
NA items 16

Number of conditions 31

1.3 DWER Licence

1.3.1 Environmental Protection Act 1986 Licence number L6798/1993/12 **Category 5** **Mine Operations**

Condition No.	General conditions	Compliant (y), leave blank if no	Compliance comments
	Interpretation		
	Licence conditions		
	The Licence Holder must ensure that the following conditions are complied with:		
	Emissions		
1	The Licensee shall use all reasonable and practical measures to prevent and where that is not practicable to minimise dust emissions from the Premises.	**y**	
2	The Licensee shall ensure that no visible dust generated by the activities of the Premises crosses the boundary of the Premises.	**y**	
	Records and reporting		
3	The Licence Holder must maintain accurate and auditable books including the following records, information, reports, and data required by this Licence: (a) the calculation of fees payable in respect of this Licence; (b) complaints received under condition 7 of this Licence.	**y**	
4	The books specified in condition 3 must: (a) be legible; (b) if amended, be amended in such a way that the original and subsequent amendments remain legible or are capable of retrieval; (c) be retained by the Licence Holder for the duration of the Licence; and (d) be available to be produced to an inspector or the CEO as required.	**y**	
5	The Licensee shall ensure that: (a) any person left in charge of the Premises is aware of the conditions of the Licence and has access at all times to the Licence or copies thereof; and (b) any person who performs tasks on the Premises is informed of all of the conditions of the Licence that relate to the tasks which that person is performing.	**y**	
6	The Licence Holder must: (a) undertake an audit of their compliance with the conditions of this Licence during the preceding annual period; and (b) prepare and submit to the CEO an Annual Audit Compliance Report in the approved form by 31 January each year for the previous annual period.	**y**	
7	The Licence Holder must record the following information in relation to complaints recieved by the Licence Holder (whether recieved directly from a complainant or forwarded to them by the Department or another party) about any alleged emissions from the premises: (a) the name and contact details of the complainant, (if provided); (b) the time and date of the complaint; (c) the complete details of the complaint and any other concerns or other issues raised; and (d) the complete details and dates of any action taken by the Licence Holder to investigate or respond to any complaint.	**y**	
8	The Licensee shall submit to the CEO an Annual Environmental Report by 31 January in each year. The report shall contain the information listed in 1 in the format or form specified in that table for the pervious annual period. Table 1: Annual Environmental Report	**y**	Due Jan 2022

Condition or table (if relevant)	Parameter	Format or form
-	Summary of any failure or malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken	None specified
-	A copy of the annual report submitted to the Department of Mines, Industry Regulation and Safety as required by Mining Lease M70/793.	
Condition 6	Compliance	Annual Audit Compliance Report (AACR)
Condition 7	Complaints summary	None specified

9	The Licensee shall ensure that the parameters listed in Table 2 are notified to the CEO in accordance with the notification requirements of the table. Table 2: Notification requirements	**y**	

Condition or table (if relevant)	Parameter	Notification requirement[1]	Format or form[2]
-	Any failure or malfunction of any pollution control equipment or any incident, which has caused, is causing or may cause pollution	Part A: As soon as practicable but no later than 5pm of the next usual working day. Part B: As soon as practicable	N1

Note 1: Notification requirements in the Licence shall not negate the requirement to comply with s72 of the Act.
Note 2: Forms are in Schedule 2

1.3.2 Environmental Protection Act 1986: License Reissued L8411/2010/2 **Category 58** **Port Operations**

Number of conditions 15

Condition number	General conditions (applies to port area)	Compliant (y), leave blank if no	Compliance comments
1	**General**		
1.1	**Interpretation**		
1.2	**General conditions**		
1.2.1	Nothing in the Licence shall be taken to authorise any emission that is not mentioned in the Licence, where the emission amounts to: a) Pollution; b) Unreasonable emission; c) Discharge of waste in circumstances likely to cause pollution; or d) Being contrary to any written law.	**y**	
1.2.2	The Licensee shall maintain all pollution control and monitoring equipment to the manufacturer's specification or any relevant and effective internal management system.	**y**	
1.2.3	The Licensee, except where storage is prescribed in section 1.3, shall only store substances that are classed as dangerous goods below placard quantities or environmentally hazardous materials not classified as dangerous goods if they are stored in accordance with the Code of Practice for the Storage and handling of dangerous goods.	**y**	
1.2.4	The Licensee shall immediately recover, or remove and dispose of spills of environmentally hazardous material outside an engineered containment system.	**y**	
1.3	**Premises operation**		
1.3.1	The Licensee must ensure that the infrastructure and equipment specified in column 1 of Table 1.3.1 are maintained and operated in good working order in accordance with the requirements specified in column 2 of Table 1.3.1.	**y**	

2 Emissions

Table 1.3.1: Infrastructure Controls

Column 1	***Column 2***
Site infrastructure	***Operation details***
Silica stockpile programmable sprinkler system	*1. The sprinkler system shall as a minimum be operated twice per 24 hour period and at any time visible dust occurs from the stockpile.* *2. The sprinkler system shall be programmed to operate at any time wind velocity exceeding 10 knots is detected by the system's wind sensor.*
C2 and C3 conveyors	*1. Belt scrapers and belt sprayers shall be in operation at all times when the conveyors are loading product onto a ship.*
Ship Loader	*1. The ship loader shall deliver product within the ship's hold.* *2. The ship loader dust collection system shall be in operation at all times when the ship loader is in use.*

2.1 General

There are no specified conditions relating to general emissions in this section. **N/A**

2.2 Point source emissions to air

There are no specified conditions relating to point source emissions to air in this section **N/A**

2.3 Point source emissions to surface water

2.3.1 The licensee shall collect all spillages of silica sand from the berth within 24 hours of a shiploading event in a manner that will prevent its entry to the waters of Princess Royal Harbour **y**

2.3.2 The licensee shall instruct ship's masters during in and out loading of silica sand that all spillage of silica sand onto the deck of the vessel is to be collected in a manner so as to prevent its access into the waters of Princess Royal Harbour. **y**

2.4 Point source emissions to groundwater

There are no specified conditions relating to point source emissions to groundwater in this section. **N/A**

2.5 Emissions to land

There are no specified conditions relating to emissions to land in this section. **N/A**

2.6 Fugitive emissions

There are no specified conditions relating to fugitive emissions in this section. **N/A**

2.7 Odour

There are no specified conditions relating to odour in this section. **N/A**

2.8 Noise

There are no specified conditions relating to noise in this section. **N/A**

3 Monitoring

3.1 General monitoring

3.1.1 The licensee shall ensure that:
a) Particle size analysis of silica sand is conducted in accordance with AS 1289.3.6.1, and
b) All samples are submitted to a laboratory with a current NATA accreditation for the parameters to be measured. y

3.2 Monitoring of point source emissions to air

There are no specified conditions relating to monitoring of point source emissions to air in this section. **N/A**

3.3 Monitoring of point source emissions to surface water

There are no specified conditions relating to monitoring of point source emissions to surface water in this section. **N/A**

3.4 Monitoring of point source emissions to groundwater

There are no specified conditions relating to monitoring of point source emissions to groundwater in this section. **N/A**

3.5 Monitoring of emissions to land

There are no specified conditions relating to monitoring of emissions to land in this section. **N/A**

3.6 Monitoring of inputs and outputs

3.6.1 The licensee shall undertake the monitoring specified in Table 3.6.1 y

Table 3.6.1 Monitoring of inputs and outputs

3.7 Process monitoring

There are no specified conditions relating to process monitoring in this section. **N/A**

3.8 Ambient environmental quality monitoring

There are no specified conditions rerating to ambient environmental quality monitoring in this section. **N/A**

3.9 Meteorological monitoring

There are no specified conditions relating to meteorological monitoring in this section. **N/A**

4 Improvements

4.1 Improvement programme

There are no specified improvement conditions in this section. **N/A**

5 Information

5.1 Records

5.1.1 All information and records required by the licensee shall: y As per AER 2021
a) be legible
b) if amended, be amended in such a way that the original and subsequent amendments remain
c) except for records listed in 5.1.1(d) be retained for at least 6 years from the date the records were made or until the expiry of the licence or any subsequent licence; and
d) for those following records, be retained until the expiry of the licence and any subsequent licence:

Input/Output¤	Parameter¤	Units¤	Averaging·period¤	Frequency¤
Product·stored¤	Weight¤	Tonnes¤	Monthly·total¤	Each·batch·arriving·at·premises¤
Product·shipped¤	Weight¤	Tonnes¤	Total·during·ship·loading·period¤	Each·ship·loading·event¤
	Particles·with·diameter·less·than·53·µm¤	%·by·weight¤	Ship·loading·period¶ ¤	
	Moisture·content·(H2O)·¤			
	Aluminium·oxide·(Al2·O3)¤			
	Iron·(III)·oxide·(Fe2O3)¤			
	Titanium·dioxide·(TiO2)¤			

(i) Off - site environment effects; or
(ii) matters which effect the condition of the land or ground water.

5.1.2 The Licensee shall ensure that: y As per AER 2021
(a) any person left in charge of the premises is aware of the conditions of the licence and has access at all times to the licence or copies thereof; and
(b) any person who performs tasks on the premises is informed of all the conditions of the licence that relate to the tasks which that person is performing.

5.1.3	The Licensee shall complete an Annual Audit Compliance Report indicating the extent to which the Licensee has complied with the conditions of the licence, and any previous licence issued under part V of the Act for the premises for the previous year.	y	Due Jan 2022
5.1.4	The licensee shall implement a complaints management system that as a minimum records the number and details of complaints received concerning the environment impact of the activities undertaken at the premises and any action taken in response to the complaint.	y	Record any complaints received and any actions taken
5.2	**Reporting**		
5.2.1	The Licensee shall submit to the CEO an annual environmental report by 31 january each year. The report shall contain the information listed in Table 1 in the format or the form specified in that table for the previous annual period.	y	Due Jan 2022

Table 5.2.1 Annual environmental report

Condition·or·table·(if·relevant)¤	Parameter¤	Format·or·form1¤
¤	Summary·of·any·failure·or·malfunction·of·any·pollution·control·equipment·or·any·incidents·that·have·occurred·during·the·year·and·any·action·taken¤	None·specified¤
5.1.3¤	Compliance¤	AACR¤
5.1.4¤	Complaints·summary¤	None·specified¤
Table·3.6.1¤	Results·of·monitoring·of·inputs·and·outputs¤	None·specified¤

5.2.2	The Licensee shall ensure that the annual environmental report also contains: (a) an assessment of the information contained within the report against previous monitoring results and Licence limits and/or targets; and (b) a list of any original monitoring reports submitted to the Licensee from third parties in the reporting period and make these reports available on request.	y	Provide relevant lab reports
5.3	**Notification**		
	There are no specific notification requirements in this section.	**N/A**	

Project: Mindijup Silica Sand Mine
Company: Austsand Mining
Project no.: 12554621

Information and data management system

By: Meranda Toner
Position: Senior Environmental Scientist

5511/2

Number of compliances	4
NA items	0
Number of conditions	4

1.4 Clearing permit

Clearing permit no.	Condition no.	Aspect related to closure	Compliant (y), leave blank if no	Compliance comments
Area Permit: 5511/2 15 June 203 to 15 June 2028 File Number: A0478/201301	**1**	**1. Period in which clearing is authorised** The permit holder shall not clear more than 6 hectares of native vegetation within a 12 month period.	Y	
	2	**2. Dieback and Weed control** When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of weeds and dieback: (i) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared; (ii) shall only move soils in dry conditions; (iii) ensure that no dieback or weed-affected soil, mulch, fill or other material is brought into the area to be cleared; and (iv) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.	Y	
	3	**3. Records to be kept** The Permit Holder must maintain the following records for activities done pursuant to this Permit: In relation to the clearing of native vegetation authorised under this Permit: (i) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees; (ii) the date that the area was cleared; (iii) the size of the area cleared (in hectares); and (iv) purpose for which clearing was undertaken.	Y	
	4	**4, Reporting** (a) The Permit Holder shall provide a report to the Director Operations, Environment, Department of Mines and Petroleum by 31 July each year for the life of this permit, demonstrating adherence to all conditions of this permit, and setting out the records required under Condition 3 of this permit in relation to clearing can'ied out between 1 July and 30 June of the previous financial year. (b) Prior to 15 June 2028, the Permit Holder must provide to the Director Operations, Environment, Department of Mines and Petroleum a written report of records required under Condition 3 of this Permit where these records have not already been provided under Condition 4(a) of this Permit.	Y	

Permit No.	Total area approved to clear (ha)	Year	Clearing date	Area cleared (ha)	Balance area remaining
4537/2	17.27	2012	19/03/2012	4	13.27
		2013	21/03/2013	4	9.27
		2014	10/03/2014	4	5.27
4537/3	17.27	2015	N/A	0	5.27
Expired					
Total balance remaining					5.27

Permit No.	Total area approved to clear (ha)	Year	Clearing date	Area cleared (ha)	Balance (area remaining)
5511/1	69.9	2013		0	69.9
superseded		2014		0	69.9
5511/2	70	2015		0	70
		2016	8/02/2016	6	64
		2017	16/03/2017	6	58
		2018	19/03/2018	6	52
		2019	8/04/2019	6	46
		2020	13/03/2020	6	40
		2021	14/06/2021	6	34

