KASA Consulting

Report

May 2021

Provisional Mine Closure Plan

Lynas Rare Earths Processing Facility and By-products Storage Facility – Kalgoorlie

EPA Ref. CMS17898

Lynas Rare Earths Ltd

KASA CONSULTING
Environment I Safety I Quality

Version	Description	Author	Reviewed By	Date
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GLOSSARY

Term	Definition
°C	Degrees Celsius
µm	Micron
AEP	Average Exceedance Probability
AER	Annual Environmental Report
AHD	Australian Height Datum
ANZECC	Australian And New Zealand Environment Conservation Council
ANZMEC	Australian And New Zealand Mineral and Energy Council
APA	Australian Pipeline Association
ARR	Australian Rainfall & Runoff
BAM Act	*Biosecurity and Agriculture Management Act 2007*
BC Act	*Biodiversity Conservation Act 2016*
BOM	Bureau of Meteorology
BSF	By-product Storage Facility
C&M	Care and Maintenance
CDIRS	Computerised Design IFD Rainfall System
CEO	Chief Executive Officer
CKB	City of Kalgoorlie-Boulder
cm	Centimetres
DBCA	Department of Biodiversity Conservation and Attractions
DMIRS	Department of Mines, Industry, Regulation and Safety
DWER	Department of Water and Environmental Regulation
EC	Electrical Conductivity
EIL	Ecological Investigation Level
EP Act	*Environmental Protection Act 1986*
EPA	Environmental Protection Authority (Western Australia)
EPBC Act	*Environment Protection and Biodiversity Protection Act 1999*
ERICA	Environmental Risk from Ionising Contaminants: Assessment
ESP	Exchangeable Sodium Percentage
GEDC	Goldfields Esperance Development Commission
GGP	Goldfields Gas Pipeline
GLC	Ground Level Concentrations
ha	Hectare
HIL	Health Investigation Level
hr	Hour
HSL	Health Screening Levels
IFD	Intensity-Frequency-Duration
IP	Iron Phosphate
JTSI	Department of Jobs, Tourism, Science and Innovation

Term	Definition
kg	Kilogram
km	Kilometre
L	Litres
LAMP	Lynas Advanced Materials Plant
LEM	Landform Evolution Modelling
LiDAR	Light Detection and Ranging
m	Metre
M	Million
mbgl	metres below ground level
mbgs	metres below ground surface
MCP	Mine Closure Plan
mg	Milligram
mm	Millimetre
MRF	Mine Rehabilitation Fund
OHS	Occupational Health and Safety
PEC	Priority Ecological Communities
PMLU	Post Mining Land Use
PMP	Project Management Plan
PSI	Preliminary Site Investigation
QMS	Quality Management System
RE	Rare Earths
REPF	Rare Earths Processing Facility
RIA	Radiation Impact Assessment
RLE	Rehabilitation Liability Estimate
s	Second
SVOC	Semi Volatile Organic Compounds
SWC	Soilwater Consultants
SWIS	South West Interconnected System
t	Tonnes
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TPS	Town Planning Scheme
TTLC	Total Threshold Limit Concentrations
UCL	Unallocated Crown Land
VOC	Volatile Organic Compounds
WA	Western Australia
WESP	Wet Electrostatic Precipitator

1 SCOPE & PURPOSE

The Mt Weld Rare Earths Project is an existing rare earth (RE) mine and concentration plant situated 35 km south east of Laverton in the north eastern Goldfields region of Western Australia. The RE ore is mined by Mt Weld Mining Pty Limited (Mt Weld Mining), a wholly owned subsidiary of Lynas Rare Earths Ltd, and then processed in the existing concentration plant at the Mt Weld mine site to produce an RE concentrate.

Lynas Kalgoorlie Pty Ltd (Lynas), also a wholly owned subsidiary of Lynas Rare Earths Ltd, proposes to construct and operate a Rare Earths Processing Facility (REPF) at 70 Johns Road, Yilkari, near the town of Kalgoorlie (formerly Lot 500, Great Eastern Highway, Yilkari, and referred to within this document as Lot 500), and an associated permanent off-site By-product Storage Facility (BSF) on Common Reserve 8767, Yarri Road, Parkeston (Yarri Road) in the City of Kalgoorlie-Boulder (CKB), Figure 2-1. The REPF will further separate and concentrate the Mt Weld RE concentrate to produce an RE carbonate, which will be exported to the Lynas downstream production facilities, including the Lynas Advanced Materials Plant (LAMP) located in Kuantan, Malaysia, and a proposed facility in Texas, USA, via Fremantle port in Western Australia.

The project was referred to the Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986* (EP Act) on 13 September 2020, and the EPA determined that the REPF would be assessed at “Assessment on Referral Information – with Additional Information Requested”. The EPA issued a Notice Requiring Information for Assessment, under Section 40(2)(a) of the EP Act, dated 24 November 2020.

This Mine Closure Plan addresses the following request from the EPA in relation to the Terrestrial Environmental Quality factor:

> *Prepare a Closure and Rehabilitation plan for both the REPF and Yarri Road detailing the management and mitigation of impacts on terrestrial environmental quality for assessment.*

2 PROJECT SUMMARY

Table 2-1: Project Summary

Project title:	Lynas Kalgoorlie Rare Earths Processing Facility
Proponent name:	Lynas Kalgoorlie Pty Limited
Short description:	Construction and Operation of a Rare Earths Processing Facility and By-product Storage Facility.
Location	• REPF: 70 Johns Road, Yilkari General Purpose Lease No. G 26/169 • BSF[1]: 90% on Common Reserve 8767, and 10% on Unallocated Crown Land (UCL), Parkeston
Primary feed:	162,000 tpa Mt Weld RE Concentrate
Production capacity:	86,000 tpa RE Carbonate Product
Project footprint:	Lot 500 REPF disturbance envelope of 120 ha over 135 ha site. Yarri Road BSF disturbance envelope of 97.3 ha over a 535 ha site.
Project life:	Nominally 25 years.

Notes:

1. General Purpose Lease (G 26/173) and Miscellaneous Licence (L 26/294) applications have been lodged for the Yarri Road site.

2.1 Proponent Details

The formal details of the proponent are: Lynas Kalgoorlie Pty Ltd (ABN 73 053 160 302).

Lynas Kalgoorlie Pty Ltd is a wholly owned subsidiary of Lynas Rare Earths Ltd.

Table 2-2: Proponent Details

Contact Details	Lead Approvals Consultant
Kam Leung (VP Upstream)	Peter Jansen
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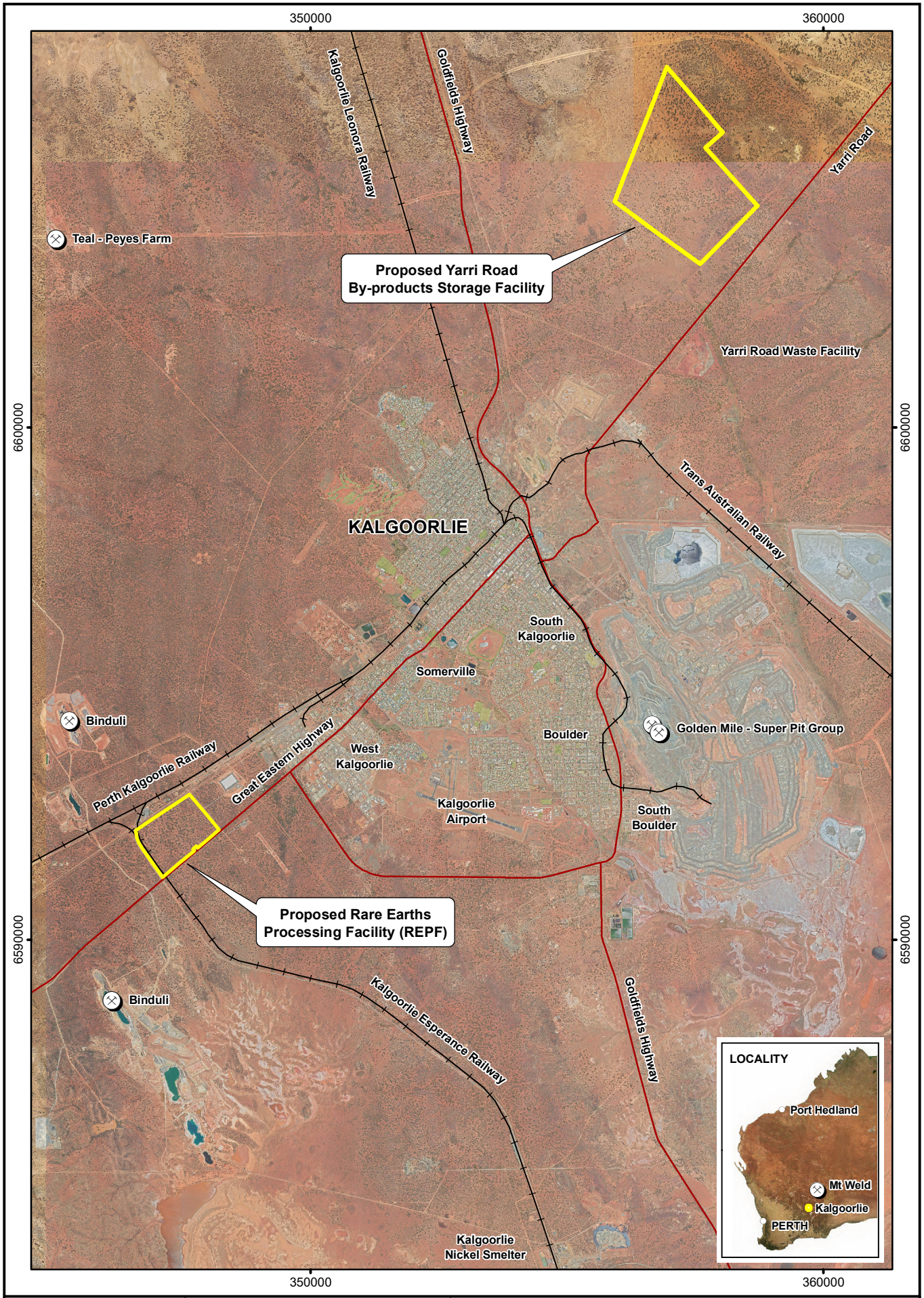
2.2 Project Site Locations

The project will be developed at two greenfield sites (Figure 2-1):

- The REPF will be located at 70 Johns Road, Yilkari 6430, (formerly referred to as Lot 500, Great Eastern Hwy, Yilkari), located approximately 8 km west of Kalgoorlie on Great Eastern Highway.
- Yarri Road BSF will be located approximately 8 km northeast of Kalgoorlie on Yarri Road, Parkeston.