Total rehabilitated area (ha) as per 2021 survey site plan	Rehab date (as per survey)	rehab date (as per Scott notes)	Rehab works (as per Scott notes)
5.6703	1996/97	26/06/1995	1 4.6 ha rehabbed
3.3899	2003	2006/6	18 ha rehabbed - scraper direct seeded from eastern cleared area and Nth boundary
8.3879	2005	8/07/2007	4.67 Ha rehabbed - Scraper direct seeded from eastern cleared area (proposed pwr line area & Nth) - finished Nth boundary and area to east of existing tailingi dams.(AUGUST,4.67 hectares Native seed)
5.0405	2006	2008/4	0.94 ha rehabbed - Scraper direct seeding east side of tailings dam (extension of 2005 area) JULY - Arid seeds - seed and seedlings east of tailings dam
4.6577	2007	2009/10	1008 seedlings in filled on all rehabbed areas
0.9041	2008	2011/4	scraped 2.2 ha - as per permit. Direct seed onto prepared area west of clearing - (rabbit baiting, arid seeds to infill plant entire rehab areas).
1.9302	2011	2011/7	-Fertilized all rehab areas, infilt all rehab areas (3510 seedlings), tree tablets (3500), also placed with new seedlings, all new seedlings planted with tree uards. Weed eradication throughout site taken place (wattle, tee tree, kunzea',Kike).
3.6076	2012	2012/3	Cleared 1st 4 hectares (of 17 ha permit 453712) in Nth West corner of lease, seed bank stockpiled and some used in rehab (3.65 ha) of pit floor in Nth eastern corner of pit. spread veg piles throughout -
0.8198	2013	2013/3	Cleared 2nd 4 ha (of 17 ha permit 453712) - Direct seed over eastern tailings dump area - Hand seeded (11/6/13) put veg piles throughout. Shade cloth fences erected around rehab in pit 18/7/13 - Fertilised pit rehab and area direct seed over eastern tailings dump -75kg/Ha. Weed eradication taken out on site - wattle, kunzea, kike sprayed (treated with Diesel &Access-60:1)
3.4019	2014	10/03/2014	Reshaped Nth Western pit face, Cleared 3rd 4 ha (permit 4537/2) on nth boundary. Seed material from pit floor spread onto reshaped area of pit and on tailings dump area. Total 3.4 ha rehabbed Stockpile remaining seed material from new cleared area. Started reshaping nth eastern face to marry in to floor hab. Erect 478 meters of shade cloth fencing - installed-along both sides tailings dump access rd (East/west). Weed eradication of wattle taken place on Eastern boundary.
4.2453	2015	1/03/2015	erected a total of 1.2 kilometers of shade cloth fencing - rehab part of tailings dump - Reshaped and rehabed western area of 17hectare pit.Weed erdication of wattle and Victorian Tee tree taken place on North and Eastern Boundry.
			erected 150 mtres of shade cloth fence from west to east along tailing dump rehab area
		20/09/2015	Hand seeded and fertlized western end of 17 hec pit/tailings dump/nth west corner of pit -(4.245 Hectares) carried out weed eradication of Sydney wattle and Vic Tea tree -types and rates in rehab file
			CPS 5511/2 for 70 ha clearing in the East Domain
7.4801	2016	8/02/2016	6 ha clearing (balance remaining . Retention of old seed storage areas as rehabilitation - good cover, diversity and older than 10 years.
1.3405	2017	16/03/2017	6 ha clearing. Weed management of Sydney wattle and *Kunzea baxteri* (2003 rehab. Area).
		27/02/2017	erected shade cloth - 400m
4.0265	2018	19/03/2018	6 ha clearing. Weed management of Sydney wattle and Victorian Tea tree (2006 rehab area)
0.1395	2019	8/04/2019	6 ha clearing. No rehab in 2019, 0.1395ha of previously rehabed land that has been reinstated
6.8645	2020		6 ha clearing. Direct see rehabilitation of 6.8645 ha and Victorian Tea tree control in 2006 rehab area.

1.5 Mining Proposal

1.5.1 Notice of intent
Superceded by Mining Proposal

1.5.2 Mining Proposal
Approved by the DMP 4 March 2014

Number of compliances	8
NA Items	1
Number of conditions	9

Commitments made in Table 11 of the Mining Proposal				
	Environmental Impact (in order of significance)	**Management Commitment**	**Compliant (y), leave blank if no**	**Compliance comments**
1	Reduction in habitat for black cockatoos	Purchase of offset property.	y	Offset property purchased.
		Buffer of 150 m native vegetation surrounding roosting trees.	y	Buffer distance maintained - not clearing has occurred
		Progressive rehabilitation of native vegetation.	y	Progressive rehabilitation undertkaen
		Regular vegetation surveys to be conducted as per current practice.	y	Rehabilitation surveys every 2 years. 2019 monitoring round completed
2	Spread of dieback	Regular vegetation surveys to include reference to dieback if encountered.	y	Identified in previous vegetation surveys and practice will continue. Clearing conducted as per clearing permit
		Vehicle access limited to tracks and mining area.	y	
		Clearing to be conducted as per permit conditions:	y	
		(i) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;	y	
		(ii) shall only move soils in dry conditions;	y	
		(iii) ensure that no dieback or weed-affected soil, mulch, fill or other material is brought into the area to be cleared; and	y	
		(iv) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.	y	
3	Poor vegetation recovery of progressively rehabilitated areas	Regular vegetation surveys.	y	Completed every two years, last in October 2019. Progressive rehab is ongoing - positive results in 2017: 60 % increase in diversity, improvement to plant loss and cover.
		Continue progressive rehabilitation using stockpiled topsoil and vegetation as per current practice.	y	
4	Proliferation of weed species	Regular vegetation surveys to include reference to weeds if encountered.	y	Completed every two years, last in October 2019. Weed control has been implemented where necessary as identified including Sydney Wattle and Kunzea baxteri.
		Weed control program to be implemented if required.	y	
5	Inadequate topsoil is available	Continue to manage topsoil as per current practice.	y	Ongoing
6	Lowering of landform due to removal of material	Progressive backfilling and rehabilitation of mine voids to minimise void volumes.	y	Ongoing
		Grading of mine void slopes to resemble natural slopes.	y	
7	Hydrocarbon spills or leaks	Bunded fuel storage and loading facilities.	y	Information is included in inductions, procedures and spill kits are provided.
		Inclusion of hydrocarbon spills and leaks information in workplace inductions.	y	
		Spill procedures in place.	y	
		Availability of spill kits at the workshop/fuel storage area.	y	
8	Dust	Use of coarse material to cover fine material stockpiles where possible	y	As per current practice
		Maintenance of original vegetation to provide a windbreak where possible. This includes a buffer of at least 100 m at the tenement boundary.	y	
		Water is applied to tracks if necessary.	y	
		Wind barrier fencing (shade cloth type).	y	
9	Groundwater contamination as a result of processing activities	Surface water sampling once a year in both water dams and reported in the AER.	NA	Water monitoring was conducted from May 2003 until September 2008 as part of Austsand's operating licence for top up (purchased) water and for process water. No indication of water contamination was identified and the requirement was removed from the licence. Ongoing annual surface water monitoring is currently undertaken.

1.2 Tenement

Mining Tenement Conditions

Tenement No.	Condition No.	Closure Conditions	Compliant (y), leave blank if no	Compliance comments
M70-793	1	Survey.	y	
	2	Compliance with the provisions of the Aboriginal Heritage Act, 1972 to ensure that no action is taken which would interfere with or damage any Aboriginal site.	N/A	No Aboriginal Heritage sites have been identified within
	3	All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.	N/A	No surface hole drilling conducted
	4	All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Industry and Resources (DoIR). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DoIR.	N/A	No exploration conducted
	5	All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration programme.	N/A	No exploration conducted
	6	Unless the written approval of the Environmental Officer, DoIR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface clearing or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.	y	No exploration conducted
	7	No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment; and until his written approval has been obtained.	y	Mining Proposal submitted 2014. NOI relevant prior to that
	8	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled:•"Notice of Intent - Proposed Silica Sand Mine, Mindijup, Western Australia" dated November 1993 and retained on Minerals and Energy Department File No: 2241/93; •(Reg ID 38128) "AustSand Mining - Mindijup Silica Sand Mines - Mine Closure Plan" dated 3 April 2013 signed by Scott Whitbread and retained on Department of Mines and Petroleum File No. EARS-MCP-38128; •(MP Reg ID 47246) "Austsand Mining. Mindijup Silica Mine. M70/793 Mining Proposal" dated 4 March 2014 signed by Scott Whitbread and retained on Department of Mines and Petroleum File No. EARS-MP-47246 as Doc ID 2800008 Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.	y	Mine Closure plan is regularly updated - 2015 MCP approved in March 2016. Revision submitted Dec 2018, however still waiting on assessment by DMIRS. Next revision due December 2021
	9	The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.	y	As per clearing permit
	10	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.	y	As part of progressive rehabilitation
	11	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the State Mining Engineer.	N/A	To be conducted at closure
	12	All rubbish and scrap being progressively disposed of in a suitable manner.	y	As per current practice
	13	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped if required and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer.	N/A	Included in Mine Closure Planning. Roads currently in use
	14	Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the Director, Environment, DoIR for his assessment and until his written approval to proceed has been obtained.	y	Noted
	16	The Lessee submitting to the Executive Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: December	y	No comments received to date
	18	The lessee taking all reasonable measures to prevent or minimise the generation of dust from all materials handling operations, stockpiles, open areas and transport activities.	y	Dust control measures implemented
	19	On the completion of operations or progressively when possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self sustaining, functional ecosystems comprising suitable, local provenance species or alternative agreed outcome to the satisfaction of the Executive Director, Environment Division, DMP.	y	Progressive rehabiliation is conducted. Closure as per MCP
	20	A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by an Environmental Officer, DMP. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMP's website" •2021	y	Approved March 2016. Revision submitted Dec 2018, however still waiting on assessment by DMIRS. Revised plan due December 2021