Imagery: © Landgate (December 2018)

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MGA94 (Zone 51)

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CAD Ref: a2769_ERD04_01	Author: P. Jansen	Kasa Consulting Pty Ltd
Date: March 2021 | Rev: A | A4	Drawn: CAD Resources ~ www.cadresources.com.au	

Figure 2-1

Project Site **Locations**

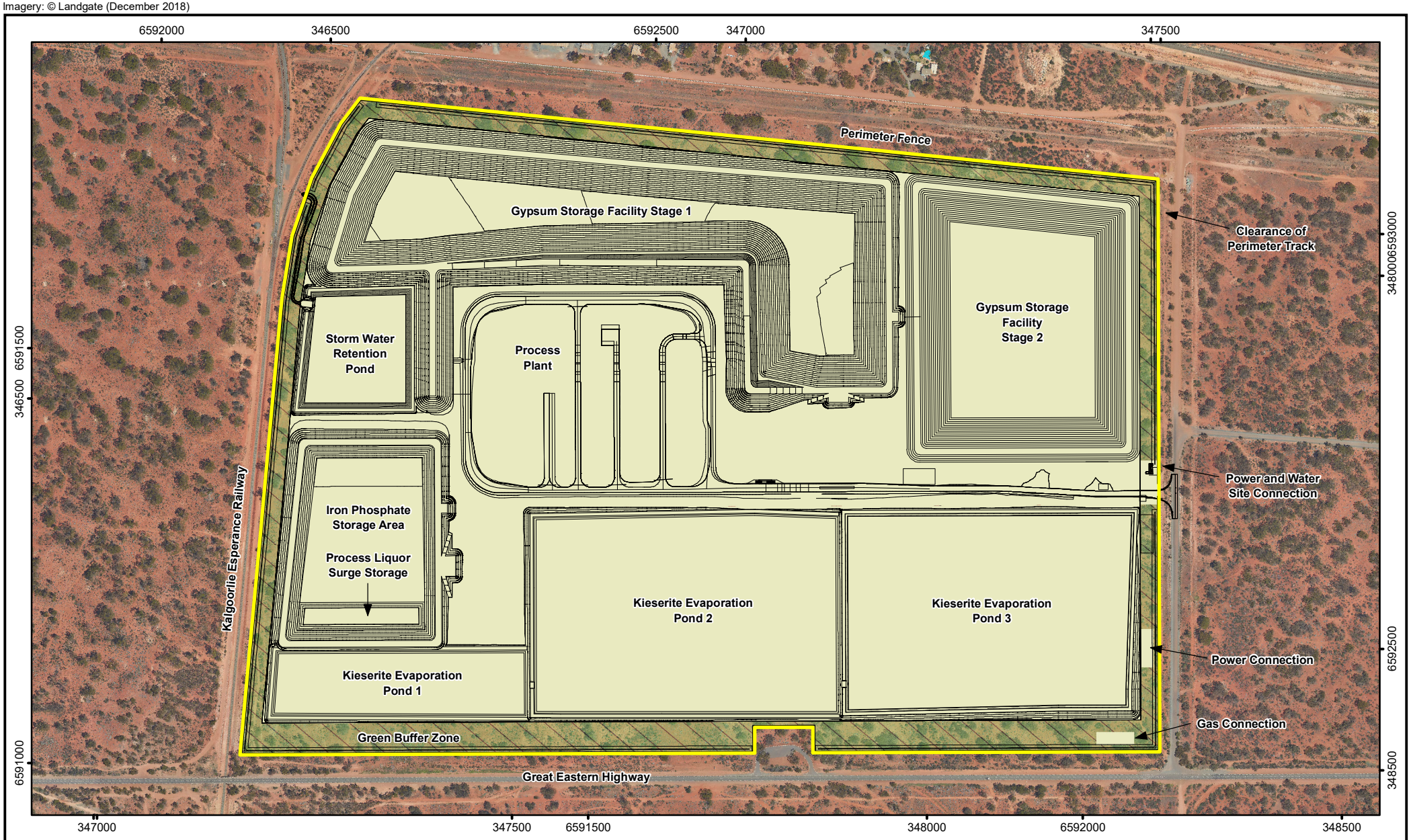
2.3 REPF Description

The REPF development site is 135 ha in total area, of which 120 ha will be utilised for the REPF footprint. The footprint is required for the process plants, by-product storage facilities, evaporation ponds and ancillary infrastructure as shown in Table 2-3. The proposed site layout is shown in Figure 2-2, and a flow diagram showing the processing circuit is presented in Insert 2-1.

Table 2-3: Lot 500 – Project Components and Disturbance

Components	Area (Ha)
Plant Site	9.4 ha
Iron Phosphate Storage Facility	10.2 ha
Gypsum Storage Facility Stage 1	26.3 ha
Gypsum Storage Facility Stage 2	16.3 ha
Evaporation Ponds	38 ha
Stormwater Retention Pond	4 ha
Buildings, Civils, Utilities and Internal Buffers	10.3 ha
Roads and Access Corridor	5.2 ha
Total Disturbance Envelope	**120 ha**
External Green Buffers	15 ha
TOTAL LOT AREA	**135 ha**

Imagery: © Landgate (December 2018)



Legend

- Lot 500 Great Eastern Hwy, Yilkari
- Green Buffer Zone
- Proposed Layout
- Proposed Clearing

0 100 200m

Scale: 1:8,000
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CAD Ref: a2769_ERD04_02		Author: P. Jansen	Kasa Consulting Pty Ltd
Date: March 2021	Rev: A A4	Drawn: CAD Resources ~ www.cadresources.com.au	

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Figure 2-2

Lot 500 - Site Layout

2.3.1 Cracking and Leaching Plant

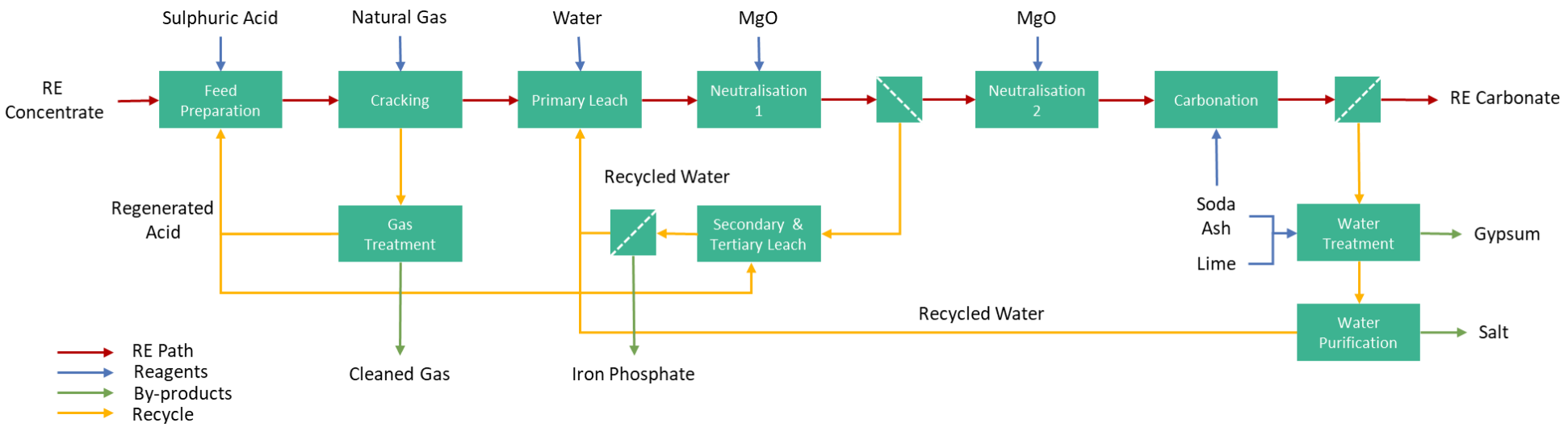
2.3.1.1 Core Processes

Key infrastructure at Lot 500 will include:

- Cracking and Leaching Plant:
  - Feed Preparation;
  - Cracking;
  - Primary Leach;
  - Two stages of Neutralisation;
  - Filtration, Secondary and Tertiary Leach;
  - RE Carbonate Production (Carbonation);
  - Carbonate Filtration;
  - Product Handling and Storage Facility;
  - Water Treatment and Purification;
  - Gas Treatment (pollution controls, stack, fans); and
  - Reagents and consumables (sulphuric acid, magnesium oxide, sodium carbonate calcium hydroxide, flocculant).
- Utilities (power, water, gas);
- Ancillary plant (compressed air, communications, control system);
- Infrastructure buildings (processing, raw and finished materials storage, offices, laboratory, warehouse, workshop, control rooms, substations);
- Lined Evaporation Pond;
- Lined IP Drying and Storage Facility; and
- Lined Gypsum Storage Facility.

The RE solution is precipitated as an RE carbonate which is sent to Malaysia for processing into final products. The process overview is illustrated in Insert 2-1.

Insert 2-1: Rare Earths Processing Facility Process Flow Diagram



2.3.1.2 Raw Materials and Product Handling

Concentrate will be transported from the Mt Weld concentration plant to the REPF in closed containers, with handling at the REPF undertaken by a tippler unit attached to a reach stacker which tips into a hooded hopper, which is drafted through a bag filter to eliminate dust.

Concentrate will remain in sealed containers and be stored on an engineered hardstand in a container yard adjacent to the feed hopper and feed conveyor at the REPF site in order to minimise handling and dust generation. Other chemicals, reagents and supplies will be transported in closed containers or sealed vessels by a combination of road and rail. The RE carbonate product from the REPF will be packaged in closed containers and transported by rail to the port of Fremantle for export. The IP by-product will be transported in covered triple side tippers from Lot 500 to the BSF site for long-term storage.

Acid is proposed to be transported to the REPF site via road in acid tankers. Loading and unloading of acid tankers is highly regulated and carried out by suitably trained operators in accordance with approved procedures.

2.3.1.3 Feed Preparation

The stored concentrate will be gravity fed into the feed hopper directly from the container by the tippler unit. The concentrate is then conveyed into the acid mixing tank located above the kiln, where concentrated sulphuric acid is mixed with the RE concentrate.

2.3.1.4 Cracking

The mixture of concentrated sulphuric acid and RE concentrate will be gravity fed into a rotary kiln. The mixture will be heated to 600 degrees C as part of the cracking process, forming a soluble RE sulphate. This process will also lock up thorium as insoluble thorium pyrophosphate.

2.3.1.5 Flue Gas Treatment

Flue gas from the kiln, which contains sulphuric acid vapour, will be cleaned using a flue gas treatment system, including a combination of two venturi scrubbers, spray tower and Wet Electrostatic Precipitator (WESP). The liquor collected from the flue gas treatment is a weak acid which is recycled to secondary leach where it is used to recover unreacted RE minerals.

The Flue Gas Treatment system is implemented to ensure that emissions meet the environmental standards prescribed by DWER in the site environmental licence, and ensure that ambient air quality standards are complied with. An emergency gas scrubbing system utilising a packed tower and caustic scrubbing will be installed as a backup in the event of any failure of the primary gas treatment system.

2.3.1.6 Primary Leach

Cracked material will be discharged from the kiln into the primary leach circuit where the RE sulphate will be dissolved in water, leaving insoluble material, including thorium pyrophosphate, in suspension.

2.3.1.7 Neutralisation

The slurry from Primary Leach will be neutralised with magnesium oxide which will raise the pH of the slurry to precipitate iron, phosphate and aluminium, leaving the Res in solution.

2.3.1.8 Filtration, Secondary and Tertiary Leach

The neutralised slurry will be filtered to produce a filter cake which will be re-leached in secondary and tertiary leaching to recover unleached REs. The slurry from secondary and tertiary leaching will be filtered, producing an IP filter cake which will be stored and solar dried in an engineered and lined IP storage facility at Lot 500. After solar drying it will either be stored in-situ and/or transported to the dedicated BSF at Yarri Road. The filtrate will be recycled to the primary water leach circuit to recover REs.

2.3.1.9 Carbonate Production (Carbonation)

An RE carbonate precipitate will be produced from the neutralised RE sulphate solution. The precipitate will be filtered and bagged for shipping to the LAMP in Malaysia for separation and product finishing.

Energy is recovered during the cracking and leaching process, using heat exchangers which produces excess heat, using heat exchangers and is stored in a hot water tank. The hot water is then used in the carbonation process, which requires additional heat for the process reactions to occur.

2.3.1.10 Water Treatment and Purification

The design of the REPF will maximise the recovery and re-use of water in the process as far as practicable. Wastewater from gas treatment and RE carbonate production will be neutralised with calcium oxide (quicklime) to precipitate gypsum. This resulting slurry will be pumped into a lined Gypsum Storage Facility where gypsum settles out and the water can be recovered for treatment. The water will then be softened with sodium carbonate (soda ash) and sent to a Reverse Osmosis (RO) plant which will recover water to recycle back into the process. The raffinate (brine) discharge from the water recovery process will contain sodium and magnesium sulphate salts and will be directed to the lined evaporation pond on-site.

2.3.2 Chemical Storage

The Proposal will involve chemical storage at Lot 500 (Table 2-4). Consequently, a Dangerous Goods Licence is required and will be applied for under the Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007. Lynas will ensure that the DG permit application will reflect the final chemical storage composition and tank specifications adopted prior to commencement of construction.

Table 2-4: Lot 500 Chemicals Stored on Site - Provisional

Raw Material Inputs and Chemicals	Quantity	Vessel Type	Dangerous Good Descriptions	Comments
50% Sodium Hydroxide (Caustic Soda)	50 m^3	Carbon Steel Tank	Class 8	1 x 50 m^3 reagent storage for water treatment.
10% Sodium Hydroxide (Caustic Soda)	100 m^3	Carbon Steel Tank	Class 8	1 x 100 m^3 emergency scrubber vessel.
98% Sulphuric Acid	450 m^3	Carbon Steel Tank	Class 8	2 x 225 m^3 day tanks.
65% Sulphuric Acid	220 m^3	FRP Tank	Class 8	Produced on site. 1 x 60 m^3 acid sludge vessel. 1 x 160 m^3 acid storage vessel.
Diesel	40,000 L in aggregate	Dual-skinned tank	Class 1	2 x Emergency generator diesel tanks – nominally 5kL capacity each. Diesel storage tank on site for site vehicles – nominally 30kL capacity.
Calcium Hydroxide (Lime)	700 m^3	Carbon Steel Silo	N/A	1 x 700 m^3 powdered lime silo.
Magnesium Oxide (Magnesia)	250 m^3 1600t	Carbon Steel Silo Container	N/A	2 x 100 m^3 silos. 1 x 50 m^3 silo. 80 Containers @ 20t each.
Sodium Carbonate (Soda Ash)	579 m^3	Carbon Steel Silo	N/A	1 x 579 m^3 silo.