Mine Rehabilitation Fund

Year	Mine Activity Type	Mine Activity Reference	Disturbance			Land Under Rehabilitation		Total area of activity (ha)	RLE ($)
			Category	Previous (ha)	Total (ha)	Category	Total (ha)		
2014	plant site	processing plant	B		0.0124	E	0.0000	0.0124	$372.00
	Fuel storage facility	fuel bunker	B		0.0015	E	0.0000	0.0015	$45.00
	mine void with a depth of at least 5 metres above ground water level	mine void	C		6.9860	E	37.8940	44.8800	$201,536.00
	TSF class 2	TSF (2)	B		0.5500	E	0.0000	0.5500	$16,500.00
	TSF class 2	TSF (1)	B		0.5900	E	0.0000	0.5900	$17,700.00
	plant site	screening plant	B		0.0039	E	0.0000	0.0039	$117.00
	Dam - fresh water	collection dam and process water dam	B		0.5800	E	0.0000	0.5800	$17,400.00
	building other than workshop or camp site	site office	C		0.0073	E	0.0000	0.0073	$131.40
	transport or service infrastructure corridor	gravel roads	C		0.2000	E	0.0000	0.2000	$3,600.00
	laydown or hardstand areas	laydown yard	C		0.0150	E	0.0000	0.0150	$270.00
	laydown or hardstand areas	concrete slab and tyre bath pad	C		0.0260	E	0.0000	0.0260	$468.00
	topsoil stockpile	seed bank and subsoil	E		2.7101	E	0.0000	2.7101	$5,420.00
	borrow pit or shallow surface excavation with a depth less than 5 metres	shallow excavation	C		0.0000	E	0.4120	0.4120	$824.00
	land other than land under rehabilitation or rehabilitated land that is cleared of vegetation and is not otherwise described in this table	product stockpiles, access tracks, backfilled mine void and other cleared areas	C		28.0061	E	0.0000		$504,109.80
	workshop	workshop	B		0.0116	E			$348.00
	Totals				39.6999		38.3060	49.9882	$768,841.20
								1% of RLE total is	$7,688
2015	**plant site**	processing plant	B	0.0124	0.0124	E	0.0000	0.0124	$372.00
	Fuel storage facility	fuel bunker	B	0.0015	0.0020	E	0.0000	0.0020	$60.00
	mine void with a depth of at least 5 metres above ground water level	mine void	C	6.986	10.3700	E	42.7800	53.1500	$272,220.00
	TSF class 2	TSF (2)	B	0.55	0.5600	E	0.0000	0.5600	$16,800.00
	TSF class 2	TSF (1)	B	0.59	0.5900	E	0.0000	0.5900	$17,700.00
	plant site	screening plant	B	0.0039	0.0039	E	0.0000	0.0039	$117.00
	Dam - fresh water	collection dam and process water dam	B	0.58	0.6100	E	0.0000	0.6100	$18,300.00
	building other than workshop or camp site	site office	C	0.0073	0.0200	E	0.0000	0.0200	$360.00
	transport or service infrastructure corridor	gravel roads	C	0.2	0.2000	E	0.0000	0.2000	$3,600.00
	laydown or hardstand areas	laydown yard	C	0.015	0.0150	E	0.0000	0.0150	$270.00
	laydown or hardstand areas	concrete slab and tyre bath pad	C	0.026	0.0260	E	0.0000	0.0260	$468.00
	topsoil stockpile	seed bank and subsoil	E	2.7101	1.4000	E	0.0000	1.4000	$2,800.00
	Low grade stockpile (class 2)	Reject material	C	0	3.7400	E	0.0000	3.7400	$67,320.00
	borrow pit or shallow surface excavation with a depth less than 5 metres	shallow excavation	C	0	0.0000	E	0.4120	0.4120	$824.00
	land other than land under rehabilitation or rehabilitated land that is cleared of vegetation and is not otherwise described in this table	product stockpiles, access tracks, backfilled mine void and other cleared areas	C	0	17.8070	E	0.0000	17.8070	$320,526.00
	Run of mine pad	Stockpile (product)	C	0	4.3800	E	0.0000	4.3740	$78,840.00
	workshop	workshop	B	0.0116	0.0116	E	0.0000	0.0120	$348.00
	Totals				39.7479		43.1920	82.9343	$800,925.00
								1% of RLE total is	$8,009
2016	**plant site**	processing plant	B	0.0124	0.0180	E	0.0000	0.0180	$540.00
	Fuel storage facility	fuel bunker	B	0.002	0.0020	E	0.0000	0.0020	$60.00
	mine void with a depth of at least 5 metres above ground water level	mine void	C	10.37	22.1590	E	43.3170	65.4760	$485,496.00
	TSF class 2	TSF (2)	B	0.56	0.5590	E	0.0000	0.5590	$16,770.00
	TSF class 2	TSF (1)	B	0.59	0.5910	E	0.0000	0.5910	$17,730.00
	plant site	screening plant	B	0.0039	0.0040	E	0.0000	0.0040	$120.00
	Dam - fresh water	collection dam and process water dam	B	0.61	0.6070	E	0.0000	0.6070	$18,210.00
	building other than workshop or camp site	site office	C	0.02	0.0070	E	0.0000	0.0070	$126.00
	transport or service infrastructure corridor	gravel roads	C	0.2	0.5000	E	0.0000	0.5000	$9,000.00
	laydown or hardstand areas	laydown yard	C	0.015	0.0150	E	0.0000	0.0150	$270.00
	laydown or hardstand areas	concrete slab and tyre bath pad	C	0.026	0.0260	E	0.0000	0.0260	$468.00
	topsoil stockpile	seed bank and subsoil	E	1.4	2.6400	E	0.0000	2.6400	$4,128.00
	Low grade stockpile (class 2)	Reject material	C	3.74	3.7450	E	0.0000	3.7450	$67,410.00
	borrow pit or shallow surface excavation with a depth less than 5 metres	shallow excavation	C	0	0.0000	E	0.4120	0.4120	$824.00
	land other than land under rehabilitation or rehabilitated land that is cleared of vegetation and is not otherwise described in this table	product stockpiles, access tracks, backfilled mine void and other cleared areas	C	17.87	11.3400	E	0.0000	11.3400	$204,120.00
	Run of mine pad	Stockpile (product)	C	4.38	4.3740	E	0.0000	4.3740	$78,732.00
	workshop	workshop	B	0.116	0.0120	E	0.0000	0.0120	$360.00
	Totals				46.5990		43.7290	90.3280	$904,364.00
								1% of RLE total is	$9,044
2017	**plant site**	processing plant	B	0.018	0.0180	E	0.0000	0.0180	$540.00
	Fuel storage facility	fuel bunker	B	0.002	0.0020	E	0.0000	0.0020	$60.00
	mine void with a depth of at least 5 metres above ground water level	mine void	C	22.159	19.7340	E	50.7970	70.5310	$456,806.00
	TSF class 2	TSF (2)	B	0.559	0.5590	E	0.0000	0.5590	$16,770.00
	TSF class 2	TSF (1)	B	0.591	0.5910	E	0.0000	0.5910	$17,730.00
	plant site	screening plant	B	0.004	0.0040	E	0.0000	0.0040	$120.00
	Dam - fresh water	collection dam and process water dam	B	0.607	0.6070	E	0.0000	0.6070	$18,210.00
	building other than workshop or camp site	site office	C	0.007	0.0070	E	0.0000	0.0070	$126.00
	transport or service infrastructure corridor	gravel roads	C	0.5	0.5000	E	0.0000	0.5000	$9,000.00
	laydown or hardstand areas	laydown yard	C	0.015	0.0150	E	0.0000	0.0150	$270.00
	laydown or hardstand areas	concrete slab and tyre bath pad	C	0.026	0.0260	E	0.0000	0.0260	$468.00
	topsoil stockpile	seed bank and subsoil	E	2.064	2.0640	E	0.0000	2.0640	$4,128.00
	Low grade stockpile (class 2)	Reject material	C	3.745	3.7450	E	0.0000	3.7450	$67,410.00
	borrow pit or shallow surface excavation with a depth less than 5 metres	shallow excavation	C	0	0.0000	E	0.4120	0.4120	$824.00
	land other than land under rehabilitation or rehabilitated land that is cleared of vegetation and is not otherwise described in this table	product stockpiles, access tracks, backfilled mine void and other cleared areas	C	11.34	12.1770	E	0.0000	12.1770	$219,186.00
	Run of mine pad	Stockpile (product)	C	4.374	4.3740	E	0.0000	4.3740	$78,732.00
	workshop	workshop	B	0.116	0.0120	E	0.0000	0.0120	$360.00
	Totals				44.4350		51.2090	95.6440	$890,740.00
								1% of RLE total is	$8,907
2018	**plant site**	processing plant	B	0.018	0.0180	E	0.0000	0.0180	$540.00
	Fuel storage facility	fuel bunker	B	0.002	0.0020	E	0.0000	0.0020	$60.00
	mine void with a depth of at least 5 metres above ground water level	mine void	C	19.734	17.5460	E	52.9850	70.5310	$421,798.00
	TSF class 2	TSF (2)	B	0.559	0.5590	E	0.0000	0.5590	$16,770.00
	TSF class 2	TSF (1)	B	0.591	0.5910	E	0.0000	0.5910	$17,730.00
	plant site	screening plant	B	0.004	0.0040	E	0.0000	0.0040	$120.00
	Dam - fresh water	collection dam and process water dam	B	0.607	0.6055	E	0.0000	0.6055	$18,165.00
	building other than workshop or camp site	site office	C	0.007	0.0070	E	0.0000	0.0070	$126.00
	transport or service infrastructure corridor	gravel roads	C	0.5	0.5000	E	0.0000	0.5000	$9,000.00
	laydown or hardstand areas	laydown yard	C	0.015	0.0150	E	0.0000	0.0150	$270.00
	laydown or hardstand areas	concrete slab and tyre bath pad	C	0.026	0.0260	E	0.0000	0.0260	$468.00
	topsoil stockpile	seed bank and subsoil	E	2.064	2.2430	E	0.0000	2.2430	$4,486.00
	Low grade stockpile (class 2)	Reject material	C	3.745	3.8320	E	0.0000	3.8320	$68,976.00
	borrow pit or shallow surface excavation with a depth less than 5 metres	shallow excavation	C	0	0.0000	E	0.4120	0.4120	$824.00
	land other than land under rehabilitation or rehabilitated land that is cleared of vegetation and is not otherwise described in this table	product stockpiles, access tracks, backfilled mine void and other cleared areas	C	12.177	17.8600	E	0.0000	17.8600	$321,480.00
	Run of mine pad	Stockpile (product)	C	4.374	4.4338	E	0.0000	4.3740	$79,808.40
	workshop	workshop	B	0.116	0.0120	E	0.0000	0.0120	$360.00
	Totals				48.2543		53.3970	101.5915	$960,981.40
								1% of RLE total is	$9,610

1.10 EPBC 2012/6472 (27 May 2013)

Number of complia	13
NA Items	0
Number of conditic	13

Condition no.	Condition content	Compliant (y), leave blank if no	Compliance comments
1	The person taking the action must not clear more than 70 ha of native vegetation within the project area. Clearing must not occur within the 'Site Boundary Buffer (100m)' identified at Attachment A.	Y	
2	To avoid potential impacts to Black Cockatoos, the person taking the action must not undertake any clearing within a 150 m radius of any Black Cockatoo roosting trees identified at Attachment A.	y	
3	To avoid potential impacts to Black Cockatoos, the person taking the action must not undertake any clearing within the 25.36 ha 'Wetland area' in the south west corner of the project area identified at Attachment A.	y	
4	To prevent the occurrence of Dieback (*Phytophthora cinnamomi*) on site and to mitigate potential impacts to Black Cockatoo roosting habitat to be retained within the Project Area, the person taking the action must ensure that all vehicles being used during operation of the quarry that have come from a Dieback affected area be washed down prior to entering the project area in accordance with WA DEC best practice guidelines for the management of *Phytophthora cinnamomi* .	y	
5	To mitigate impacts to Black Cockatoos, the person taking the action must prepare and submit a Rehabilitation and Mine Closure Plan (RMCP). The RMCP must include, but not be limited to: a. details of progressive rehabilitation measures for each cell of annual clearing. These details should include: commencement timeframes, species to be utilised, stocking rates, measuresto be utilised to ensure success, success targets, contingency measures in the case of not meeting targets and monitoring requirements; b. measures to exclude weeds and feral animals from rehabilitation areas; c. details of rehabilitation and revegetation measures following the completion of mining operations; d. strategies to prevent the spread of Dieback; e. maps showing where key rehabilitation work is to occur; f. timeframes for the implementation and completion of the above measures or strategies; g. details of monitoring and contingency measures if performance indicators are not met; and, h. roles and responsibilities of personnel associated with implementing each of the above measures. The RMCP must be submitted to the Departement within 12 months of the commencement of mining operations. If the Minister approves the RMCP, the approved RMCP must be implemented.	y	RMCP approved on 10 May 2017

6	To offset the loss of habitat for Black Cockatoos, prior to the commencement of mining operations, the person taking the action must provide the Departement with written evidence of the provision of funds to WA DEC for the acquisition of the offset property. The written evidence must include a description and map clearly defining the location and boundaries of the offset property and be accompanied with the offset attributes. The person taking the action must provide the Department with written evidence that an area of no less than 600 ha of Lot 51 on Deposited Plan 38521, Branson Road, Takalarup, WA, has been attributed as an offset for this action. The person taking the action must inform the Department how much of this property remains unattributed to any action for the purpose of offsetting.	y	
7	Within 30 days after the commencement of the action, the person taking the action must advise the Department in writing of the actual date of commencement.	y	
8	The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the RMCP required by this approval and make them available upon request to the Department. Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Department's website. The results of audits may also be publicised through the general media.	y	
9	By 31 December of each year after the commencement of the action, the person taking the action must publish a report on their website addressing compliance with the conditions of this approval over the previous 12 months, including implementation of any management plans as specified in the conditions. Non-compliance with any of the conditions of this approval must be reported to the Department at the same time as the compliance report is published.	y	
10	If the person taking the action wishes to carry out any activity otherwise than in accordance with the RMCP as specified in the conditions, the person taking the action must submit to the department for the Minister's written approval a revised version of that RMCP. The varied activity shall not commence until the Minister has approved the varied RMCP in writing. The Minister will not approve a varied RMCP unless the revised RMCP would result in an equivalent or improved environmental outcome over time. If the Minister approves the revised RMCP, that RMCP must be implemented in place of the RMCP originally approved.	y	
11	If the Minister believes that it is necessary or convenient for the better protection of listed threatened species to do so, the Minister may request that the person taking the action make specified revision to the RMCP specified in the conditions and submit the revised RMCP for the Minister's written approval. The person taking the action must comply with any such request. The revised approved RMCP must be implemented. Unless the Minister has approved the revised RMCP, then the person taking the action must continue to implement the RMCP originally approved, as specified in the conditions.	y	
12	If, at any time after five (5) years from the date of approval, the person taking the action has not substantially commenced the action, then the person taking the action must not substantially commence mining operations associated with this action without the written agreement of the Minister.	y	Five years from approval date is 27 May 2018
13	Unless otherwise agreed to in writing by the Minister, the person taking the action must provide a copy of each approved RMCP referred to in these conditions of approval to members of the public upon request. Copies must be provided within a reasonable time of the request.	y	

Project: Mindijup Silica Sand Mine
Company: Austsand Mining
Project no.: 6136478

Information and data management system

By: Meranda Toner
Position: Senior Environmental Scientist

Number of compliances	5
NA Items	0
Action Reguired (AR) items	0
Not Compliant (N)	3
Number of conditions	8

Mine Closure Plan (GHD 2015 - approved dated 24 March 2016)

Approved by DMP on 30 May 2016, Revised in December 2018 (awaiting DMIRS assessment), Next revision due in December 2021.