2.3.3 Non-process Infrastructure and Ancillary Plant

Non-process infrastructure at Lot 500 will include raw and finished materials storage, offices, laboratory, warehouse, workshop, control rooms and substations, as well as an access road and carparking. Additionally, the ancillary plant area will include compressed air, communications and control system.

A buffer of between 30 to 50 m along the plant boundary, which will not be cleared, will be left around the perimeter of the site to act as a visual screen.

2.3.4 Utilities

Natural gas will be supplied through a spur from the Goldfields Gas Pipeline (GGP), operated by Australian Pipeline Association (APA).

Approximately 1.8 GL per annum of water supply will be required for the industrial processes associated with the REPF. CKB (who hold the head lease for Lot 500) has agreed to supply reclaimed water (treated domestic wastewater) to the REPF site to meet this requirement. CKB is responsible for the construction of pipeline infrastructure from its reclaimed water service to the REPF site boundary and is responsible for obtaining all relevant easements and approvals for the delivery of reclaimed water to the REPF site.

Potable water for office reticulation, ablutions and safety showers will be supplied from the Goldfields Water Supply Scheme by Water Corporation, who are responsible for obtaining all relevant easements and approvals for the delivery of water to the REPF site.

Given the above, and the high salinity, no groundwater will be abstracted from beneath or in proximity to the proposed site, and therefore no applications for groundwater licensing under the WA *Rights in Water and Irrigation Act, 1914* are required.

Power will be supplied from the grid and/or a local source. Lynas is currently applying for a connection to the South West Interconnected System (SWIS) with Western Power and third-party power retailers. Lynas is also assessing opportunities to supplement power requirements for the REPF from renewable power sources. Additionally, potential opportunities to establish a solar farm for power generation purposes (either during operations and/or post closure) are being assessed by Lynas.

2.3.5 Materials Transport

Lot 500 is strategically located on the main transport route into Kalgoorlie from the west which can accommodate significant traffic demand. There are also alternative routes from the east and the north of the site to accommodate road transport from Mt Weld.

Emergency response plans are being established which incorporate measures to ensure potential environmental impacts, in the event of a transport accident, is mitigated. The potential impacts in the event of a motor vehicle or rail accident include:

- Physical damage to members of the public and surrounding environment (land, waterways, flora and fauna); and
- Exposure of the public or the surrounding environment to low levels of naturally occurring radiation. The Radiation Impact Assessment indicates that any exposure will be significantly below legislative limits and, in many cases, this exposure would be below or just above the minimum detection limits of the currently available radiation monitoring equipment.

Concentrate will be transported from the Mt Weld concentration plant to the REPF in closed containers, with handling at the REPF undertaken by a tippler unit attached to a reach stacker which tips into a hooded hopper, which is drafted through a bag filter to eliminate dust.

Concentrate will remain in sealed containers and be stored on an engineered hardstand in a container yard adjacent to the feed hopper and feed conveyor at the REPF site in order to minimise handling and dust generation. Other chemicals, reagents and supplies will be transported in closed containers or sealed vessels by a combination of road and rail. The RE carbonate product from the REPF will be packaged in closed containers and transported by rail to the port of Fremantle for export. The IP by-product will be transported in covered triple side tippers from Lot 500 to the BSF site for long-term storage.

The gypsum and IP by-products from the REPF process will be managed in several ways. Key options include each of, or a combination of, the following:

- Off-site permanent relocation of by-products to the dedicated BSF at Yarri Road;
- Transfer of a portion of the IP back to Mt Weld for disposal utilising a back-loading arrangement; and
- Re-use of IP and/or gypsum, noting the inherent complexities in obtaining approvals for re-use of such materials.

2.4 Yarri-Road BSF Description

Whilst by-products (gypsum and IP) will initially be stored on-site at the REPF, there is finite space available on Lot 500 for the long-term storage of by-products A separate off-site designated facility for permanent storage of IP and gypsum will therefore be developed at the Yarri Road site.

The locational attributes of the Yarri Road site include:

- The site is at least 4 km from any residential development;
- The site is free from any mining tenure;
- It is relatively near to the REPF and can be readily accessed via a Heavy Vehicle bypass route; and
- It has sufficient capacity for an extended operational life of the Kalgoorlie REPF.

The Yarri Road site has an area of approximately 535 ha and will require an easement for the access road from Yarri Road. The facility is designed to store all the IP and gypsum produced from the REPF over the 25+ year life span. Additional facilities will be required for the operation of the site, including a hardstand and wheel wash area, stormwater containment pond, infrastructure, and internal roads. 97.3 ha of the site will require clearing for the by-product landform and associated infrastructure and facilities required for the first 25 years of operation.

Lynas is currently considering two coverage scenarios for the by-product materials – coverage by gypsum and coverage by gypsum / rock. The results of landform evolution modelling (LEM) of the two cover scenarios show that the stockpile landforms at Yarri Road will be stable for the first 500 years of their existence (Soilwater Consultants, 2021). Lynas will use rock armouring to stabilise the landform and prevent erosion of the gypsum cap in the very long term. This will ensure that impacts from potential erosion are highly unlikely.

Table 2-5 below summarises the anticipated volumes of by-products that will be generated at the REPF. While a portion of the by-products produced will be stored on-site at the REPF, most of the gypsum and IP by-product will be transported and stored at the Yarri Road BSF.

Table 2-5: Anticipated By-product Volumes (at 90% Plant Utilisation)

Stream	Solid	Water	Moisture (%)	Total		
	Dry (t/h)	(t/h)		Wet (t/h)	Dry (tpa)	Wet (tpa)
Iron Phosphate	14.8	14.8	50%	29.6	117,000	233,000
Gypsum	36.1	33.4	48%	69.6	285,000	548,000

The layout of the BSF is shown in Figure 2-3 with the make-up of the site footprint shown in Table 2-6.

Table 2-6: Yarri Road BSF – Site Footprint Components

Components	Area (Ha)
IP Landform	21.3 ha
Gypsum Landform	36.8.5 ha
Diversion Bunds	0.6 ha
Drainage Channel	1.6 ha
Stormwater Containment Pond	1.1 ha
Total By-product Stockpile Area	**64 ha**
Roads and Access Corridor	3.5 ha
Hardstand and Wheel Wash Area	0.3 ha
Topsoil Stockpile	10.1 ha
Internal Cleared Buffers	19.5 ha
Total Disturbance Envelope	**97.3 ha**
TOTAL LOT AREA	**535 ha**

2.4.1 Non-process Infrastructure

Non-process infrastructure at the BSF will include an access road, wheel wash area, office, ablutions, communications, heavy vehicle maintenance workshop for minor repairs and servicing and carparking.

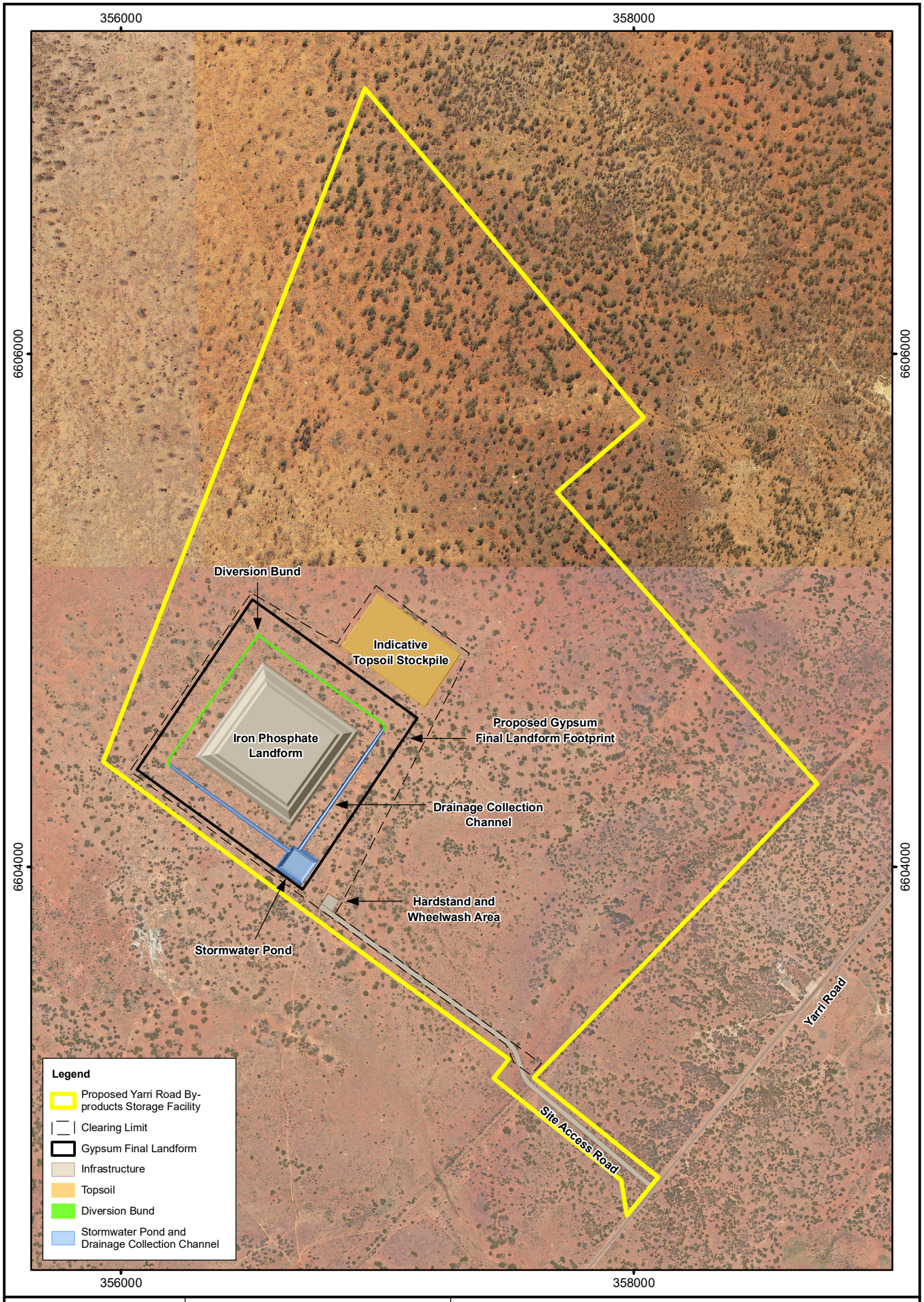
2.4.2 Utilities

Power will be supplied from the grid and/or generated on-site using genset. Potential opportunities to establish a solar farm for power generation purposes (either during operations and/or post closure) are being assessed by Lynas.

Diesel fuel for on-site vehicles will be tankered to the BSF and stored in a 10,000 L on-site diesel tank. Fuel storage will meet the requirements of *AS1940:2017 – The storage and handling of flammable and combustible liquids* and will be appropriately bunded or comprised of double skinned tanks, with appropriate measures to contain spills being employed as standard practice.

Potable and process water supply will be tankered to the BSF and stored in an on-site water tank.

No major mobile equipment servicing will be undertaken on-site, however it is anticipated that a workshop may be located at the BSF site for minor repairs and maintenance.



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Scale: 1:20,000
MGA94 (Zone 51)

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Figure 2-3
Yarri Road BSF
Indicative Site Layout

3 IDENTIFICATION OF CLOSURE OBLIGATIONS AND COMMITMENTS

Mine closure is subject to the requirements of state and national legislation, applicable tenement conditions, commitments made in approved Mining Proposals and any stated conditions on other environmental approvals such as ministerial statements. Lynas will establish a compliance management system which records obligations arising from applicable legislation and future approvals, which will then be used to identify project closure obligations and commitments.

In recognition of mining being a temporary land use, the predominant intent of closure obligations and commitments is to facilitate future intended land use(s) by returning the land to a safe, stable and non-polluting condition which can sustainably support the proposed end mine land use(s). As a result, closure obligations and commitments for the project cover a range of environmental aspects such as topsoil reclamation, infrastructure removal, landform rehabilitation and environmental monitoring.

Key sources which lay out relevant closure obligations and commitments include:

- *Mining Act, 1978,*
- *Environmental Protection Act, 1986,*
- *Contaminated Sites Act, 2003,*
- *Aboriginal Heritage Act, 1978,*
- *Soil and Land Conservation Act 1945,*
- *Dangerous Goods Safety Act, 2004 and,*
- *Health Act, 1911.*

Additional sources of closure obligations and commitments include relevant tenement conditions and commitments within approval documents and their associated management plans. At this early stage, these sources comprise the tenement obligations placed on General Purpose Lease G 26/169 for Lot 500 and statement / commitments required by the Minor or Preliminary Works Approval granted under Section 41A (3) for the REPF site (Assessment No. 2269).

All current closure obligations and commitments, not including the commitments made within this MCP document for the project, are identified within Table 3-1.

Table 3-1: Identified Closure Obligations and Commitments for Lot 500

Source Document	Closure Commitment
Minor or Preliminary Works Approval for the REPF (2269)	Access roads, carparks and hardstands will be ripped and covered with stored topsoil and mulched vegetation that has been retained.
	Any concrete curbing or installed concrete, including kiln footings, will be removed, and disposed of at an approved landfill facility.
	Buildings will be demountable to allow for easy decommissioning and removal.
	Surface water drainage structures will be decommissioned and removed.
	All excavations will be backfilled and re-contoured to original profile levels.
	Topsoil will be spread over re-contoured surfaces then deep ripped.
	Direct seeding of local provenance native seeds will be undertaken over the area.
G 26/169 Conditions 1	All disturbances to the surface of the land made because of exploration, including costeans, drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Mines, Industry Regulation and Safety. Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, Department of Mines, Industry Regulation and Safety.

4 STAKEHOLDER ENGAGEMENT

The Kalgoorlie community and the broader Goldfields region is underpinned by the resource sector. With this comes a degree of acknowledgement and acceptance of the sector and the benefits development can bring to the community in terms of prospective employment and economic lift.

As a new development on the periphery of Kalgoorlie, Lynas acknowledges the need to communicate and engage with the community about the impacts of the project.

Lynas is committed to an open, transparent and comprehensive engagement program for the project at all stages of the project. A stakeholder engagement strategy was developed which identified key stakeholders that Lynas needed to engage with from Federal, State and Local Government, key agencies and regulatory authorities, and the community and interest groups.

4.1 Identification of Key Stakeholders

Lynas initially commenced stakeholder engagement on the REPF with the following Federal, Local and State Government agencies:

- Commonwealth Department of Agriculture, Water and the Environment;
- Commonwealth Department of Industry, Science, Energy and Resources;
- Department of Jobs, Tourism, Science and Innovation;
- Department of Mines, Industry Regulation and Safety;
- Western Australia Environmental Protection Authority;
- Department of Water, Environmental Regulation (EPA Services, Science and Planning (Air Quality Branch and Noise Branch) and Regulatory Services / Licensing Division);
- Department of Health;
- City of Kalgoorlie-Boulder;
- Shire of Laverton;
- Goldfields Esperance Development Commission (GEDC); and
- Commonwealth Department of Industry, Industry and Science.

4.2 Key Stakeholder Engagement Initiatives

On 3 September 2020, Lynas hosted a Joint Agency site visit of Lot 500 and Yarri Road and a subsequent briefing on the project to key representatives from DWER, DMIRS, JTSI, CKB, GEDC. Lynas is appreciative of the positive feedback and advice received from these regulators which will be taken into account in any ongoing assessments and implementation of the project.

Additionally, Lynas has undertaken several broader local community engagement activities since 2019 and these remain ongoing. These include:

- Direct engagement with neighbouring property owners to Lot 500.
- Direct engagement with indigenous stakeholders and representatives.
- Presented at the Kalgoorlie What's Down the Track Forum in November 2019 to over 300 attendees. The primary objective of the Kalgoorlie-Boulder Chamber of Commerce and Industry What's Down the Track Forum is to provide a 12-month forecast into the drivers that support the growth and opportunities that exist within our region's economy. Lynas also presented to the November 2020 forum.
- Co-hosted a Business After Hours with the Kalgoorlie-Boulder Chamber of Commerce and Industry, engaging with 180 local community members.
- Established a Lynas Western Australia Facebook page (standalone from corporate) as a mechanism to further engage the community in Laverton and Kalgoorlie-Boulder.
- Held a Community Information Session in June 2020 (see below for details).
- Hosted an information stall at the annual Lorna Mitchell Spring Festival (October 2020) in Kalgoorlie which was attended by over 7,000 people.
- Hosted a booth and presented at the annual Diggers and Dealers Forum in Kalgoorlie (October 2020).

In June 2020, Lynas hosted an online video information forum which allowed broad engagement with the community. Members of the community were invited to submit their questions via email in advance or during the session.

Over a three-week period in September 2020, Lynas established the Lynas Kalgoorlie Information Pop-up shop within a public venue in Kalgoorlie for members of the community to attend and receive relevant information and have an opportunity to provide their direct feedback on the project. Feedback to date has been positive with no objections or significant concerns raised by attendees on the project or its predicted impacts. Lynas will report relevant outcomes of this stakeholder engagement to the EPA once this initiative is complete.

The Town Planning Scheme (TPS) Amendment 95, which includes additional planning provisions to the TPS for Lot 500, went through a mandatory public advertising process. There was minimal community response to the prospect of an industrial development on the site.

In February 2021, Lynas distributed a project update via email to inform key stakeholders, including nearby residents and heritage groups, of the project's status. Due to COVID-19 restrictions on regional travel, key Lynas representatives were not able to conduct in-person briefings of these residents. As a temporary alternative and to fulfil Lynas' commitment to open and transparent stakeholder engagement, Lynas circulated a project update which included notification of the proposed preliminary works.

4.3 Public Review Period

The Proposal will be subject to a 4-week public review period where Lynas' proposal will be accessible to the public for review and comment, with Lynas' response to public submissions being provided to the EPA for consideration as part of its assessment process.

To offer the local community further opportunity to enquire and comment on the proposal, Lynas will re-establish the 'Pop-up Shop" in Kalgoorlie town in order to facilitate community engagement throughout the public review period.

A register of all stakeholder engagement activities and outcomes is provided in Table 4-1.