Action Items 2015 MCP	Status	Comments	Compliance
1. Review and update the compliance register on a regular basis	On-going	Quarterly review and update as changes occur.	y
2. Review and update the Stakeholder Register on a regular basis	On-going	Updated with regulator correspondance - no other stakeholder's engaged. No complaints received / other stakeholder comments received.	y
3. Undertake ongoing consultation with Stakeholders to inform the MCP and identify suitable post-mining land use	Action required prior to 2021 MCP revision	No stakeholder correspondance on mine closure since 2014/2015. Suggest re-issue letters and identifying any additional stakeholders.	N
4. Austsand will conduct specific stakeholder consutlation during the period of this MCP on the post-mining land uses	See above	see above	N
5. Conduct periodic pH and electrical conductivity reading on decant dam as an indicator of acidity changes that may require active management	On-going	Updated in 2018 MCP	Y
6. If the rehabilitation material balance audit identifies a deficit of required material, Austsand will prepare a contingency plan to mitigate the material deficit. The plan will be included into the MCP to enable actions contained within it to be progressively implemented through the life of the mine	Action required prior to next MCP		N
7. Continue rehabilitation montoring on a biennial basis. Add additional rehabilitaiton plota and analogue sites to the study	On-going. Monitoring round completed in October 2019.	Additional analogue sites to be added in next monitoring round (2021)	Y
8. Continue to undertake monitoring on an annual basis using hand-held monitornig equipment for pH and TDS	On-going	Annual surface water quality monitoring	Y

Project: Mindijup Silica Sand Mine
Company: Austsand Mining
Project no.: 12554621

Information and data management system

By: Vicki Davies
Position: Environmental Scientist

Number of compliances	4
NA Items	0
Action Reguired (AR) items	3
Not Comliant (N)	0
Number of conditions	6

EPBC 2012/6472 (Approved 10 May 2017): Extension of existing Silica Sand Mine, Mindijup - revised Rehabilitation and Mine Closure Plan

Action No.	Action	Description	Status	Comments	Compliance
1	Review and update the Compliance Register on a regular basis	Austsand maintains a Legal Obligations Register (also called a Compliance Register) (Appendix B). The register includes licence, permit and tenement conditions, as well as Austsand's voluntary commitments and undertakings. The register is updated with additional requirements as they become available. A summary of the register is provided in Table 2.	On-going	Latest update February 2018	y
2	Review and update the Stakeholder Register on a regular basis.		On-going	Latest update February 2018	y
3	Undertake ongoing consultation with Stakeholders and update the Stakeholder Register with feedback received.		On-going	Letters issued to identified stakeholders in 2014/15 - no response received. Further action required to address stakeholder consultation	y
4	Review the risk assessment with environmetnal specalists and implement further risk mitigation as required		On-going	As per above	AR
5	Austsand will conduct specific consultation during the period of this RMCP on the post mining land uses		On-going	As per above	AR
6	If the rehabilitation material balance audit identifies a deficit of required material, Austsand will prepare a contingency plan to mitigate the material deficit. The plan will be included into the MCP to enable actions contained within it to be progressively implemented through the life of the mine		On-going	Audit to be undertaken	AR
7	Continue rehabilitation montoring on a biennial basis. Add additional rehabilitaiton plots and analogue sites to the study		On-going	Monitoring round completed in October 2019. Additional sites to be added in next monitoring round (2021)	y

Appendix C

Stakeholder engagement register

Internal Stakeholders – ongoing

Stakeholder	Issues raised
Mine managers and site's staff	Employment continuity and future opportunities Mine development and processes Rehabilitation of site, clearing closure studies Resourcing and planning functions Adhering to MCP guidelines and closure studies Significant issues relating to operations or restricted access Impacts on surface water and groundwater Indigenous sites and engagement through closure Closure costs and responsibilities
Shareholders	Social and environmental performance associated with closure

External Stakeholders - Consultation prior to 2012

Stakeholder	Issues raised
Residents of local farms Post mining owners/managers	Employment and contracting changes and opportunities Rehabilitation plans, visual aesthetics Timing of works e.g., heavy vehicle traffic and road safety Dust generated in earth works Public safety (preventing access)
Region based organisations e.g., St John Ambulance, Tourist bureaus, High Schools and Primary Schools, Local inns/motels/hotels	Likely to be indirectly affected but are important points of contact to disseminate information/raise awareness of closure impacts.
Indigenous/traditional landowners Surrounding Indigenous communities	Employment and contracting changes and opportunities Rehabilitation plans, including seeding opportunities and visual aesthetics Timing of works (heavy vehicle traffic and road safety) Public safety (preventing access)
Chamber of Minerals and Energy of WA	Generally interested in issues relating to the sector or specific commodity, including such issues as environmental policy and legislation and safety standards.
City of Albany	Stability of landforms Rehabilitation – sediment transport, vegetation monitoring, weed, feral animals and dieback management, traffic management
DEC (now DBCA) DMP (now DMIRS) DOW (now DWER) DIA (now DPLH) Department of Health Main Roads WA	Stability of landforms Management of residue General dust suppression Seepage Disposal of mine infrastructure Rehabilitation – sediment transport, vegetation monitoring, weed, feral animals and dieback management

Appendix D

Closure information register

Baseline reports and studies (Pre 2012 MCP)

Date	Author	Description
May-11	GHD	Report for Clearing Permit Application for Mindijup Silica Sand Project - Supporting Documentation
2007	Environ	Phase 1 of an air quality investigation for Austsand at Albany Port
2011	GCG Health Safety and Hygiene	Austsand Mining - Mindijup Site Occupational Health Hazard Risk Assessment
2011	E.M. Sandiford	Regional Vegetation Assessment of Proposed Clearing on Mining Lease M70/793
2010	E.M. Sandiford and S. Barrelt	Albany Regional Vegetation Survey Extent, Type and Status
Jun-12	GHD	Environmental Assessment and Mitigation Plan
Dec-12	GHD	Mindijup Mine Clearing Offset Proposal

Operational monitoring reports / documents (during the life of mine)

Date	Author	Description
Jun-11	GHD	Rehabilitation Plan
2010	GHD	Assessment of rehabilitation dated October 2010
Jun-11	GHD	Rehabilitation plan for ongoing works
2013	GHD	Mine Closure Stakeholder Consultation Plan
2014	Austsand	Rehabilitation notes 2004-2014
2015	GHD	Rehabilitation Assessment 2014/2015
2014 / 2015	GHD	Memorandum Surface Water Monitoring Results
2016	GHD	Rehabilitation and Mine Closure Plan
2017	GHD	Rehabilitation Assessment 2017
2019	GHD	Rehabilitation Assessment 2019

Relevant industry reports (relevant other reference reports and studies)

Date	Author	Description
Feb-09	Grange Resources Pty Ltd	Albany Iron Ore-Southdown Magnetite Mining Proposal Carnaby's Black Cockatoo Impact Assessment

Appendix E

Surface water quality summary table and laboratory Certificate of Analysis

Table 1 Summary of Laboratory Results 2006-2021

			Inorganics					Acidity & Alkalinity						Major Ions									Metals					
			pH (Lab)	Electrical conductivity (lab)	Redox (Lab)	Total Dissolved Solids	Total Dissolved Solids (Filtered)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Hardness as CaCO3 (Filtered)	Acidity (as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)	Cations Total	Anions Total	Ionic Balance	Aluminium	Aluminium (Filtered)	Iron	Iron (Filtered)	Manganese	Manganese (Filtered)
			pH units	µS/cm	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL			0.01	1	0.1	10	10	1	1	1	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	0.01	0.01	0.05	0.05	0.001	0.001
ANZECC 2000 SW Aust. Lowland River			**6.5-8**																									
Field ID	**Sampled_Date**	**Lab_Report_Number**																										
Collection dam 1	7/09/2006	SGS-98233	7.7	1200	-	720	-	-	-	-	-	-	-	25	33	9.8	160	340	-	-	-	-	-	-	-	-	-	-
	30/04/2007	SGS-11733	7.5	1300	-	650	-	-	-	-	-	-	-	29	35	11	160	340	-	-	-	-	-	-	-	-	-	-
	14/04/2008	SGS-PE016134	7.6	1300	-	670	-	-	-	-	-	-	-	22	33	8	150	340	-	-	-	-	-	-	-	-	-	-
	27/08/2008	SGS-PE018174	7.7	1200	-	570	-	-	-	-	-	-	-	27	29	7.6	140	320	-	-	-	-	-	-	-	-	-	-
	26/05/2014	EP1403887	7.11	1300	92.3	758	-	<1	28	<1	28	245	8	32	40	12	164	404	36	12.3	12.7	1.5	-	<0.01	-	<0.05	-	0.136
	27/10/2016	EP1610261	7.24	1220	-	-	838	<1	28	<1	28	-	5	30	34	7	148	407	34	-	-	-	<0.01	0.01	0.79	0.13	0.019	0.019
	21/06/2017	EP1706650	7.51	1060	-	-	832	<1	30	<1	30	-	8	40	37	8	156	391	32	12	12.3	1.08	0.01	<0.01	1.38	<0.05	0.065	0.065
	2/05/2018	EP1805559	7.5	1370	-	940	-	-	-	-	-	-	4	38	38	12	146	418	34	11.7	13.1	5.8	0.09	<0.01	0.58	0.07	0.026	0.027
	14/05/2019	EP1904649	6.79	1410	-	906	-	<1	22	<1	22	-	10	-	-	-	167	461	36	-	-	-	0.01	<0.01	1.32	0.27	0.091	0.084
	21/05/2020	EP2005274	7	1420	-	1080	-	-	-	-	-	-	9	-	-	-	158	419	37	-	-	-	0.01	<0.01	1.72	0.48	0.18	0.174
	21/05/2020	EP2005883	-	-	-	-	-	<1	16	<1	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12/05/2021	EP2105358	7.09	1260	-	948	-	<1	21	<1	21	-	5	-	-	-	150	407	31	-	-	-	<0.01	0.01	0.1	0.86	0.039	0.038
Collection dam 2	26/05/2014	EP1403887	7.06	1280	92.7	778	-	<1	30	<1	30	238	8	31	39	12	160	403	34	12	12.7	2.64	-	<0.01	-	<0.05	-	0.065
	27/10/2016	EP1610261	7.15	1250	-	-	846	<1	25	<1	25	-	5	33	35	7	152	398	30	-	-	-	0.02	-	1.02	-	0.044	-
	21/06/2017	EP1706650	7.32	1090	-	-	820	<1	31	<1	31	-	9	40	37	8	160	386	32	12.2	12.2	0.13	0.05	-	4.9	-	0.092	-
	2/05/2018	EP1805559	7.37	1360	-	943	-	-	-	-	-	-	5	38	38	12	150	410	34	11.8	12.9	4.12	0.18	-	1.56	-	0.043	-
	14/05/2019	EP1904649	6.75	1420	-	904	-	<1	24	<1	24	-	10	-	-	-	183	468	36	-	-	-	0.02	-	2.27	-	0.12	-
	21/05/2020	EP2005274	7.04	1430	-	1060	-	-	-	-	-	-	11	-	-	-	149	411	39	-	-	-	0.03	-	3.91	-	0.218	-
	21/05/2020	EP2005883	-	-	-	-	-	<1	14	<1	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12/05/2021	EP2105358	7.17	1260	-	988	-	<1	20	<1	20	-	4	-	-	-	143	410	31	-	-	-	<0.01	-	1	-	0.029	-
Process dam 1	7/09/2006	SGS-98233	**6.3**	1100	-	680	-	-	-	-	-	-	-	18	23	8.7	120	320	-	-	-	-	-	-	-	-	-	-
	30/04/2007	SGS-11733	7.1	1000	-	480	-	-	-	-	-	-	-	18	25	8.8	120	280	-	-	-	-	-	-	-	-	-	-
	14/04/2008	SGS-PE016134	**6.3**	1100	-	590	-	-	-	-	-	-	-	14	27	7.4	130	310	-	-	-	-	-	-	-	-	-	-
	27/08/2008	SGS-PE018174	6.6	970	-	650	-	-	-	-	-	-	-	18	24	7.2	130	230	-	-	-	-	-	-	-	-	-	-
	26/05/2014	EP1403887	**5.67**	1110	107	932	-	<1	4	<1	4	193	25	23	33	11	149	366	37	10.6	11.2	2.52	-	0.19	-	0.4	-	0.091
	27/10/2016	EP1610261	**5.43**	1060	-	-	872	<1	1	<1	1	-	24	22	29	7	136	369	32	-	-	-	0.55	0.09	1.9	0.28	0.044	0.042
	21/06/2017	EP1706650	6.67	1010	-	-	942	<1	9	<1	9	-	9	32	34	7	148	371	33	11	11.3	1.43	0.67	0.03	1.92	0.08	0.049	0.047
	2/05/2018	EP1805559	**6.43**	1320	-	1080	-	-	-	-	-	-	12	33	36	12	144	401	37	11.2	12.2	4.53	0.99	0.02	1.79	0.08	0.036	0.03
	14/05/2019	EP1904649	**4.76**	1330	-	1050	-	<1	<1	<1	<1	-	31	-	-	-	161	452	45	-	-	-	1.07	0.12	1.9	0.21	0.118	0.094
	21/05/2020	EP2005274	**5.48**	1390	-	1140	-	-	-	-	-	-	23	-	-	-	159	421	53	-	-	-	0.72	0.12	2.58	0.51	0.181	0.164

Table 1 Summary of Laboratory Results 2006-2021

			Inorganics					Acidity & Alkalinity						Major Ions									Metals					
			pH (Lab)	Electrical conductivity (lab)	Redox (Lab)	Total Dissolved Solids	Total Dissolved Solids (Filtered)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Hardness as CaCO3 (Filtered)	Acidity (as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)	Cations Total	Anions Total	Ionic Balance	Aluminium	Aluminium (Filtered)	Iron	Iron (Filtered)	Manganese	Manganese (Filtered)
			pH units	µS/cm	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL			0.01	1	0.1	10	10	1	1	1	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	0.01	0.01	0.05	0.05	0.001	0.001
ANZECC 2000 SW Aust. Lowland River			**6.5-8**																									
Field ID	**Sampled_Date**	**Lab_Report_Number**																										
	21/05/2020	EP2005883	-	-	-	-	-	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12/05/2021	EP2105358	**5.11**	986	-	865	-	<1	<1	<1	<1	-	22	-	-	-	124	327	28	-	-	-	0.38	0.1	1.42	0.14	0.058	0.053
Process dam 2	26/05/2014	EP1403887	**5.43**	1120	127	995	-	<1	2	<1	2	197	25	23	34	11	150	365	37	10.8	11.1	1.62	-	0.2	-	0.41	-	0.091
	27/10/2016	EP1610261	**5.16**	1080	-	-	903	<1	<1	<1	<1	-	26	23	31	7	141	370	32	-	-	-	0.54	-	1.94	-	0.045	-
	21/06/2017	EP1706650	**6.48**	988	-	-	969	<1	7	<1	7	-	10	30	33	8	147	370	33	10.8	11.3	2.05	0.76	-	2	-	0.052	-
	2/05/2018	EP1805559	**6.22**	1300	-	1100	-	-	-	-	-	-	12	32	36	13	148	402	36	11.3	12.2	3.82	1.25	-	1.92	-	0.038	-
	14/05/2019	EP1904649	**4.71**	1360	-	1060	-	<1	<1	<1	<1	-	37	-	-	-	186	457	44	-	-	-	1.31	-	2.32	-	0.113	-
	21/05/2020	EP2005274	**4.8**	1400	-	1050	-	-	-	-	-	-	25	-	-	-	142	418	40	-	-	-	0.74	-	2.59	-	0.185	-
	21/05/2020	EP2005883	-	-	-	-	-	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12/05/2021	EP2105358	**4.69**	971	-	805	-	<1	<1	<1	<1	-	24	-	-	-	112	321	28	-	-	-	0.4	-	1.49	-	0.061	-

LABORATORY REPORT COVERSHEET

DATE:	4 October 2006
TO:	Austsand Mining PO Box 1373 ALBANY WA 6330
ATTENTION:	Mr Scot Whitbread
YOUR REFERENCE:	Water Analysis
OUR REFERENCE:	98233
SAMPLES RECEIVED:	07/09/2006
SAMPLES/QUANTITY:	2 Waters

The above samples were received intact and analysed according to your instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.