Table 4-1: Stakeholder Engagement Register

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
Resident	26/02/2021	Jacob Altes, neighbour John Ganser, Lynas George Nicholls, Lynas	Discussed timing of preliminary works that Lynas is preparing to carry out on the REPF site, including selective logging, earthworks and concrete. Jacob raised no issues related to these works.	Continue contact on a regular basis.
Industry	26/02/2021	Mike Tamlin, Neometals COO Matt Read, Neometals GM Lithium Projects John Ganser, Lynas George Nicholls, Lynas	Discussed potential mutual opportunities, particularly with regard to establishment of a chlor-alkali plant, should Neometals reinitiate a project in Kalgoorlie.	Continue contact for updates.
Native Title Services Goldfields	10/02/2021	Anthony Sherlock – Kalgoorlie Chief Operations Officer Andrew Burke – Future Acts and Heritage Co-ordinator	Project update emailed for information and feedback requested.	Address any feedback received.
Indigenous Stakeholder	10/02/2021	Simon Blackshield – Lawyer for Marlinyu-Ghoorlie NT Group	Project update emailed for information and feedback requested.	Address any feedback received.
Indigenous Stakeholder	10/02/2021	Marj Strickland – Maduwongga Applicant	Project update emailed for information and feedback requested.	Address any feedback received.
Local Busines	10/02/2021	Patricia Lewis – Bundarra Contracting	Project update emailed for information and feedback requested.	Address any feedback received.
Local Government Representatives	10/02/2021	Shire of Laverton: Pat Hill – Shire President Peter Naylor CEO	Project update emailed for information and feedback requested.	Address any feedback received.
WA School of Mines	9/02/2021	WA School of Mines: Sabina Shugg – Director	Project update emailed for information and feedback requested.	Address any feedback received.
Aboriginal Chamber of Commerce	9/02/2021	Aboriginal Chamber of Commerce	Project update emailed for information and feedback requested.	Lynas invited to speak at a monthly forum.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
State Government Officers	9/02/2021	Regional Development Australia, Goldfields Esperance: Jo Swan – Director Lee Jacobsen – Chair Travis Tucker – Committee Member	Project update emailed for information and feedback requested.	Address any feedback received.
State Government Officers	9/02/2021	Goldfield Esperance Development Commission: Kris Starcevich – CEO	Project update emailed for information and feedback requested.	Address any feedback received.
Chamber of Minerals and Energy	9/02/2021	CME WA: Paul Everingham – CEO Ryan O'Hanlon – Manager Goldfields	Project update emailed for information and feedback requested.	Address any feedback received.
Kalgoorlie Boulder Chamber of Commerce and Industry	9/02/2021	Simone De Been – Kalgoorlie-Boulder CCI	Project update emailed for information and feedback requested.	Address any feedback received.
Federal Government Representative	9/02/2021	Rick Wilson MHR – Federal Member for O'Connor	Project update emailed for information and feedback requested.	Address any feedback received.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
State Government Representatives	9/02/2021	Robin Chapple – State Member for Mining and Pastoral Region Robin Scott – State Member for Mining and Pastoral Region Kyle McGinn – State Member for Mining and Pastoral Region Ken Baston – State Member for Mining and Pastoral Region Jacqui Boydell – State Member for Mining and Pastoral Region Hon. Stephen Dawson MLC – State Member for Mining and Pastoral Region Kryan O'Donnell – State Member for Kalgoorlie	Project update emailed for information and feedback requested.	Address any feedback received.
State Government Officers	9/02/2021	DMIRS: David Alexander – Senior Policy Advisor Neil Roberts – Chief of Staff	Project update emailed for information and feedback requested.	Address any feedback received.
State Government Officers	9/02/2021	JTSI: Gerad Treacy – GM Strategic Projects Anthea Petersen	Project update emailed for information and feedback requested.	Address any feedback received.
Local Government Officers	9/02/2021	John Bowler – Major CKB John Walker – CEO of CKB Alex Wiese – Executive Manager of Economy and Growth CKB	Project update emailed for information and feedback requested.	Address any feedback received.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
Resident	9/02/2021	Jacob Altes – Neighbour	Project update emailed for information and feedback requested.	Address any feedback received.
Resident	9/02/2021	Kevin Mclerie – Neighbour	Project update emailed for information and feedback requested.	Address any feedback received.
Resident	9/02/2021	Shirley and Greg Elston – Neighbours	Project update emailed for information and feedback requested.	Address any feedback received.
Indigenous Stakeholder	13/01/2021	Marlinyu-Ghoorlie NT Group	Lynas has attempted to organise contact between Lynas and the Marlinyu-Ghoorlie Group from November 20 through January 21. 4/11/20: Voice message with Simon Blackshield. Reply received same day confirming Simon as the best contact and passing on email address. Email sent on the same day providing information on the project and requesting how they would like to proceed. 11/11/20: Follow up email to Simon Blackshield. 30/11/20: Follow up phone messages sent to Simon Blackshield. 27/12/20: Reply from Simon Blackshield asking for additional information to take to Future Act team meeting. 13/1/21: Additional information provided about the project by Lynas.	Continue trying to make contact.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
Indigenous Stakeholder	22/12/2020	Marj Strickland – Maduwongga Applicant	Concerned about the radiation risks. Queried the process for grant of the sub-lease by CKB to Lynas for Lot 500. Questioned the determination that native title was extinguished on this land. Marj believed that CKB and Lynas are trying to bypass them and have not consulted the Traditional Owners. Lynas has consulted widely with the community and have not singled out any particular group.	Lynas advised the representative that all radiation assessments conducted to date demonstrated that radiation impacts were within acceptable limits. Lynas advised that CKB has acquired the lease through Landcorp and have followed due process. Lynas advised that native title had been extinguished following due process. Remain in contact. Organise higher level contact from Lynas.
State Government Officers	10/12/2020	Andrew Ducas – Manager Customers & Stakeholders – Goldfields & Esperance for Water Corporation	EPA comment regarding concern dust deposition on Water Corp dam roof. Andrew will organise contacts in Kalgoorlie regional office and Perth water quality branch.	Organise to meet with WC regional office and water quality branch.
Indigenous Stakeholder	1/12/2020	Marj Strickland, Graham Nudding – Maduwongga Applicants	Initial contact with Maduwongga group. Main concerns raised with Yarri Road: • Radiation, need to know it is safe. • Need to look after the land, preserve as much land as possible. • Recognition of traditional owners. • Focussed on native title. • Economic opportunities, funding to support their native title claim, business opportunities. • Cultural awareness for Lynas employees Native title claims is in dispute with 2 other groups. Going to trial next week with overlapping claim by Wongatha group. Overlapping claim with Marlinyu Ghoorlie group in Kalgoorlie region.	Maintain contact. Future heritage survey participation. NT process for Yarri Road lease.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
Indigenous Stakeholder	30/11/2020	Maduwongga NT Group	Koa Jaensch (archaeological consultant working for Lynas) was requested to organise contact between the Maduwongga NT claimants and Lynas: 3/11/20: Koa made contact with the Corser and Corser office who gave Koa the contact details for Pet Berryman. 4/11/20: Koa made contact via email on the 4 November, providing information on the project and requesting how they would like to proceed. 6/11/20: Pet Berryman emailed requesting further information about project. 13/11/20: Additional information received from Lynas and sent to Pet Berryman. 25/11/20: Having had no response Koa followed up with Pet Berryman on information sent through on the 13 November. Reply received on the same day confirming that the information had been passed onto the clients for their attention. 27/11/20: Koa received email from Marjorie Strickland, Maduwongga applicant, with contact details for a meeting. 30/11/20: Koa passed contact information onto John Ganser at Lynas, with suggestion to meet with the Maduwongga group. Koa and John had a phone conversation and John then organised to meet Marjorie Strickland in Kalgoorlie on the 1st of December.	
Native Title Services Goldfields	19/11/2020	Anthony Sherlock – NTSG Lynas – Kam Leung	Establishment of new Native Title Services provider. Working towards providing some clarity for dealing with Native title claimant groups	Suggested Lynas make contact with Perth staff.
Aboriginal business community	19/11/2020	Rowena Leslie – Goldfields Aboriginal Chamber of Commerce Lynas – Kam Leung	Opportunities for Aboriginal businesses	Opportunities for local aboriginal businesses included in Lynas Policy. Will maintain contact.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
Resident	17/11/2020	Jacob Altes, nearest residential receptor	Jacob has rejected an offer of $2 million for his property as there are no similar lifestyle options available to him in Kalgoorlie. He is happy to stay on Hall Road. Jacob has started collecting timber from the site.	Continue contact with Jacob, regular updates on project status.
State Government Representatives	17/11/2020	Trevor Donaldson, Daniel Chambers	Opportunity for Forest Products Commission to "harvest" timber from the site before we clear the site for earthworks.	Develop plan for harvesting timber.
DWER & DMIRS	16/11/2020	Caron Goodbourn, Manager Process Industries Tania Liaghati, Team Leader James Best, Senior Environmental Officer	Officers briefed on proposed s41a application. DMIRS advised that Mining Proposal required and would need to detail clearing schedule and rehabilitation measures. DWER advised that a Works Approval if required, would offer the proponent a defence in the event of unexpected environmental impacts occurring. Neither agency is able to issue approvals prior to an EPA determination on the consent.	Lynas to include required information on staging in the submissions.
Lorna Mitchell Spring Festival	11/10/2020	Kalgoorlie community members Lynas – Kam Leung, Brendan Poepjes	Hosted a stall at annual community spring festival – over 7,000 attendees. Update and information on project. adiation safety demonstrations. Local employment and business opportunities.	Conducted radiation safety demonstrations.
Kalgoorlie Community	31/8/2020 – 20/9/2020	Various	Issues raised primarily related to interest in the project, development schedule and job opportunities.	Maintain up to date project information on website.
Local industry	9/09/2020	Adrian Lally, Environmental Supt, Norton Gold	Further discussions with Norton Gold and City of Kalgoorlie Boulder on developments in West Kalgoorlie	Joint meeting with CKB, Lynas and Norton.
Various	3/9/2020	Various representatives from DWER, DMIRS, JTSI, CKB, GEDC	Lynas provided a site tour of Lot 500 and Yarri Road, as well as an overall project briefing addressing the project description, approvals process and environmental management.	Lynas to refer project under Section 38 to EPA following a pre-referral meeting with the Chairman and DWER (completed 9/9/2020).
Local Government – CKB	2/9/2020	Alex Wiese – CKB Simon Tomizzi – Arup Other CKB and Arup representatives	Input on Lynas infrastructure requirements into the Kalgoorlie Industrial Land Study.	Information supplied. Lynas will continue assisting CKB and Arup with the study input and review of outcomes.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
DWER	9/07/2020	EPA Services – Helen Butterworth, Stuart Simmonds; DWER Noise Branch – Jingnan Guo; DWER Licensing – Daniel Hartnup;	Pre-referral noise assessment briefing addressing: • Proposal summary and background; • Noise assessment methodology, results and conclusions. DWER feedback included: • Assessment appears acceptable; • confirm identified sensitive receptors as some appear to be industrial premises; • verify noise specifications for certain equipment proposed as some appear lower than is likely to be achieved.	Lynas confirmed that minimum noise specifications will be prescribed in tender/contract specifications. Initial responses confirm that these specifications will be met. Use of shielding/sound barriers will also be adopted as required to meet assigned noise levels at sensitive receptors. Talis confirmed status of sensitive receptors which were also ground truthed in collaboration with the City of Kalgoorlie-Boulder.
DWER	7/07/2020	Services – Helen Butterworth, Stuart Simmonds, Leanna Zheng; DWER Air Quality Branch – Anthony Stuart, Sean Lam; DWER Licensing – Daniel Hartnup;	Pre-referral air quality assessment briefing addressing: • Proposal summary and background; • Air quality assessment methodology, results and conclusions. DWER feedback included: • Assessment appears acceptable; • Include information that identifies and assesses upset / shut-down conditions.	Air quality assessment has been revised to assess upset conditions and confirms that assessment criteria will continue to be met with these events.
Resident	10/7/2020	Nearest resident	Reviewed proposed site layout including green barrier around the site, gypsum ponds and bund directly south of the residence. The bund will be revegetated. Dust from road, metal recycling 2 doors down – would like sealing. Firewood from land clearing – Lynas suggested a special gate. Rebuilding residence, B&B? Has tenant on site – not supportive of project. Noise from plant – is there going to be PA, alarms (emergency sirens are okay)? – no PA or alarms. Will there be dusty uncleared areas like Water Corp?	Keep updated.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
Local industry	2/07/2020	Adrian Lally, Environmental Supt, Norton Gold	Norton Gold have a $550m heap leach project directly west of Lot 500. Using same noise modelling consultant as Lynas Will impact some of the same receptors as Lynas Is there interest in some collaboration (engaging with receptors, common services).	Joint meeting with CKB, Lynas and Norton.
State Government Representatives	2/07/2020	Hon Kyran O'Donnell MLA, Shadow Minister for Seniors and Aging, Volunteering (Liberal)	Proposal Update Radiation safety briefing and demonstration very supportive of project, how can he assist?	Provide dates for a Mt Weld visit.
State Government Representatives	2/07/2020	Hon Kyle McGinn MLC, Member for Mining & Pastoral Region	Proposal update Yarri Road site Radiation safety briefing and demonstration Support for local employment and business. Kyle has discussed project with Minister Johnson. He was disappointed about COVID and cancelled trip to Kuantan, He still wants to visit Mt Weld. He suggested that Lynas participates in Spring Festival, Mining Expo and Diggers.	Kyle will advise when he is in Laverton and can visit Mt Weld.
Resident	2/07/2020	Kevin McLerie, neighbour to Lot 500 (187 Halls Road) John Walker, CEO CKB	Proposal overview. Radiation safety briefing and demonstration. Kevin lives on site with wife and has downsized his business. Understands and supports resources industry. Would like to see Halls Rd sealed.	Keep updated.
Local business	2/07/2020	Rino Borremi, Access Hire Luke Bowler, Access Hire John Bowler, Mayor of Kalgoorlie Boulder	Proposal Update. Opportunities for Local content and local business.	Evening session (2 Jul) with CKB Councillors
Local Industry	2/07/2020	Alex Wiese, CKB Adrian Lally, Norton Gold	CKB plan for “Industrial precinct” in West Kalgoorlie including Lynas and Norton Gold projects. CKB plan to align zoning and land use for outer West Kalgoorlie. Agreement to work together, CKB to take a lead role, Lynas and Norton to support.	CKB to gather information on the stakeholders in the area, Lynas and Norton to have regular meetings.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
Local business	2/07/2020	Cathie, Jill, Julian, Mairia, Office National	ON had missed on-line community forum. Provided Proposal Briefing including Radiation Safety demo. Discussed Lynas buy local strategy, require local business to be competitive.	
Local Government	2/07/2020	John Bowler, Major John Walker, CEO CKB Councillors	Proposal Briefing. Reason for choosing Kalgoorlie. Radiation safety briefing and demonstration. By-product strategy including re-use, Yarri Road site, Mt Weld and West Kalgoorlie. Residential operation and buy local policy.	
Kalgoorlie On-line Community Forum	16/06/2020	Lynas – Kam Leung, Kallan McElroy	Lynas presentation included: • Why REs are important • Our operations in the Goldfields • Our Plans for Kalgoorlie • Lynas is safe including a radiation safety demonstration • Community and business involvement • Followed by an on-line Q&A session.	The presentation and Q&A are posted on the Lynas website. https://www.lynascorp.com/projects/