DON SARATHCHANDRA
Senior Chemist

Steven Edmett
STEVEN EDMETT
Project Manager

SGS Australia Pty Ltd ABN 44 000 964 278 | Environmental Services t +61 (0)8 9458 7278 | 52 Murray Road f +61 (0)8 9451 3505 | Welshpool 6106 | Western Australia | www.au.sgs.com

Member of the SGS Group

CLIENT: Austsand Mining **OUR REFERENCE:** 98233
PROJECT: Water Analysis

LABORATORY REPORT

Your Reference Our Reference Type of Sample	Units	Main Storage Dam 98233-1 Water	Reclaimed Water 98233-2 Water
pH	pH Units	7.7	6.3
Total Dissolved Solids (grav) @ 180°C	mg/L	720	680
Conductivity @25°C	µS/cm	1,200	1,100
Chloride, Cl	mg/L	340	320
Sulphate, SO_4	mg/L	30	17
Calcium, Ca	mg/L	25	18
Magnesium, Mg	mg/L	33	23
Sodium, Na	mg/L	160	120
Potassium, K	mg/L	9.8	8.7

CLIENT: Austsand Mining **OUR REFERENCE:** 98233

PROJECT: Water Analysis

LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
--------			
pH	pH Units	0.1	AN-101
Total Dissolved Solids (grav) @ 180°C	mg/L	10	PEI-002
Conductivity @25°C	µS/cm	2	AN-106
Chloride, Cl	mg/L	1	PEI-020
Sulphate, SO_4	mg/L	1	PEI-020
Calcium, Ca	mg/L	0.2	PEM-007
Magnesium, Mg	mg/L	0.1	PEM-007
Sodium, Na	mg/L	0.5	PEM-007
Potassium, K	mg/L	0.1	PEM-007

CLIENT: Austsand Mining **OUR REFERENCE:** 98233
PROJECT: Water Analysis

LABORATORY REPORT

NOTES:
LOR - Limit of Reporting.

This test is not covered by the scope of our NATA accreditation.
SGS terms and conditions are available from www.au.sgs.com

LABORATORY REPORT COVERSHEET

DATE:	22 May 2007
TO:	Austsand Mining PO Box 1373 ALBANY WA 6331
ATTENTION:	Mr Scot Whitbread
YOUR REFERENCE:	Water Analysis
OUR REFERENCE:	11733
SAMPLES RECEIVED:	30/04/2007
SAMPLES/QUANTITY:	2 Waters

The above samples were received intact and analysed according to your instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.

SAID HIRAD
Project/Validation Chemist

CLIENT: Austsand Mining **OUR REFERENCE:** 11733

PROJECT: Water Analysis

LABORATORY REPORT

Your Reference Our Reference Type of Sample	Units	Main Storage Dam 1 11733-1 Water	Reclaimed Water 2 11733-2 Water
pH	pH Units	7.5	7.1
Conductivity @25°C	µS/cm	1,300	1,000
Total Dissolved Solids @ 180°C	mg/L	650	480
Chloride, Cl	mg/L	340	280
Sulphate, SO_4	mg/L	35	25
Calcium, Ca	mg/L	29	18
Sodium, Na	mg/L	160	120
Magnesium, Mg	mg/L	35	25
Potassium, K	mg/L	11	8.8

CLIENT: Austsand Mining **OUR REFERENCE:** 11733

PROJECT: Water Analysis

LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
Waters and Wastewaters			
pH	pH Units	0.1	AN-101
Conductivity @25°C	µS/cm	2	AN-106
Total Dissolved Solids @ 180°C	mg/L	10	PEI-002
Chloride, Cl	mg/L	1	PEI-020
Sulphate, SO_4	mg/L	1	PEI-020
Calcium, Ca	mg/L	0.2	PEM-007
Sodium, Na	mg/L	0.5	PEM-007
Magnesium, Mg	mg/L	0.1	PEM-007
Potassium, K	mg/L	0.1	PEM-007

CLIENT: Austsand Mining **OUR REFERENCE:** 11733
PROJECT: Water Analysis

LABORATORY REPORT

NOTES:
LOR - Limit of Reporting.

This test is not covered by the scope of our NATA accreditation.
SGS terms and conditions are available from www.au.sgs.com

LABORATORY REPORT COVERSHEET

DATE: 24 April 2008

TO: Austsand Mining
PO Box 1373
ALBANY WA 6330

ATTENTION: Mr Scot Whitbread

YOUR REFERENCE: Water Analysis, PO # 460848

OUR REFERENCE: PE016134

SAMPLES RECEIVED: 14/4/08

SAMPLES/QUANTITY: 3 waters

The above samples were received intact and analysed according to your instructions.
Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.
Microbiological testwork was subcontracted to ProMicro, Hillarys, report no. P0808878 (NATA 2651).

DON SARATHCHANDRA
NATA Signatory

SAID HIRAD
NATA Signatory

SGS Australia Pty Ltd
ABN 44 000 964 278
Environmental Services 10 Reid Road Newburn Western Australia 6105
t + 61 (0)8 9373 3500 f + 61 (0)8 9373 3668
www.au.sgs.com

CLIENT: Austsand Mining **OUR REFERENCE:** PE016134

PROJECT: Water Analysis, PO # 460848

LABORATORY REPORT

Your Reference Our Reference Type Of Sample	Units	Main Storage Dam PE016134-1 Water	Reclaimed Water PE016134-2 Water
pH	pH Units	7.6	6.3
Total Dissolved Solids @ 180°C	mg/L	670	590
Conductivity @25°C	µS/cm	1,300	1,100
Chloride, Cl	mg/L	340	310
Sulphate, SO_4	mg/L	33	30
Calcium, Ca	mg/L	22	14
Magnesium, Mg	mg/L	33	27
Sodium, Na	mg/L	150	130
Potassium, K	mg/L	8.0	7.4

CLIENT: Austsand Mining **OUR REFERENCE:** PE016134

PROJECT: Water Analysis, PO # 460848

LABORATORY REPORT

Your Reference Our Reference Type Of Sample	Units	Potable Water PE016134-3 Water
Total Coliforms	CFU/100 mL	1 EST
Faecal (Thermotolerant) Coliforms	CFU/100mL	0
Heterotrophic Plate Count @ 21°C	CFU/mL	5,400
Heterotrophic Plate Count @ 37°C	CFU/mL	1,600

CLIENT: Austsand Mining **OUR REFERENCE:** PE016134

PROJECT: Water Analysis, PO # 460848

LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
Waters and Wastewaters			
pH	pH Units	0.1	AN-101
Total Dissolved Solids @ 180°C	mg/L	10	PEI-002
Conductivity @25°C	µS/cm	2	AN-106
Chloride, Cl	mg/L	1	PEI-071
Sulphate, SO_4	mg/L	1	PEI-072
Calcium, Ca	mg/L	0.2	AN-321
Magnesium, Mg	mg/L	0.1	AN-321
Sodium, Na	mg/L	0.5	AN-321
Potassium, K	mg/L	0.1	AN-321
Microbiology			
Total Coliforms	CFU/100 mL	0	PM4.2
Faecal (Thermotolerant) Coliforms	CFU/100mL	0	PM4.3
Heterotrophic Plate Count @ 21°C	CFU/mL	1	PM4.1
Heterotrophic Plate Count @ 37°C	CFU/mL	1	PM4.1

CLIENT: Austsand Mining **OUR REFERENCE:** PE016134

PROJECT: Water Analysis, PO # 460848

LABORATORY REPORT

NOTES:

LOR - Limit of Reporting.

In accordance with the Australian Standard methods for Membrane Filtration, if the colony count per plate is outside the range of 20-80, the result derived from this must be shown as an estimation. The reason for this is statistical.

This test is not covered by the scope of our NATA accreditation.

LABORATORY REPORT COVERSHEET

DATE:	4 September 2008
TO:	Austsand Mining PO Box 1373 ALBANY WA 6330
ATTENTION:	Mr Scot Whitbread
YOUR REFERENCE:	Water Analysis
OUR REFERENCE:	PE018174
SAMPLES RECEIVED:	27/08/2008
SAMPLES/QUANTITY:	2 Waters

The above samples were received intact and analysed according to your instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.

SAID HIRAD
NATA Signatory

WORLD RECOGNISED ACCREDITATION

SGS Australia Pty Ltd
ABN 44 000 964 278

Environmental Services 10 Reid Road Newburn Western Australia 6105
t + 61 (0)8 9373 3500 f + 61 (0)8 9373 3668

www.au.sgs.com

Member of the SGS Group

CLIENT: Austsand Mining **OUR REFERENCE:** PE018174

PROJECT: Water Analysis

LABORATORY REPORT

Your Reference Our Reference Type of Sample	Units	Main Storm Dam PE018174-1 Water	Reclaimed Water PE018174-2 Water
pH	pH Units	7.7	6.6
Conductivity @25°C	µS/cm	1,200	970
Total Dissolved Solids @ 180°C	mg/L	570	650
Chloride, Cl	mg/L	320	230
Sulphate, SO_4	mg/L	28	17
Calcium, Ca	mg/L	27	18
Magnesium, Mg	mg/L	29	24
Sodium, Na	mg/L	140	130
Potassium, K	mg/L	7.6	7.2

CLIENT: Austsand Mining **OUR REFERENCE:** PE018174

PROJECT: Water Analysis

LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
Water Analysis			
pH	pH Units	0.1	AN101
Conductivity @25°C	µS/cm	2	AN106
Total Dissolved Solids @ 180°C	mg/L	10	AN113
Chloride, Cl	mg/L	1	AN274
Sulphate, SO_4	mg/L	1	AN275
Calcium, Ca	mg/L	0.2	AN050-AN321
Magnesium, Mg	mg/L	0.1	AN050-AN321
Sodium, Na	mg/L	0.5	AN050-AN321
Potassium, K	mg/L	0.1	AN050-AN321

CLIENT: Austsand Mining **OUR REFERENCE:** PE018174
PROJECT: Water Analysis

LABORATORY REPORT

NOTES:
LOR - Limit of Reporting.

CERTIFICATE OF ANALYSIS

Work Order	: **EP1410619**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MR DAVID MORGAN	Contact	: Scott James
Address	: 239 ADELAIDE TERRACE PERTH WA 6004	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: david.morgan@ghd.com	E-mail	: perth.enviro.services@alsglobal.com
Telephone	: +61 08 6222 8222	Telephone	: +61-8-9209 7655
Facsimile	: +61 08 9429 6555	Facsimile	: +61-8-9209 7600
Project	: 61 30701 Albany water surface monitoring	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 16-DEC-2014
Sampler	: SW	Issue Date	: 31-DEC-2014
Site	: ----		
		No. of samples received	: 5
Quote number	: EN/005/14	No. of samples analysed	: 5

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Canhuang Ke	Metals Instrument Chemist	Perth Inorganics
Efua Wilson	Metals Chemist	Perth Inorganics
Jeremy Truong	Senior Inorganic Chemist	Perth Inorganics
Scott James	Laboratory Manager	Perth Inorganics

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Process water dam 1	Process water dam 2	Collection dam 1	Collection dam 2	QA01
Client sample ID								
Client sampling date / time				15-DEC-2014 11:15	15-DEC-2014 11:20	15-DEC-2014 12:00	15-DEC-2014 12:10	15-DEC-2014 11:15
				EP1410619-001	EP1410619-002	EP1410619-003	EP1410619-004	EP1410619-005
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	5.89	5.56	7.07	7.11	5.67
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1300	1330	1420	1440	1350
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	1480	1420	902	940	1510
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	216	220	254	254	216
EA075: Redox Potential								
Redox Potential	----	0.1	mV	-20.0	-23.8	-24.2	-34.3	-22.4
pH Redox	----	0.01	pH Unit	5.37	5.40	6.76	7.03	5.39
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	7	4	44	44	5
Total Alkalinity as CaCO3	----	1	mg/L	7	4	44	44	5
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	25	25	9	8	24
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	42	43	34	34	41
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	429	429	438	440	428
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	27	27	34	34	27
Magnesium	7439-95-4	1	mg/L	36	37	41	41	36
Sodium	7440-23-5	1	mg/L	167	168	170	169	168
Potassium	7440-09-7	1	mg/L	12	12	22	21	12
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.27	0.30	<0.01	<0.01	0.28
Manganese	7439-96-5	0.001	mg/L	0.199	0.201	0.840	0.831	0.204
Iron	7439-89-6	0.05	mg/L	0.21	0.25	0.20	0.23	0.24
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	13.1	13.1	13.9	14.0	13.0
Total Cations	----	0.01	meq/L	11.9	12.0	13.0	13.0	11.9

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Process water dam 1	Process water dam 2	Collection dam 1	Collection dam 2	QA01
			Client sampling date / time	15-DEC-2014 11:15	15-DEC-2014 11:20	15-DEC-2014 12:00	15-DEC-2014 12:10	15-DEC-2014 11:15
Compound	CAS Number	LOR	Unit	EP1410619-001	EP1410619-002	EP1410619-003	EP1410619-004	EP1410619-005
EN055: Ionic Balance - Continued								
Ionic Balance	----	0.01	%	**4.94**	**4.26**	**3.39**	**3.86**	**4.42**

CERTIFICATE OF ANALYSIS

Work Order	: **EP1510913**	Page	: 1 of 3
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS MERANDA TONER	Contact	: Customer Services EP
Address	: 239 ADELAIDE TERRACE PERTH WA 6004	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: meranda.toner@ghd.com	E-mail	: ALSEnviro.Perth@alsglobal.com
Telephone	: +61 08 6222 8222	Telephone	: +61-8-9209 7655
Facsimile	: +61 08 9429 6555	Facsimile	: +61-8-9209 7600
Project	: 61/30701 Albany water surface monitoring	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 08-Jun-2015 23:20
C-O-C number	: ----	Date Analysis Commenced	: 10-Jun-2015
Sampler	: SCOTT WHITBREAD	Issue Date	: 16-Jun-2015 16:50
Site	: ----		
		No. of samples received	: 5
Quote number	: ----	No. of samples analysed	: 5

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Efua Wilson	Metals Chemist	Perth Inorganics
Jeremy Truong	Laboratory Supervisor	Perth Inorganics
Scott James	Laboratory Manager	Perth Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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.

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

- EA015H (Total Dissolved Solids) result may bias high due to sample matrix interference.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Process water dam 1	Process water dam 2	Collection dam 1	Collection dam 2	QA01
			Client sampling date / time	03-Jun-2015 08:20	03-Jun-2015 08:25	03-Jun-2015 09:10	03-Jun-2015 09:20	[03-Jun-2015]
Compound	CAS Number	LOR	Unit	EP1510913-001	EP1510913-002	EP1510913-003	EP1510913-004	EP1510913-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	5.37	4.99	6.89	6.94	5.24
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1140	1150	1240	1250	1140
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	----	10	mg/L	934	886	794	814	930
EA065: Total Hardness as CaCO3								
^ Total Hardness as CaCO3	----	1	mg/L	174	174	211	213	178
EA075: Redox Potential								
Redox Potential	----	0.1	mV	-22.6	-29.1	-54.7	-63.2	-28.1
pH Redox	----	0.01	pH Unit	4.90	4.84	6.51	6.51	5.18
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	3	1	31	32	3
Total Alkalinity as CaCO3	----	1	mg/L	4	1	31	32	3
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	33	35	6	7	33
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	37	36	32	32	37
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	342	339	348	354	337
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	22	22	30	31	22
Magnesium	7439-95-4	1	mg/L	29	29	33	33	30
Sodium	7440-23-5	1	mg/L	145	146	151	150	148
Potassium	7440-09-7	1	mg/L	9	8	8	8	8
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.49	0.56	<0.01	<0.01	0.54
Manganese	7439-96-5	0.001	mg/L	0.049	0.050	0.001	0.018	0.050
Iron	7439-89-6	0.05	mg/L	0.48	0.54	0.06	0.06	0.52
EN055: Ionic Balance								
^ Total Anions	----	0.01	meq/L	10.5	10.3	11.1	11.3	10.3
^ Total Cations	----	0.01	meq/L	10.0	10.0	11.0	11.0	10.2
^ Ionic Balance	----	0.01	%	2.32	1.44	0.53	1.34	0.62

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP1610261**	Page	: 1 of 3
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MR JONATHAN CRAMER	Contact	: Mitchell Bevan
Address	: 999 HAY STREET PERTH WA 6000	Address	: 10 Hod Way Malaga WA Australia 6090
Telephone	: 6222 8222	Telephone	: 08 9209 7619
Project	: 61/33145 AUSTSANDS MINING	Date Samples Received	: 28-Oct-2016 09:45
Order number	: ----	Date Analysis Commenced	: 31-Oct-2016
C-O-C number	: ----	Issue Date	: 04-Nov-2016 16:09
Sampler	: JONATHAN CRAMER		
Site	: ----		
Quote number	: ----		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Bek Simpfendorfer	Inorganic Supervisor	Perth Inorganics, Malaga, WA
Canhuang Ke	Metals Instrument Chemist	Perth Inorganics, Malaga, WA
Jeremy Truong	Laboratory Manager	Perth Inorganics, Malaga, WA
Tyrone Cole	Inorganics Preparation Supervisor	Perth Inorganics, Malaga, WA

General Comments

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

- EA015H (Total Dissolved Solids): TDS for samples 'Process Dam-1' and 'Process Dam-2' biasing high due to possible sample matrix interferences.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Process Dam-1	Process Dam-2	Collection Dam-1	Collection Dam-2	----
			Client sampling date / time	[27-Oct-2016]	[27-Oct-2016]	[27-Oct-2016]	[27-Oct-2016]	----
Compound	CAS Number	LOR	Unit	EP1610261-001	EP1610261-002	EP1610261-003	EP1610261-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	5.43	5.16	7.24	7.15	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1060	1080	1220	1250	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	872	903	838	846	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	1	<1	28	25	----
Total Alkalinity as CaCO3	----	1	mg/L	1	<1	28	25	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	24	26	5	5	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	32	32	34	30	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	369	370	407	398	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	22	23	30	33	----
Magnesium	7439-95-4	1	mg/L	29	31	34	35	----
Sodium	7440-23-5	1	mg/L	136	141	148	152	----
Potassium	7440-09-7	1	mg/L	7	7	7	7	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.09	----	0.01	----	----
Manganese	7439-96-5	0.001	mg/L	0.042	----	0.019	----	----
Iron	7439-89-6	0.05	mg/L	0.28	----	0.13	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.55	0.54	<0.01	0.02	----
Manganese	7439-96-5	0.001	mg/L	0.044	0.045	0.019	0.044	----
Iron	7439-89-6	0.05	mg/L	1.90	1.94	0.79	1.02	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP1706650**	Page	: 1 of 3
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MR JON CRAMER	Contact	: Customer Services EP
Address	: 999 HAY STREET PERTH WA, AUSTRALIA 6000	Address	: 10 Hod Way Malaga WA Australia 6090
Telephone	: +61 08 9964 3677	Telephone	: +61-8-9209 7655
Project	: 61/33145 Enviro Support - Austsand Mining	Date Samples Received	: 22-Jun-2017 09:45
Order number	: ----	Date Analysis Commenced	: 23-Jun-2017
C-O-C number	: ----	Issue Date	: 29-Jun-2017 12:20
Sampler	: JON CRAMER		
Site	: ----		
Quote number	: EN/005/16		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Jeremy Truong	Laboratory Manager	Perth Inorganics, Malaga, WA
Tyrone Cole	Inorganics Preparation Supervisor	Perth Inorganics, Malaga, WA

General Comments

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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 no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

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

- EA015H (Total Dissolved Solids): TDS for various samples biasing high due to possible sample matrix interferences.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Process Dam -1	Process Dam -2	Collection Dam -1	Collection Dam -2	----
			Client sampling date / time	21-Jun-2017 00:00	21-Jun-2017 00:00	21-Jun-2017 00:00	21-Jun-2017 00:00	----
Compound	CAS Number	LOR	Unit	EP1706650-001	EP1706650-002	EP1706650-003	EP1706650-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.67**	**6.48**	**7.51**	**7.32**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1010**	**988**	**1060**	**1090**	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**942**	**969**	**832**	**820**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**9**	**7**	**30**	**31**	----
Total Alkalinity as CaCO3	----	1	mg/L	**9**	**7**	**30**	**31**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**9**	**10**	**8**	**9**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**33**	**33**	**32**	**32**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**371**	**370**	**391**	**386**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**32**	**30**	**40**	**40**	----
Magnesium	7439-95-4	1	mg/L	**34**	**33**	**37**	**37**	----
Sodium	7440-23-5	1	mg/L	**148**	**147**	**156**	**160**	----
Potassium	7440-09-7	1	mg/L	**7**	**8**	**8**	**8**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.03**	----	<0.01	----	----
Manganese	7439-96-5	0.001	mg/L	**0.047**	----	**0.065**	----	----
Iron	7439-89-6	0.05	mg/L	**0.08**	----	<0.05	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.67**	**0.76**	**0.01**	**0.05**	----
Manganese	7439-96-5	0.001	mg/L	**0.049**	**0.052**	**0.065**	**0.092**	----
Iron	7439-89-6	0.05	mg/L	**1.92**	**2.00**	**1.38**	**4.90**	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**11.3**	**11.3**	**12.3**	**12.2**	----
Total Cations	----	0.01	meq/L	**11.0**	**10.8**	**12.0**	**12.2**	----
Ionic Balance	----	0.01	%	**1.43**	**2.05**	**1.08**	**0.13**	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP1805559**	Page	: 1 of 3
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MR JON CRAMER	Contact	: Marnie Thomsett
Address	: 999 HAY STREET PERTH WA, AUSTRALIA 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 6222 8222	Telephone	: 08 9406 1311
Project	: 6136478 Enviro Support Austsand	Date Samples Received	: 03-May-2018 13:00
Order number	:	Date Analysis Commenced	: 07-May-2018
C-O-C number	: ----	Issue Date	: 24-May-2018 15:30
Sampler	: VICKI DAVIES		
Site	: ----		
Quote number	: EN/005/17		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Indra Astuty	Instrument Chemist	Perth Inorganics, Wangara, WA
Tyrone Cole	Inorganics Preparation Supervisor	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 Contact for details.

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

- EG020: It is recognised that total concentration is less than dissolved for some metal analytes. However, the difference is within experimental variation of the methods.
- EA015H (Total Dissolved Solids): TDS for various samples biasing high due to possible sample matrix interferences.
- Amendment (21/05/2018): This report has been amended and re-released to allow the reporting of additional analytical data.
- Sodium Absorption 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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Process Dam 1	Process Dam 2	Collection Dam 1	Collection Dam 2	----
			Client sampling date / time	02-May-2018 00:00	02-May-2018 00:00	02-May-2018 00:00	02-May-2018 00:00	----
Compound	CAS Number	LOR	Unit	EP1805559-001	EP1805559-002	EP1805559-003	EP1805559-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.43	6.22	7.50	7.37	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1320	1300	1370	1360	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	1080	1100	940	943	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	12	12	4	5	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	37	36	34	34	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	401	402	418	410	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	33	32	38	38	----
Magnesium	7439-95-4	1	mg/L	36	36	38	38	----
Sodium	7440-23-5	1	mg/L	144	148	146	150	----
Potassium	7440-09-7	1	mg/L	12	13	12	12	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.02	----	<0.01	----	----
Manganese	7439-96-5	0.001	mg/L	0.030	----	0.027	----	----
Iron	7439-89-6	0.05	mg/L	0.08	----	0.07	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.99	1.25	0.09	0.18	----
Manganese	7439-96-5	0.001	mg/L	0.036	0.038	0.026	0.043	----
Iron	7439-89-6	0.05	mg/L	1.79	1.92	0.58	1.56	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	12.2	12.2	13.1	12.9	----
Total Cations	----	0.01	meq/L	11.2	11.3	11.7	11.8	----
Ionic Balance	----	0.01	%	4.53	3.82	5.80	4.12	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP1904649**	Page	: 1 of 3
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MR JON CRAMER	Contact	: Marnie Thomsett
Address	: 999 HAY STREET PERTH WA, AUSTRALIA 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 6222 8222	Telephone	: 08 9406 1311
Project	: 61-36478	Date Samples Received	: 15-May-2019 13:30
Order number	:	Date Analysis Commenced	: 16-May-2019
C-O-C number	: ----	Issue Date	: 29-May-2019 12:46
Sampler	: VICKI DAVIES		
Site	: Water Quality Monitoring		
Quote number	: EN/005/18		
No. of samples received	: 5		
No. of samples analysed	: 5		

Accreditation No. 825
Accredited for compliance with
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- Analytical Results