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
DWER/DAWE	02/06/2020	DAWE – Angela Gilman, David Loch DWER/EPA/s – Robert Hughes JTSI – Adam Lynas –Kam Leung, John Ganser KASA – Peter Jansen	Lynas presented proposed preliminary works and sought DAWE/EPA advice on process to initiate this application while the main approvals process was ongoing. EPA's advice was for Lynas to pursue EPBC referral and delegate decision first, prior to referring the Proposal under Section 38 of EP Act. DAWE advised (and confirmed in follow up email) that: It would be reasonable for Lynas' referral under the *Environment Protection and Biodiversity Protection Act 1999* (EPBC Act) to specifically exclude the preliminary works, so long as it appropriately justifies that those preliminary works do not need to be referred. There is a risk that our delegate will decide that the entire Proposal needs to be referred if the information provided in the referral does not present a convincing case that the preliminary works do not need to be referred. This is likely to cause a delay in the process while further referral information is provided. If the preliminary works are undertaken and it turns out that they *do* have a significant impact on a matter of national environmental significance, then an offence will have been committed under the EPBC Act. It would be helpful if Lynas can acknowledge this risk in the referral, so that the delegate could be clear that Lynas understands the potential consequences of the Department accepting a referral that does not include the preliminary works.	DAWE and EPA advice was noted. Lynas to submit EPBC referral in late June 2020) and s38 referral in July.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
Commonwealth Government Officers	21/05/2020	DISER – Jessica Robinson DAWE – Angela Gilman, David Loch DWER/EPA/s – Robert Hughes Lynas – Amanda Lacaze, Kam Leung, John Ganser, Kallan McElroy, Fatahiah Mohd Saad KASA – Peter Jansen	Briefing to key Federal and State Environmental Regulators on the Proposal including an overview of radiation impacts and management. Lynas tabled proposed schedule which is reliant on commencing preliminary works while approvals are ongoing. WA EPA can accommodate this via S41A application.	A follow up, more focused discussion on the process for the preliminary works approval was proposed with DAWE and EPA/s.
Nearest residential receptor	21/11/2019, 08/04/2020, 16/4/2020	Jacob Altes, nearest residential receptor	Sent draft site layout and noted perimeter green zone (Jacob suggestion)- replacement of process water ponds with process water tanks to stop evaporation losses (Jacob suggestion) entrance off Johns Road – will look at direction of lighting during detailed design and installation – offered call to walk through design.	Send draft plans to Jacob and followed up with an email and phone call.
Commonwealth Government Officers	12/03/2020	Jeffrey Paul, Carri Elliot (DAWE)	Present C&L Proposal; Seek clarification on whether the Proposal requires referral under EPBC Act.	Commence preparation of EPBC referral.
State Government Officers	28/02/2020	Dept of Health – Duncan Surin EPA Service – Leanne Zheng JTSI – Gerard Treacy, Anthea Petersen DMIRS – Tania Liaghati, Martin Ralph, Paul Foley	Presentation by Lynas on LAMP radiation monitoring program and update on radiation management for Kalgoorlie REPF. DMIRS introduced new factors for calculation of radon exposure.	Evaluate impact of new factors for Mt Weld and C&L.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
Kalgoorlie Boulder Chamber of Commerce and Industry	19/02/2020	KBCCI Members (180 registered, approximately 130 attended) Lynas team – Kam Leung, Grant Mcauliffe, Tony Malloch, Alex Logan, John Ganser, Jeff Wishart	Lynas co-hosted KBCCI Business After Hours members networking events.	Short Talk – Long history in Goldfields (discovery 1966, mining 2007, processing 2011, Cracking & Leaching 2022). REs are part of our lives and future (digital technology, cleaner vehicles, renewable energy). Lynas Kuantan largest RE plant and what we are relocating (C&L) to Kalgoorlie. Meet our team tonight, register your interest. Lynas is Safe – Radiation demonstration by Alex Logan
State Government Representatives	05/02/2020	Member for Mining & Pastoral Region (Greens)	Provided briefing on Lynas and REPF Proposal in Kalgoorlie. Had a long history with the Proposal back to Ashton days, was involved in protests at Kuantan in early days. Had an understanding about the low level of radiation due to relationship. Was a former member of the Radiation Health Committee (ARPANSA) representing the interests of the general public. Spoke of potential pathway if ingested.	Continue briefings, invitation to visit Lynas sites.
State Government Officers	19/12/2019	Dept of Health – Duncan Surin EPA Service Unit – Robert Hughes JTSI – Gerard Treacy, Anthea Petersen DMIRS – Tania Liaghati, Martin Ralph, Paul Foley	Radiation Aspects of Lynas REPF Proposal in Kalgoorlie. Presentation on Kuantan radiation Management.	Presentation by Lynas Kuantan Radiation Executive.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
State Government Representatives	13/12/2019	Hon Ken Baston MLC, Member for Mining & Pastoral (Liberal) Hon Robin Scott MLC, Member for Mining & Pastoral (Pauline Hanson's One Nation) David Modolo, Electorate Officer for Hon Robin Scott	Presentation on Lynas REPF Proposal in Kalgoorlie. Overview of Mt Weld operations. Both very supportive of Kalgoorlie Proposal. Raised concerns re radiation. Satisfied low risk after presentation and demonstration using Mt Weld concentrate.	Follow up communication.
State Government Representatives	12/12/2019	Hon Kyle McGinn MLC, Member for Mining & Pastoral Region	Briefing on Lynas RE Processing in Kalgoorlie Proposal. Very supportive of the Proposal in Kalgoorlie, if residential. Concern about radiation and safety, and feed from non-Goldfields region if waste were to remain.	Follow up with invitation to Mt Weld, more information on radiation.
State Government Representatives	12/12/2019	Hon Kyran O'Donnell MLA, Shadow Minister for Seniors and Aging, Volunteering (Liberal) Krystie Tham, Research Officer	Briefing on Lynas RE Processing in Kalgoorlie Proposal. Very enthusiastic about proposal in Kalgoorlie. Some concerns about radiation.	Invitation to Mt Weld.
Local Education Stakeholders	12/12/2019	Chelsie Grace, Director Central Regional TAFE	Overview of Central Regional TAFE and Tour of Facilities including Workshops.	Investigate opportunities for collaboration.
Local Education Stakeholders	12/12/2019	Sabina Shugg, Director Kalgoorlie Campus WASM Bryan Maybee, Discipline Lead, Minerals and Energy Economics, WASM Laurence Dyer, Discipline Lead, Metallurgical Engineering, WASM	Overview of WASM and tour of teaching facilities.	Investigate opportunities for collaboration.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
Kalgoorlie Boulder Chamber of Commerce and Industry	21/11/2019	KBCCI hosted event, supported by local and state government agencies.	KBCCI annual What's Down the Track Forum attended by government agencies, local business, local community and stakeholders with Goldfield interests	Update on Lynas REPF progress.
State Government Representatives	11/12/2019	Hon Stephen Dawson MLC, Minister for Environment; Disability Services, Electoral Affairs; Member for Mining and Pastoral Region (Labour) Darren Foster – Principal Policy Adviser Robert Hughes – EPA Services	Briefing on Lynas RE Processing in Kalgoorlie Proposal.	Further dialogue.
State Government Representatives	11/12/2019	Hon Jacqui Boydell MLC, Member for Mining and Pastoral Region (The Nationals) Josh Nyman, Office of Mia Davies, Leader of the Nationals	Briefing on Lynas REPF in Kalgoorlie Proposal. Very supportive of Proposal, concern about potential issues with radiation.	Josh Nyman provided copies of presentations.

Stakeholder Group	Date	Stakeholder Contact	Issues Raised	Lynas Response
State Government Officers	31/10/2019	JTSI – Chris Cottam, Gerard Treacy, Anthea Petersen Dept of Health – Duncan Surin DMIRS – Rick Rogerson, Tony Bullen, Isabell McCagh (Tenure), Warren Ormsby (land Use Planning), Dan Endacott, Karen Caple (Environmental Compliance) Christina Folley, Paul Foley (Mines Safety) DWER – Rebecca Kelly (Regulatory Services), Robert Hughes (Assessments)	Interagency meeting hosted by JTSI. Briefing on Lynas Processing Proposal in WA.	Further dialogue.
State Government Officers	3/10/2019	Tom Hatton – Chairman EPA Robert Hughes – Manager EPA	Update on Lynas C&L in WA Proposal.	Further dialogue.
Local Government Officers	08/07/2019	Alex Wiese – Executive Manager of Economy and Growth KBCC Stuart Devenish – General Manager Infrastructure and Environment KBCC John Walker – CEO KBCC	Followed on from previous meeting with Council to aid support operational setup in Kalgoorlie. Review of Potential Sites for C&L Plant. Water Supply – reviewed volumes of available water and water makeup. Power Supply.	Further dialogue.
Local Government Officers	14/06/2019	Alex Wiese – Executive Manager of Economy and Growth CKB Stuart Devenish – General Manager Infrastructure and Environment CKB John Walker – CEO CKB	Council willingness to aid support operational setup in Kalgoorlie. Review of Potential Sites for C&L Plant inclusive of drive out to sites to review sites. Water Supply. Power Supply.	Further dialogue.

5 BASELINE AND CLOSURE DATA AND ANALYSIS

A series of desktop and site-specific field investigations and surveys have been conducted to expand the existing baseline environmental dataset at the REPF and BSF sites. Several of these investigations are ongoing and the data and information gathered will be progressively added to this document as they become available.

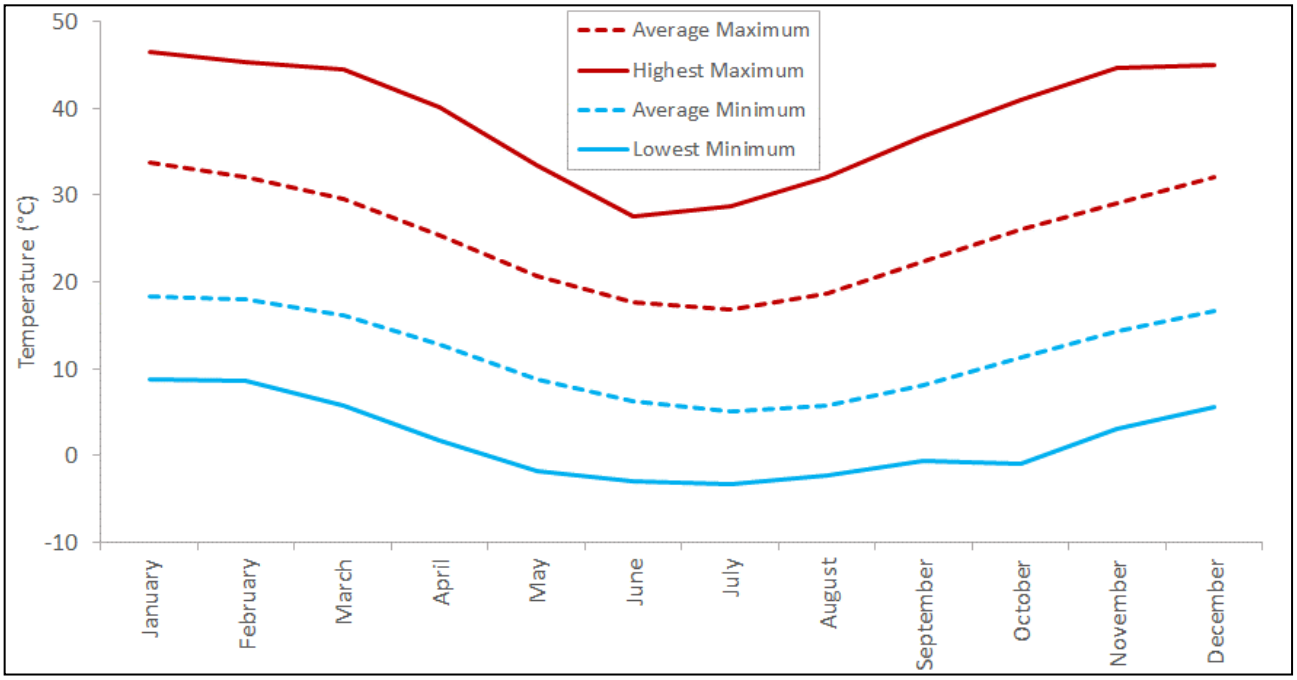
5.1 Climate

The climate and meteorological characteristics of a region control the dispersion, transformation, and removal (or deposition) of pollutants from the atmosphere, and therefore ambient air quality. To present the climatic characteristics of the existing site and locality, data was sourced from the nearest Bureau of Meteorology (BoM) automatic weather station (AWS) to the two sites which is Kalgoorlie Airport, located approximately 5 km to the west of the REPF and 12 km to the southeast of the BSF.

Kalgoorlie has a semi-arid climate characterised with hot, dry summers and mild winters. The long-term temperature statistics from the BoM Kalgoorlie AWS are presented in Insert 5-1. January is the hottest month with an average maximum temperature of 33.6 °C. Temperatures above 40.0 °C occur on approximately 9 days per year with hot, dry, north to north easterly winds. These high temperatures are usually followed by a cool change from the south and occasionally with a thunderstorm.

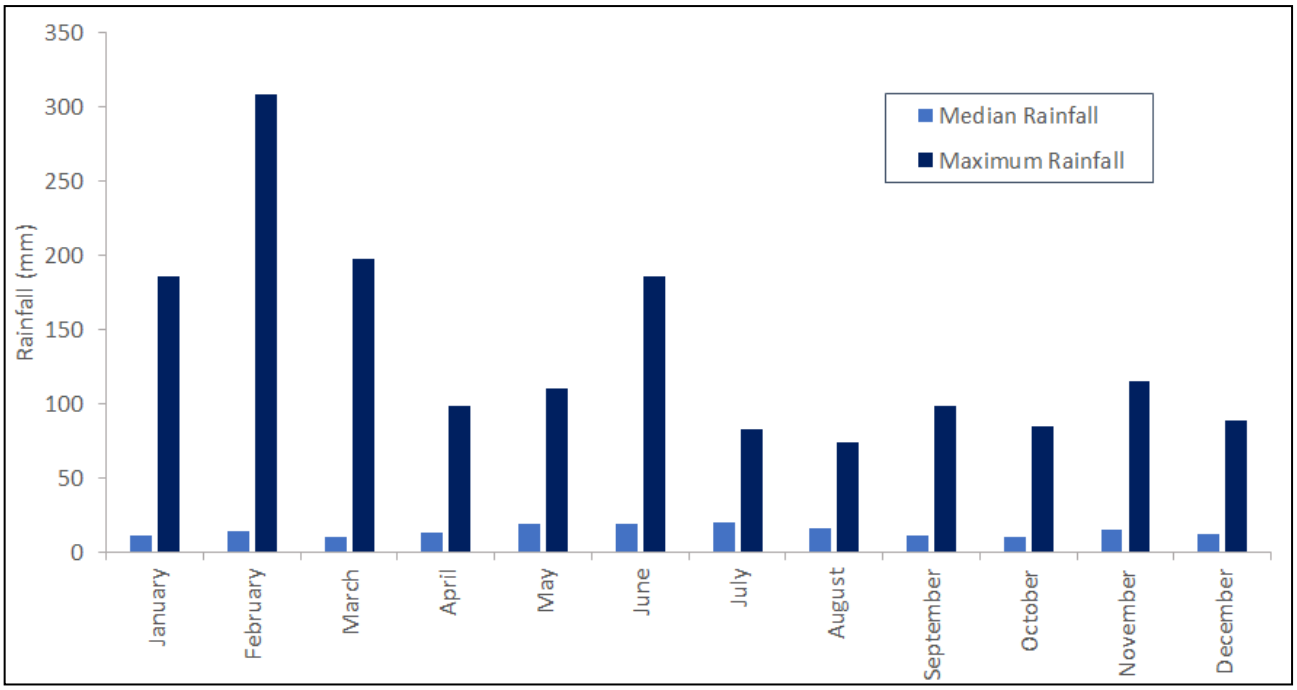
By contrast, winters are cool, with July average minimum and maximum temperatures being 5.1 °C and 16.8 °C, respectively. Cold, wet days with a maximum below 12.0 degrees C occur about once every winter. Overnight temperatures fall below freezing about four times in a typical winter. Such events occur on clear, calm nights.