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Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Indra Astuty	Instrument Chemist	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
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 sample #1 and #2 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Amendment (24/05/2019): This report has been amended and re-released to allow the reporting of additional analytical data.
- 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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Process Dam 1	Process Dam 2	Collection Dam 1	Collection Dam 2	FD01
				Client sampling date / time	14-May-2019 00:00	14-May-2019 00:00	14-May-2019 00:00	14-May-2019 00:00	14-May-2019 00:00
Compound	CAS Number	LOR	Unit		EP1904649-001	EP1904649-002	EP1904649-003	EP1904649-004	EP1904649-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		4.76	4.71	6.79	6.75	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		1330	1360	1410	1420	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		1050	1060	906	904	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		<1	<1	22	24	----
Total Alkalinity as CaCO3	----	1	mg/L		<1	<1	22	24	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		31	37	10	10	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		45	44	36	36	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		452	457	461	468	----
ED093F: Dissolved Major Cations									
Sodium	7440-23-5	1	mg/L		161	186	167	183	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.12	----	<0.01	----	----
Manganese	7439-96-5	0.001	mg/L		0.094	----	0.084	----	----
Iron	7439-89-6	0.05	mg/L		0.21	----	0.27	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		1.07	1.31	0.01	0.02	1.40
Manganese	7439-96-5	0.001	mg/L		0.118	0.113	0.091	0.120	0.118
Iron	7439-89-6	0.05	mg/L		1.90	2.32	1.32	2.27	2.58

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2005274**	Page	: 1 of 3
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MR JON CRAMER	Contact	: Rebecca Shaw
Address	: 999 HAY STREET PERTH WA, AUSTRALIA 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 9964 3677	Telephone	: +61-8-9406 1301
Project	: 6136478	Date Samples Received	: 22-May-2020 10:55
Order number	: 6136478	Date Analysis Commenced	: 25-May-2020
C-O-C number	: ----	Issue Date	: 29-May-2020 12:56
Sampler	: VD/PY		
Site	:		
Quote number	: EN/005/19		
No. of samples received	: 5		
No. of samples analysed	: 5		

Accreditation No. 825
Accredited for compliance with
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Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA

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 Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
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 #1 and #2 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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Process Dam 1	Process Dam 2	Collection Dam 1	Collection Dam 2	FD01
				Client sampling date / time	21-May-2020 11:20	21-May-2020 11:20	21-May-2020 11:45	21-May-2020 11:45	21-May-2020 11:45
Compound	CAS Number	LOR	Unit		EP2005274-001	EP2005274-002	EP2005274-003	EP2005274-004	EP2005274-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		5.48	4.80	7.00	7.04	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		1390	1400	1420	1430	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		1140	1050	1080	1060	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		23	25	9	11	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		53	40	37	39	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		421	418	419	411	----
ED093F: Dissolved Major Cations									
Sodium	7440-23-5	1	mg/L		159	142	158	149	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.12	----	<0.01	----	----
Manganese	7439-96-5	0.001	mg/L		0.164	----	0.174	----	----
Iron	7439-89-6	0.05	mg/L		0.51	----	0.48	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.72	0.74	0.01	0.03	<0.01
Manganese	7439-96-5	0.001	mg/L		0.181	0.185	0.180	0.218	0.178
Iron	7439-89-6	0.05	mg/L		2.58	2.59	1.72	3.91	1.73

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2005883**	Page	: 1 of 2
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MR JON CRAMER	Contact	: Rebecca Shaw
Address	: 999 HAY STREET PERTH WA, AUSTRALIA 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 9964 3677	Telephone	: +61-8-9406 1301
Project	: 6136478	Date Samples Received	: 22-May-2020 10:55
Order number	: ----	Date Analysis Commenced	: 10-Jun-2020
C-O-C number	: ----	Issue Date	: 11-Jun-2020 12:46
Sampler	: VD/PY		
Site	:		
Quote number	: EN/005/19		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
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- Analytical Results

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Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA

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 Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Client sample ID*	**Process Dam 1**	**Process Dam 2**	**Collection Dam 1**	**Collection Dam 2**	**----**
			Client sampling date / time	21-May-2020 11:20	21-May-2020 11:20	21-May-2020 11:45	21-May-2020 11:45	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2005883-001**	**EP2005883-002**	**EP2005883-003**	**EP2005883-004**	**--------**
				Result	Result	Result	Result	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	**----**
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	**----**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	**16**	**14**	**----**
Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	**16**	**14**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2105358**	Page	: 1 of 3
Amendment	: **2**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS VICKI DAVIES	Contact	: Nick Courts
Address	: 999 HAY STREET PERTH WA, AUSTRALIA 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: 6136478	Date Samples Received	: 13-May-2021 11:50
Order number	: ----	Date Analysis Commenced	: 14-May-2021
C-O-C number	: ----	Issue Date	: 18-Jun-2021 12:32
Sampler	: JON CRAMER		
Site	:		
Quote number	: EN/005		
No. of samples received	: 4		
No. of samples analysed	: 4		

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- Analytical Results

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Signatories

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Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA

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.

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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **Amendment (18/06/21): This report has been amended to alter the project reference code to 6136478. All analysis results are as per the previous report.**
- EG020: It has been confirmed by re-digestion and re-analysis that total Iron and aluminium concentrations are less than dissolved for sample EP2105358-003.
- TDS by method EA-015 may bias high 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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Process Dam 1	Process Dam 2	Collection Dam 1	Collection Dam 2	----
			Sampling date / time	12-May-2021 00:00	12-May-2021 00:00	12-May-2021 00:00	12-May-2021 00:00	----
Compound	CAS Number	LOR	Unit	EP2105358-001	EP2105358-002	EP2105358-003	EP2105358-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.11**	**4.69**	**7.09**	**7.17**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**986**	**971**	**1260**	**1260**	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**865**	**805**	**948**	**988**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	**21**	**20**	----
Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	**21**	**20**	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**22**	**24**	**5**	**4**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**28**	**28**	**31**	**31**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**327**	**321**	**407**	**410**	----
ED093F: Dissolved Major Cations								
Sodium	7440-23-5	1	mg/L	**124**	**112**	**150**	**143**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.10**	----	**0.01**	----	----
Manganese	7439-96-5	0.001	mg/L	**0.053**	----	**0.038**	----	----
Iron	7439-89-6	0.05	mg/L	**0.14**	----	**0.86**	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.38**	**0.40**	<0.01	<0.01	----
Manganese	7439-96-5	0.001	mg/L	**0.058**	**0.061**	**0.039**	**0.029**	----
Iron	7439-89-6	0.05	mg/L	**1.42**	**1.49**	**0.10**	**1.00**	----

Appendix F

Closure Cost Estimate

CLIENTS|PEOPLE|PERFORMANCE

Calculation Sheet

CALCULATION DETAILS

Client	**TT Sands Pty Ltd**		
Project	**Mindijup Silica Sand Mine Closure Plan**		
Job No.	**12554621**	**Rev.**	**2**

Calculation Title	**Calculation Sheet**
Doc No.	**12554621-CAL-A_Closure budget estimate 2021-2022**
Client Doc No.	

NOTES

These calculations present the Bill of Quantities developed for the closure option for the Mindijup Silica Sand mine site. The purpose of the calculations is to provide a cost estimate for TT Sands Pty Ltd (trading as Austsand Mining) to plan future mining and rehabilitation works.

Rev	Description	By	Chk'd	App'd	Date
2	Draft for Client Review	V Davies	P Lombard		23-Dec-21
1	Draft for Client Review	P Yoganathan	A Rafty		19-Dec-19
0	Final Issue	P Fortier	B Edwards	C Gwynne	13-Dec-12
A	Draft for Client Review	P Fortier	B Edwards		5-Dec-12

Template Version: 3.20

CALCULATION NOTES

CLIENT:	**TT Sands Pty Ltd**			DOC NO:	**12554621-CAL-A_Closure budget estimate 2021-2022**
PROJECT:	**Mindijup Silica Sand Mine Closure Plan**			JOB: **12554621**	REV: **2**
CALCULATION TITLE:	**Calculation Sheet**				
PREPARED:	V Davies	CHECKED:	P Lombard	APPROVED:	

CALCULATION PURPOSE

These calculations have been developed for the Mindijup Silica Sand Mine for the use of TT Sands Pty Ltd only, unless prior permission is granted from GHD Pty Ltd.

The Mindijup Silica Sand Mine includes the following facilities:

- Tailings dams
- Product stockpiles
- Mine void
- Site buildings (site office, workshop, fuel bunker, washbay and concrete slab, processing plant, screening plant and hopper);
- Roads and hardstands facilities (site buildings pads and other hard, low permeability surfaces);
- Power transmission infrastructure
- Water management infrastructure (potable water treatment and distribution system, wastewater treatment system, pumping station, process water dam, supply line and on site bore, collection dam
- Rehabiliated areas
- Subsoil and seed banks
- Reject material stockpiles

INPUT ASSUMPTIONS

Input Unit Rates
The input unit rates have been sourced from Austsand's records, Rawlinsons Australian Construction Handbook (2019) and unit rates for similar mining operations in the region known to GHD.

Areas
Quantities have been taken from drawing no 12993-32L (2021), Lot 5 Mindijup Road Palmdale December 2021 Update Survey which reports areas on the drawing, quanitified by Harley Dykstra surveying.
They have also been taken from DMIRS Annual Environmental Report details for the Period Finishing: November 2021 (for DMIRS under the Environmental Assessment and Regulatory System).

Facility Status
Data informing the status and closure method of each facility has been resourced from information contained within the Mindijup Silica Sand Mine Closure Plan (MCP) (GHD 2018). Drawing no 12993-11X (2018) was referenced in the MCP.

GENERAL NOTES

Options Assessment
Only one option has been costed for the closure of each facility.

Escalation Rates
The costing has been prepared based on current rates and does not consider escalation into the future.

CLIENT:	**TT Sands Pty Ltd**	DOC NO:	**12554621-CAL-A_Closure budget estimate 2021-2022**
PROJECT:	**Mindijup Silica Sand Mine Closure Plan**	JOB:	**12554621**
CALCULATION TITLE:	**Closure budget estimate**	REV:	**2**
FACILITY:	**Mindijup Silica Sand Mine**		
PREPARED:	V Davies	CHECKED:	P Lombard

Option description:

The closure costs are estimated for unexpected closure of the site upon immediate cessation of mining activities.
These costs are estimated for the known closure requirements of Mindijup Silica Sand Mine inclusive of a 5 year monitoring and maintenance period.
Quantities of topsoil and greenwaste material are assumed to be equal to current stockpiles.

Item	Description	Quantity	Unit	Unit rate	Cost
1.0	**Preliminaries and generals**				
1.1	P & General including mob and demob	10%			$241,269.70
Subtotal					**$241,269.70**
2.0	**Product stockpiles - surface rehabilitation**				
2.1	Deep contour ripping prior to spreading topsoil/seedbank/greenwaste	43737	m2	0.30	$13,121.10
2.2	Load and haul of topsoil/seedbank material and spreading of 60 mm across the area	43737	m2	0.55	$23,936.07
2.3	Spreading of greenwaste (cut trees and surface vegetation) on 5% of the surface	43737	m2	0.03	$1,164.17
2.4	Direct seeding of native species including seed collection and conditioning	43737	m2	0.72	$31,650.97
2.5	Planting of seedlings including the seedlings, tree fertilizer, WMF fertilizer, corflutes and pegs	43737	m2	0.16	$6,817.13
Subtotal					**$76,689.43**
3.0	**Mine void - earthwork**				
3.1	Reshaping of the mine void face with a slope of 1V:7H and final surface shaping as required	199892	m3	3.42	$683,723.32
Subtotal					**$683,723.32**
4.0	**Mine void - surface rehabilitation**				
4.1	Load and haul of topsoil/seedbank material and spreading of 60 mm across the area	107500	m2	0.55	$58,831.82
4.2	Spreading of greenwaste (cut trees and surface vegetation) on 5% of the surface	107500	m2	0.03	$2,861.38
4.3	Direct seeding of native species including seed collection and conditioning	107500	m2	0.72	$77,794.06
4.4	Planting of seedlings including the seedlings, tree fertilizer, WMF fertilizer, corflutes and pegs	107500	m2	0.16	$16,755.64
Subtotal					**$156,242.91**
5.0	**Tailings dams - analysis**				
5.1	Tailings moisture analysis on site with calibrated equipment	6	unit	3,300.00	$19,800.00
Subtotal					**$19,800.00**
6.0	**Tailings dams - removal and disposal of material**				
6.1	Puncturing and burying the plastic liner	11509	m2	1.00	$11,509.00
Subtotal					**$11,509.00**
7.0	**Tailings dams - earthwork**				
7.1	Reshaping of tailings dam walls with a slope of 1V:6H and final surface shaping as required	8333	m3	3.42	$28,502.72
Subtotal					**$28,502.72**
8.0	**Tailings dams - surface rehabilitation**				
8.1	Load and haul of topsoil/seedbank material and spreading of 60 mm across the area	11509	m2	0.55	$6,298.56
8.2	Spreading of green waste (cut trees and surface vegetation) on 5% of the surface	11509	m2	0.03	$306.34
8.3	Direct seeding of native species including seed collection and conditioning	11509	m2	0.72	$8,328.67
8.4	Planting of seedlings including the seedlings, tree fertilizer, WMF fertilizer, corflutes and pegs	11509	m2	0.16	$1,793.87
Subtotal					**$16,727.44**
9.0	**Site building, roads and hardstands and power infrastructure - removal and demolition**				
9.1	Removal of site office and ablution block	1	lump sum	11,100.00	$11,100.00
9.2	Removal of screening plant	1	lump sum	38,900.00	$38,900.00
9.3	Removal of equipment from fuel bunker and workshop including oil and fuel storage facilities	1	lump sum	25,600.00	$25,600.00
9.4	Removal of processing plant equipment	1	lump sum	222,600.00	$222,600.00
9.5	Removal of material from washbay areas (2)	1	lump sum	15,500.00	$15,500.00
9.6	Removal of underground electrical cables less then 600 mm below ground	1	lump sum	14,400.00	$14,400.00
9.7	Removal of electrical distribution board (4)	1	lump sum	10,000.00	$10,000.00
9.8	Removal of light pole (2)	2	lump sum	1,600.00	$3,200.00
9.9	Removal of laydown yard equipment	1	lump sum	42,300.00	$42,300.00
9.10	Demolish and remove workshop and fuel bunker	1	lump sum	31,100.00	$31,100.00
9.11	Demolish and remove processing plant building	1	lump sum	66,700.00	$66,700.00
9.12	Demolish and remove towers (3)	3	lump sum	22,200.00	$66,600.00
9.13	Demolish and remove concrete slabs and walls (site office, workshop, washbays, processing plant and water recovery area, retaining walls and tower footing)	228	m3	400.00	$91,200.00
Subtotal					**$639,200.00**
10.0	**Site building, roads and hardstands and power infrastructure - earthworks**				
10.1	Shaping final surface as required (average of 0.2 m deep)	12870	m3	3.42	$44,021.37
Subtotal					**$44,021.37**
11.0	**Site building, roads and hardstands and power infrastructure - surface rehabilitation**				
11.1	Contour ripping (600 mm deep) prior to spreading topsoil/seedbank/greenwaste	64350	m2	0.30	$19,305.00
11.2	Load and haul of topsoil/seedbank material and spreading of 60 mm across the area	64350	m2	0.55	$35,217.00
11.3	Spreading of greenwaste (cut trees and surface vegetation) on 5% of the surface	64350	m2	0.03	$1,712.84
11.4	Direct seeding of native species including seed collection and conditioning	64350	m2	0.72	$46,567.89
11.5	Planting of seedlings including the seedlings, tree fertilizer, WMF fertilizer, corflutes and pegs	64350	m2	0.16	$10,030.01
Subtotal					**$112,832.73**

CLIENT:	**TT Sands Pty Ltd**	DOC NO:	**12554621-CAL-A_Closure budget estimate 2021-2022**
PROJECT:	**Mindijup Silica Sand Mine Closure Plan**	JOB:	**12554621**
CALCULATION TITLE:	**Closure budget estimate**	REV:	**2**
FACILITY:	**Mindijup Silica Sand Mine**		
PREPARED:	V Davies	CHECKED:	P Lombard

Item	Description	Quantity	Unit	Unit rate	Cost
12.0	**Water management - Infrastructure removal and disposal**				
12.1	Remove and dispose of water tanks (2) and, UV and filter system	1	lump sum	8,900.00	$8,900.00
12.2	Remove and dispose of pump stations incuding all the equipment (2)	1	lump sum	15,500.00	$15,500.00
12.3	Remove pipeline (water distribution and slurry) and associated infrastructure less than 600 mm below ground and plug distribution pipelines deeper than 600 mm	1	lump sum	16,600.00	$16,600.00
12.4	Puncture process water dam liner	2393	m2	1.00	$2,392.67
12.5	Plug bore holes	2	unit	5,500.00	$11,000.00
Subtotal					**$54,392.67**
13.0	**Water management - Earthwork**				
13.1	Shape top and side walls of process water and collection dams with a slope of 1V:7H	19253	m3	3.42	$65,854.91
Subtotal					**$65,854.91**
14.0	**Water management - Surface rehabilitation**				
14.1	Load and haul of topsoil/seedbank material and spreading of 60 mm across the area	6055	m2	0.55	$3,313.74
14.2	Spreading of greenwaste (cut trees and surface vegetation) on 5% of the surface	6055	m2	0.03	$161.17
14.3	Direct seeding of native species including seed collection and conditionning	6055	m2	0.72	$4,381.80
14.4	Planting of seedlings including the seedlings, tree fertilizer, WMF fertilizer, corflutes and pegs	6055	m2	0.16	$943.77
Subtotal					**$8,800.47**
15.0	**Reject material stockpiles**				
15.1	Load and haul of topsoil/seedbank material and spreading of 60 mm across the area	38322	m2	0.55	$20,972.59
15.2	Spreading of greenwaste (cut trees and surface vegetation) on 5% of the surface	38322	m2	0.03	$1,020.04
15.3	Direct seeding of native species including seed collection and conditionning	38322	m2	0.72	$27,732.32
15.4	Planting of seedlings including the seedlings, tree fertilizer, WMF fertilizer, corflutes and pegs	38322	m2	0.16	$5,973.11
Subtotal					**$55,698.05**
16.0	**Seedbank and subsoil stockpiles**				
15.1	Load and haul of topsoil/seedbank material and spreading of 60 mm across the area	33651	m2	0.55	$18,416.27
15.2	Spreading of greenwaste (cut trees and surface vegetation) on 5% of the surface	33651	m2	0.03	$895.71
15.3	Direct seeding of native species including seed collection and conditionning	33651	m2	0.72	$24,352.07
15.4	Planting of seedlings including the seedlings, tree fertilizer, WMF fertilizer, corflutes and pegs	33651	m2	0.16	$5,245.06
Subtotal					**$48,909.12**
15.0	**Site building, power infrastructure and water management disposal fee and unloading of material**				
15.1	Disposal fee and unloading of material	1	lumpsum	66,700.00	$66,700.00
Subtotal					**$66,700.00**
16.0	**Monitoring and maintenance - Dust monitoring**				
16.1	Dust monitoring (18 samples yearly)	5	item	3,300.00	$16,500.00
Subtotal					**$16,500.00**
17.0	**Monitoring and maintenance - Rehabilitation performance monitoring**				
17.1	Vegetation assessment and level 2 flora and vegetation survey, yearly	10	item	16,700.00	$167,000.00
17.2	Ecosystem function analysis	10	item	5,000.00	$50,000.00
17.3	Photographic monitoring	10	item	3,300.00	$33,000.00
Subtotal					**$250,000.00**
18.0	**Monitoring and maintenance - Visual inspection and maintenance**				
18.1	Quarterly inspection of gates, fences and signage	20	item	300.00	$6,000.00
18.2	Quarterly site inspection for weed and feral animals	20	item	3,300.00	$66,000.00
18.3	Weed and feral animals control	5	item	5,600.00	$28,000.00
Subtotal					**$100,000.00**
19.0	**Non-specific**				
19.1	Disconnect and terminate services	1	lump sum	5,600.00	$5,600.00
19.2	Health and safety inspection	1	lump sum	16,700.00	$16,700.00
19.3	Site survey and mapping	1	lump sum	16,700.00	$16,700.00
19.4	Stakeholder consultation	1	lump sum	27,800.00	$27,800.00
Subtotal					**$61,200.00**
20.0	**Closure project management**				
20.1	Project management & Satety	15%			$398,095.00
Subtotal					**$398,095.00**
21.0	**Contingency**				
21.1	Contingency allowance	30%			$796,190.00
Subtotal					**$796,190.00**
TOTAL					**$3,952,858.84**

CLIENT:	**TT Sands Pty Ltd**	DOC NO:	**12554621-CAL-A_Closure budget estimate 2021-2022**
PROJECT:	**Mindijup Silica Sand Mine Closure Plan**	JOB:	**12554621**
CALCULATION TITLE:	**Order of Magnitude Estimate Class - 4 Prefeasability Estimate (-15% to +50%)**	REV:	**2**
FACILITY:	**Mindijup Silica Sand Mine**		
PREPARED:	V Davies	CHECKED:	P Lombard

CONDITIONS & EXCLUSIONS

1.00 **Basis of Estimate**

1.01 No preliminary contract and procurement plans have been developed as part of this estimate, therefore the estimate is based on typical contract.

1.02 Estimate base date is December 2021.

1.03 Only one option has been costed for the closure of each facility.

1.04 Area and Volume Estimations: The cut and fill volumes requirements have been estimated using the best fit profile from a 2D sketch.

1.05 Data informing the status of each facility has been resourced from documents listed within the notes section of this estimate.

1.06 No formal logistics study has been completed.

1.07 Quantities have been estimated from pdf drawing no 12993-32L (December 2021), Lot 5 Mindijup Road Palmdale 2018 Update Survey.

1.08 It is assumed that road access is sufficient for transporting demolished material to refuse site at Hanrahan Road or Bakers Junction.

1.09 Assumed working hours of 10 hrs/day with 5.5 days per week.

1.10 Topsoil/seedbank and green waste used for rehabilitation will be sourced from stockpiles within 400 m of the area to be rehabilitated.

1.11 Seeding rate is 0.5 kg/ha.

1.12 Seedling rate is 150 plants/ha.

1.13 Contour ripping not required for non-compacted surfaces.

1.14 Waste is disposed at Hanrahan road refuse site (distance: 39 km) or Bakers junction refuse site (distance: 31 km).

1.15 Topsoil will be applied to a depth of 60 mm if there is un unexpected closure and to a depth of 150 mm as part of progressive rehabilitation.

1.16 Spreading of green waste is over 5% of the surface for un unexpected closure and 30% as part of progressive rehabilitation.

1.17 No product from the stockpiles will remain at closure, only the footprint of the stockpiles will require rehabilitation.

1.18 Average depth of the mine void is 11 m.

1.19 Assumed slope of the initial mine void face for cut to fill calacualtions is 1V:1H, as no cross sections were available at the time of estimating.

1.20 No additional material is required to reshape the mine void wall.

1.21 A layer of sand in excess of one metre is retained at base of pit as part of mining operations.

1.22 Tailings dams are expected to be full at closure and will not require additional material for reshaping.

1.23 No additional material is required to reshape the tailings dams.

1.24 Average depth of the tailings dams is 5 m.

1.25 Average slope of the tailings dams walls is 1V:1.5H.

1.26 Tailings moisture content will allow for safe access for machinary.

1.27 Tailings moisture content does not exceed limits for growing vegetation.

1.28 Overhead power lines and poles on site are owned by Western Power and will not be dismantle by Austsand at closure.

1.29 All electric cables on site owned by Austsand are underground.

1.30 Site buildings include site office, workshop, fuel bunker, processing plant, screening plant, concrete tyre baths and concrete retaining walls.

1.31 Deep ripping is conducted using a winged keel rip of 0.6m depth at 2m interval on compacted areas onlys.

1.32 Storage dams are empty at closure and safe for vehicule traffic.

1.33 Pipelines are deeper then 600 mm and do not need to be removed.

1.34 Storage dams depth: 5 m .

1.35 Storage dam walls slope: 1V:1.5H.

1.36 No additional seeding or planting of seedlings required after closure; seeding and planting already included in surface rehabilitation.

1.37 Weed and feral animal control costs are dependent upon control measures necessary.

1.38 No allowance has been made to isolate all power souces prior to demolition.This action has to be done by client.

1.39 Load and haul distances have been assumed as maximum 400 m.

1.40 The inflation rate has been sourced from the Reserve Bank of Australia as average annual inflation rate between 2012 and 2018 of 1.9%.

1.41 Road area based on calculations for 2021 DMIRS AER and MRF reports.

1.42 Calculations assume that power infrastructure aligns with road corridors.

2.00 **This Cost Indication is conditioned as follows:**

2.01 Costs indicated are based on local contractors.

2.02 All demolished material may not be reusable.

2.03 One time mobilisation, demobilisation, setup cost and uninterrupted access.

2.04 This estimate accuracy is within -15% to+50%.

2.05 Contracting Strategy is by Sub-Contracts including Demolition.

3.00 **EXCLUSIONS**

3.01 No allowance for specific traffic management requirements.

3.02 No allowance for construction of haul road for transportation of demolished material.

3.03 No allowance for variation to scope.

3.04 No allowance for deferred capital cost, all work is assumed to be completed continuously under the auspices of a single mobilisation/demobilisation.

3.05 No allowance made for working Night shift. Work is during day only, 10 hours a day.

3.06 No allowance for any application and approval of Ground Disturbance Permits (GDP's) or Statutory permits.

3.07 No allowance for the value of Principal supplied items including searching for and stockpiling of imported materials.

3.08 No allowances for accelerated construction periods.

3.09 No allowance for Time extension costs.

3.10 No allowance for charges and costs levied by Authorities, Councils and Service Bodies including licensing requirements except for allowance of $60,000 for Shire disposal fee and

3.11 No allowance for Aboriginal heritage, cultural and native title issues.

3.12 No allowance for Environmental obligations and clearances.

3.13 No allowance for Geotechnical investigations.

3.14 No allowance for Client administrative charges including corporate overheads.

3.15 No allowance for increased costs due to Labour shortages in the Region.

3.16 No allowance for Legal fees.

3.17 No allowance made for blasting of rock.

3.18	No allowance made for Owners cost.
3.19	No allowance made for Abnormal weather conditions.
3.20	Cost is excluding any GST.
3.21	No allowance for any retention amount.
3.22	No allowance for dust suppression and specific PPE & Safety procedures for handling of Silica Material outside of those being currently engaged on the site.
3.23	No allowance for cleaning of any equipment which may obstruct demolition work. This activity to be done by client and/or others.
3.24	No allowance for any residual value of demolished items.
3.25	No specific allowance for induction of staff as per mine closure requirement of Silica outside of those currently engaged on the site.
3.26	No allowance for design fees.
3.27	No allowance for removal of rubbish left at closure not included in items 1.0 to 11.5.
3.28	No allowance for treatment of material, handling or disposal from contaminated sites.
3.29	No allowance for removal of water and electrical cabling & other burried servicesline work running 600mm below groundexcept for the end termination.
3.30	No allowance made for removal and disposal of asbestos material or other hazardous or noxious materials.

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