Insert 5-1: Long Term Temperature Statistics, Kalgoorlie BOM Station 012038 (1936-2019)



The median annual rainfall is 254 mm on an average of 68 days and, while the average rainfall is evenly distributed throughout the year, there is a slight winter maximum. Rainfall also displays considerable variation from year to year, with the highest monthly rainfall of 308 mm measured in February 1948 (Insert 5-2).

Insert 5-2: Long Term Rainfall Statistics, Kalgoorlie BOM Station 012038 (1936-2019)



5.1.1 Surrounding Weather Station Rainfall Data

To analyse local rainfall conditions daily rainfall data were obtained for five BoM rainfall stations, all of which remain open and are situated within a 50 km radius of both sites. Table 5-1 gives the minimum, maximum, mean and median annual rainfalls for each of the stations, while Insert 5-2 gives the minimum, maximum and mean number of rain days per year and maximum duration without rain.

Table 5-1: Rainfall Data Summary of Surrounding Weather Stations

Station Name	Minimum Annual Rainfall (mm)	Maximum Annual Rainfall (mm)	Mean Annual Rainfall (mm)	Median Annual Rainfall (mm)	No. of Years
Bulong	94.2 (1969)	587.7 (1992)	258.5	240.4	106
Kalgoorlie-Boulder Airport	108.7 (1940)	530.8 (1992)	266.9	254.9	70
Kalgoorlie Post Office	129.3 (1950)	458.7 (1942)	240.7	222.5	46
Woolibar	79.0 (2002)	483.8 (1992)	251.4	238.4	39
Cowarna Downs	43.8 (1976)	500.8 (2000)	264.8	254.8	42

Table 5-2: Local Rainfall Data Summary

Station Name	No. of Rain Days per Year			Periods Without Rain		
	Min.	Max.	Mean	Max. Duration	From	To
Bulong	25 (1944)	85 (1992)	47.7	149	6 Dec 1949	4 May 1950
Kalgoorlie-Boulder Airport	31 (1940)	132 (1963)	69.7	149	6 Dec 1949	4 May 1950
Kalgoorlie Post Office	32 (1944)	69 (1942)	50.9	110	17 Nov 1916	7 Mar 1917
Woolibar	14 (2002)	62 (1992)	37.2	129	8 Dec 2001	16 Apr 2002
Cowarna Downs	13 (1976)	94 (1992)	43.3	147	1 Jun 1976	26 Oct 1976

The data shows that rainfall patterns across the region are highly impacted by the passage of remnant tropical cyclone systems moving down from the Kimberley/Pilbara region. Even a single extreme cyclonic rainfall event can have a disproportionate effect on the mean of average rainfall for these stations but has much less effect on the calculated median.

As an example, the annual maximum of 587.7 mm recorded at Bulong in 1992 was due largely to heavy rainfalls associated with remnant Tropical Cyclone Ian which crossed the Goldfields in early March, along with an unusually wet winter that year. It should be noted that 1992 was also the wettest year on record at Kalgoorlie Airport and Woolibar with annual totals of 530.8 mm and 483.8 mm respectively due to the same events.

Frequency analyses of this rainfall event in relation to the long-term data available from the Bulong Station indicates that the 1992 maximum annual rainfall had an annual exceedance probability (AEP) of less than 0.4%.

5.1.2 Extreme Rainfall Intensities

Rainfall intensity-frequency-duration (IFD) estimates for the study area near were derived using BOM's CDIRS (Computerised Design IFD Rainfall System), which allows automatic determination of a full set of IFD curves and associated data for any location in Australia. This approach is compatible with the manual procedures described in Australian Rainfall & Runoff (ARR): A Guide to Flood Estimation (IEAust, 2016), recommended as appropriate in regions where reliable stream gauging information is unavailable. A selection of rainfall depths for various storm durations from 5 minutes to 72 hours for up to a 1% average exceedance probability (AEP) are presented in Table 5-3.

Table 5-3: Intensity Duration Frequency Rainfall Intensities

Duration	Average Exceedance Probability (AEP), Rainfall depth (mm)						
	63.2%	50%	20%	10%	5%	2%	1%
5 minute	3.90	4.65	7.23	9.18	11.3	14.3	16.9
10 minute	5.71	6.82	10.7	13.6	16.7	21.3	25.3
30 minute	9.15	10.9	17.0	21.6	26.6	33.8	40.0
1 hour	11.6	13.9	21.5	27.2	33.4	42.5	50.1
2 hour	14.5	17.2	26.6	33.8	41.4	52.6	62.1
3 hour	16.3	19.5	30.1	38.3	47.0	59.9	70.8
6 hour	20.0	23.8	37.3	47.7	59.0	75.6	89.8
12 hour	24.3	29.0	46.0	59.6	74.7	96.4	115
24 hour	29.0	34.9	56.3	73.8	93.7	122	146
48 hour	33.9	40.8	66.8	88.5	114	148	179
72 hour	6.5	44.1	72.4	96.1	124	162	195

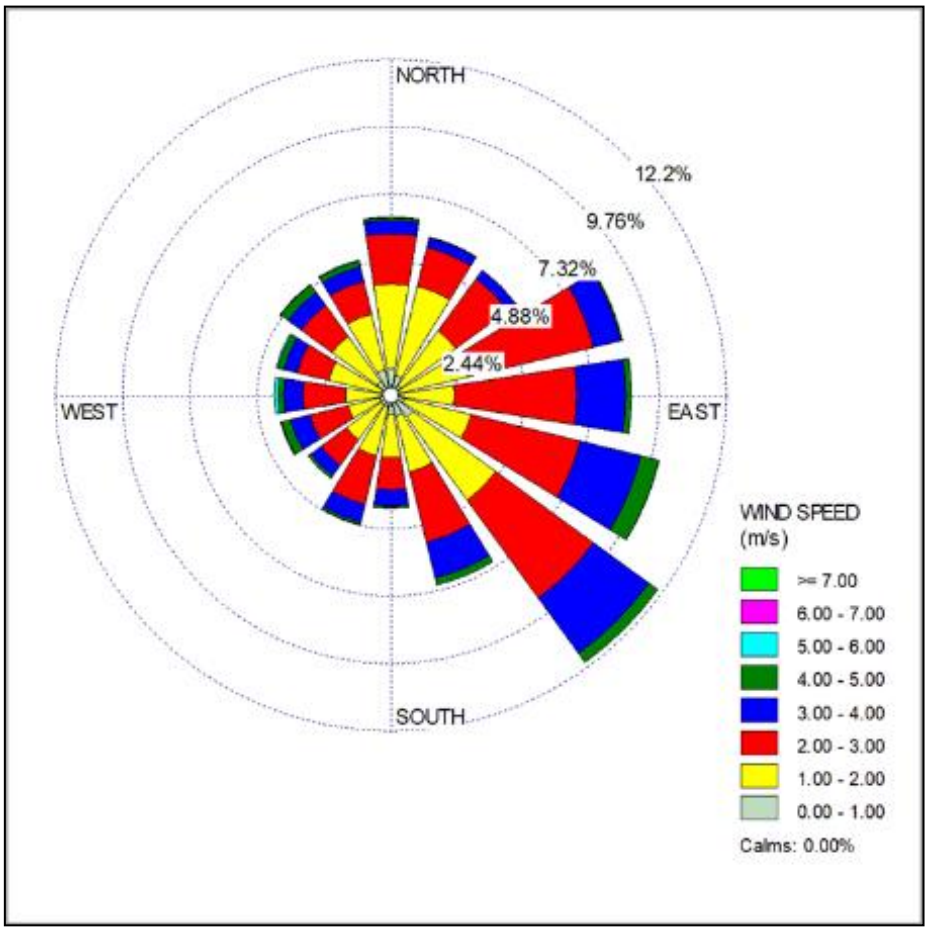
5.1.3 Wind Conditions

Lynas commissioned an air quality study to investigate the potential impacts from the REPF on air quality because of emissions from point and fugitive sources during operations (ETA, March 2021).

To establish meteorological inputs into the air dispersion model, wind speed and wind directions were extracted from the gridded CALMET output for a point corresponding to the proposed Lynas facility. The major features of the wind rose for the site (Insert 5-3) are as follows:

- The predominant wind direction is from the east-southeast and southeast.
- Highest hourly average speeds (greater than 5 m/s) occur with winds from the west.
- Winds from the south are relatively uncommon.
- Highest frequency of light winds occurs from the southeast.

Insert 5-3: Annual Wind Rose, Lynas REPF – 2014 (extracted from CALMET)



5.1.4 Considerations for Mine Closure Planning

The large seasonal variability in rainfall across the region caused by the influence of remnant tropical lows from the Pilbara coast requires consideration when designing final landforms. Large, high intensity storm events of >100 mm in 24 hours are expected to occur infrequently and post-mine landform designs and general closure planning must take this into consideration.

5.2 Topography

The wider Kalgoorlie area consists of an extensive plateau of low relief; flat to undulating plains with small valleys (occasionally broken by low narrow rocky hills, ridges, tors and bosses) are most commonly found on granitic terrain. These plains support silcrete duricrust, clay pans, salt lakes with dunes and lunettes, gilgai areas, small remnants of sand plain, and small dune tracts. Low breakaways with short saline footslopes are also occasionally present. Below these plains are some broad, flat to undulating, shallow valley plains formed on Quaternary alluvium and colluvium.

These plains show little defined drainage and some seasonal lakes and clay pans with isolated granitic and basic rock outcrops. Slightly lower down in the landscape are broad, flat valleys with chains of salt lakes. Also present on these valley floors are saline flats, clay pans, kopi dunes, sand dunes, and sometimes tors and bosses of outcropping granites. Higher up in the landscape are gently sloping to gently undulating plateau areas on granites and gneisses. These have long gentle slopes and, in places, abrupt erosional scarps. Some granitic bosses and tors are present. Rocky ranges, hills and ridges have formed on the greenstone, along with some undulating to low hilly country. Associated with this hilly terrain are gently undulating stony plains and low rises on limonite. Level to gently undulating sandplains and gravelly sandplains are mostly found over lateritic residuals and granitic basement. There are also some extensive loamy plains with sandy surfaces.

5.2.1 REPF Site

The REPF site is topographically flat to undulating, with no defined stream pathways or temporary water storage features (e.g., Salt Lake basins). It is bounded on the north by the Kalgoorlie Railway line, the south by the Great Eastern Highway and to the east and west by local gazetted roads.

Ground levels at the site are between 367 m Australian Height Datum (AHD) within the north-western portion of the site and 378 m AHD within the north-eastern area of the site (Tetris Environmental, July 2019).

5.2.2 BSF Site

The Yarri Road BSF site is largely flat in profile and slopes downwards at a gentle incline towards the south and west. There is a poorly defined channel running southwest along the eastern margin of the site. A raised earthen bund approximately 1.5 m high which was formerly a rail line runs along the eastern margin of the site boundary.

The topography varies between approximately 368 m AHD along the western margin of the site and 378 m AHD within the north-eastern area of the site. A gentle slope occurs downwards towards the west from the centre of the site, and a gentle slope from the centre towards the south which is caused by the placement of the site along the gently rounded ‘shoulder’ of the ridge which occurs directly to the north east of the site.

5.3 Soils

Tille (2006)classified the most recent and detailed mapping of Western Australia's rangelands and arid interior into a hierarchy of soil-landscape mapping units. The study area is located within the Kalgoorlie Province, which has been divided into six soil-landscape zones.

The Kambalda Zone overlies the greenstone of the Eastern Goldfields and Southern Cross Granite-Greenstone Terrane tectonic units of Tyler and Hocking (2001). It lies within the Salinaland and Coonana-Ragged Plateau Sections of Jenning and Mabbutt (1977)) and is differentiated from the Norseman Zone due to the preponderance of the stony plains with acacia shrublands and halophytic shrublands, low hills with eucalypt or acacia woodlands with halophytic undershrubs, stony plains with acacia shrublands and alluvial plains with eucalypt woodlands and halophytic undershrubs rangeland land types (Pringle, 1994).

The zone comprises flat to undulating plains (with hills, ranges and some salt lakes and stony plains) on greenstone and granitic rocks of the Yilgarn Craton. The regional scale soils were mapped as unit Mx43 across both sites – a brown deep loamy duplex.

5.3.1 REPF Site

A baseline soil investigation study was carried out by Ramboll over the REPF site in June 2020. The study involved the logging and sampling of soils from 20 test pits completed across the planned footprint of the proposed REPF, with selected samples undergoing targeted laboratory analysis. Test pits were excavated to depths ranging between 1.6 m below ground surface (mBGS) and 2.8 mBGS and soil samples were taken from the following intervals:

- surface to 0.15 mBGS,
- 0.45 to 0.6 mBGS,
- 0.85 to 1.0 mBGS, and
- 1.0 m intervals thereafter (as required).

Soils at the site typically comprise a 30-50 cm layer of sandy clay near the surface, underlain by clay with weathered metamorphosed felsic volcanics (weathered bedrock) encountered at 1.2 to 2 m depth. Below this, a pallid white clay was generally intercepted below 1.5 m depth which was interpreted as the top of the highly weathered felsic volcanics underlying the site (i.e., saprolite). A summary of the laboratory results received from the soil investigation is shown in Table 5-4.

Table 5-4: Summary of REPF Soil Investigation Laboratory Data

Analyte	No. Samples	Units	Minimum	Maximum	Average
pH	11	-	8.5	9.5	8.96
Total Organic Carbon	6	%	0.16	0.99	0.54
Sodium Adsorption Ratio	5	-	2.9	15.7	9.3
Electrical Conductivity	11	µS/cm	46	3,440	998
Moisture Content	1	%	13.7	13.7	13.7
Clay (<2 µm)	3	%	11	25	18.3
Exchangeable Cations					
Ex. Calcium	9	meq/100g	6	25.6	19.9
Ex. Magnesium	9	meq/100g	1.8	8.5	4.9
Ex. Potassium	9	meq/100g	0.4	1.7	0.72
Ex. Sodium	8	meq/100g	0.4	4.3	2.09
Cation exchange capacity	9	meq/100g	11.1	34.8	27.46
Exchangeable Sodium Percentage	9	%	0.3	12.7	6.69
Sulfate as SO_4	10	Mg/kg	190	4,370	906

The results indicate the surface soils exist in an alkaline state, with variable salinity which ranges from very low to moderate. Total organic carbon was generally low, but within the range expected for semi-arid zone topsoils. The exchangeable cations suggest the clay mineralogy is likely to be dominated by kaolinite, with minor mica forms (e.g., illite). The prevalence of kaolinite which is not a reactive clay mineral along with the variable exchangeable sodium percentage (ESP) values reported indicates the materials across the site are likely to display a range of behaviours with regards to their potential for dispersion, with stable non-dispersive materials generally dominant but some material likely to display the potential to disperse.

In addition to the above baseline information, soils were tested for a range of metals and other contaminants to provide a measure against which to assess the potential for any future soil contamination. The criteria proposed for the assessment of soil contamination were sourced from the following references:

- National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) (NEPM 2013).
- CRC Care (2011) Technical Report No. 10, Health Screening Levels for Petroleum Hydrocarbons in Soil and groundwater, Part 1: Technical Development Document, 2011.

The guidelines adopted for the site assuming a Clay lithology from the NEPM were:

- Health Investigation Level (HIL) D for commercial/industrial uses such as shops, offices, factories, and industrial sites. The HILs are applicable for assessing human health risk via all relevant pathways of exposure. The HILs are generic to all soil types and apply generally to a depth of 3 m below the surface for industrial use.
- Health Screening Levels (HSL) D for commercial/industrial use for soil vapour intrusion from petroleum hydrocarbons are guidelines that prevent accumulation of vapours at concentrations that may represent a health risk. The guidelines are relevant where soils are beneath building or structures such as confined spaces, beneath concrete hardstand, and unsurfaced areas.
- Ecological Investigation Levels (EILs) for commercial/industrial use for assessing risk to terrestrial ecosystems. EILs depend on specific soil physicochemical properties and generally apply to the top 2 m of soil. EIL calculations were completed as part of this investigation.

The soil was found to have metals contents generally low typical of a greenfield site. The exception to this is iron which is moderate to high as is typical for Red (iron rich) Loamy Earths. Soil metal concentrations are less than EILs in all cases, with toxic metals (antimony, arsenic, cadmium, lead, and mercury) being near or below detection limits for all samples. The only other metal which has significant concentrations in soils is chromium, but levels are less than a ¼ of EILs and uniform throughout suggesting they are naturally occurring.

Measurements for the presence of hydrocarbons, semi-volatile organic compounds (SVOCs) and volatile organic compounds (VOCs) concentrations were reported below the laboratory limits of reporting.

5.3.2 BSF Site

The detailed baseline survey for the BSF site has been undertaken and this section will be updated once the laboratory analysis results of this survey are finalised. What can be reported is the general soil composition observed during the field surveys was a low plasticity reddish brown sandy clay to approximately 2 m deep, followed by a weathered kaolinite clay, and in a couple of locations – bands of an alluvial high plasticity clay. The weathered kaolinite clay varied in colour and sand content, and was present to at least 72 m, where target depth of the boreholes was achieved, and observation ceased.

5.3.3 Consideration for Mine Closure Planning

In general, the soil data shows a typical red brown loam material which is prevalent over the Kalgoorlie area. Soils across the site have significant variability in terms of soil sodicity and associated clay dispersion risks. Any revegetation at the site would need to take soil sodicity into account; local species will be adapted to these conditions and should be used wherever possible.

Due to the likely presence of minor volumes of marginal to sodic soils at the site, construction and operations should seek not to impede natural drainage where possible, in turn preventing further accumulation of saline subsoils, dispersion of subsoils and subsequent acceleration of erosion and soil aggregation resulting in reduced potential as a growth medium.

Water and wind erodibility risk are low to moderate but also vary across the site. Erodibility does not also mean erosion will occur; erosion is also dependent on topography and the magnitude of rainfall events. Regardless, the erodibility of this site will be like neighbouring areas, which will exhibit off-site sediment transport during high intensity rainfall events. Surface water management at the site will need to take this into account to ensure off-site transport of native sediment or any dust from the proposed REPF is minimised.

Additionally, experience has shown that fine grained soil types of this nature will require careful management if they are required to be used on post-mine landforms, particularly sloped areas, to prevent excessive erosion.

The current lack of site-specific information on soil material at the BSF is identified as an information gap which will need to be filled to facilitate detailed mine closure planning in the long term.

5.4 Geology

5.4.1 Regional Setting

Both sites are in the Kambalda Domain of the Kalgoorlie Terrane in the eastern goldfield province (EGP) of the Yilgarn Craton. The greenstone successions of the EGP form elongate north-northwest-trending arcuate belts separated by granite-gneiss terranes and an anastomosing series of regional-scale faults. The linear, northerly trending greenstone belts comprise metamorphosed volcanic and sedimentary rocks.

The greenstone belts contain metamorphosed and deformed sequences of mafic and ultramafic volcanic rocks; sedimentary rocks and felsic volcanic and volcaniclastic rocks along, with minor chert and banded iron-formation. The Granitoid rocks are generally foliated and occupy about 60% of the region. Minor quartz-feldspar porphyry intrusions occur in the greenstone belts centred on Kalgoorlie. The Archaean rocks are poorly exposed owing to widespread surficial cover and extensive deep weathering.

Cainozoic surficial deposits form an extensive cover over the Precambrian rocks, and include Tertiary sedimentary rocks preserved in palaeochannels located in palaeodrainages that once carried water westward to the Indian Ocean and eastward to the Eucla Basin.

Dominant on the eastern and western margins of the City of Kalgoorlie Boulder, the Black Flag Group underlies both sites and consists of upper felsic volcaniclastic and sedimentary rocks which overly a series of dacites and andesites. Felsic units are intercalated with horizons of siltstone, mudstone, and sandstone. Mafic dykes are prevalent throughout the Group.

5.4.2 Tertiary Units

Palaeochannels, consisting of Tertiary sedimentary rocks are present in deep valleys, cut into the bedrock by Cretaceous to early Tertiary rivers (Kern, 1995). Palaeochannels are now covered by Quaternary sediments (Kern, 1995). Sediments in the palaeochannels generally consist of Wollubar Sandstone (unconsolidated quartz sand, with minor conglomerate, silt, clay and lignite) up to 28 m thick and Perkolilli Shale (multi-coloured clay, with minor sandy clay beds) up to 30 m thick.

5.4.3 Surficial

A variety of Cainozoic surficial deposits comprising colluvial and alluvial deposits overlie the Archaean and Tertiary rocks in the Kalgoorlie area (Kern, 1995). These are generally comprised of reddish-brown clay loams of varying thicknesses, from skeletal to over 25 m thick.

5.5 Hydrogeology

The area surrounding Kalgoorlie is underlain by weathered and fractured Archaean bedrock overlain locally by palaeo-channel deposits and by widespread alluvium and lake deposits. The bedrock forms part of the Yilgarn Goldfields fractured-rock groundwater province. An interpretative map of the regional hydrogeology of the area is shown in Figure 5-1.

The fractured bedrock is characterised by secondary permeability resulting from tectonic and decompression fracturing enhanced by chemical dissolution along fracture lines. Fractured-bedrock aquifers occur more commonly in mafic, ultramafic, and granitic rocks than in sedimentary or felsic volcanic and volcaniclastic rocks. Open fractures occur up to a depth of 125 m in greenstones in some areas (AGC, 1988), and probably to at least similar depths along major faults and shear zones.

A regional water table exists with depths to groundwater varying from less than 1 m in playa-lake environments to more than 40 m in elevated areas. The regional water table may be absent in high areas where the weathered and fractured zone is unsaturated or where fractures are poorly developed. Groundwater flow is towards the major palaeodrainages and modern playa lakes where the water table is close to the surface. Groundwater discharge occurs mainly by evaporation from playa lakes, and only a relatively small amount of water flows out of these areas through the palaeochannels.

5.5.1 REPF Site

A baseline groundwater investigation study was carried out by Ramboll over the REPF site in June 2020. The study involved the drilling, logging, and installation of three groundwater monitoring wells, followed by groundwater quality sampling of each well. Groundwater samples underwent laboratory analysis to determine groundwater baseline conditions. Each of the wells was extended to the groundwater table which was intersected between 30 m and 40 mbgl.

The wells were installed using a rotary air blast drilling method and then fitted with slotted screens with a minimum 1 m bentonite collar to complete the well casing. The wells were developed using standard methods immediately upon installation and were then left to stabilise for a period of 48 hours prior to purging and sampling. The locations of the three wells along with the inferred groundwater surface and direction of flow are shown in Figure 5-3 and Figure 5-4. The local groundwater flow direction is interpreted to be south west towards the Hannan palaeodrainage and associated playa lakes 6.5 km to south south-west. The high depth to groundwater and elevated salinity will exclude the use of groundwater by vegetation which will therefore be dependent on soil water.

The drill logs indicate that underlying the site there is a 1.5-2.5 m thick layer of colluvium consisting of low plasticity stiff sandy clay. Underlying this is a metamorphosed felsic volcanic unit which has been extensively weathered to a pallid clay (likely kaolinitic) with little or no primary minerals remaining.

Groundwater was encountered approximately 35 mbgl, with the measured groundwater elevation data, total well depth and relative elevations for the well casings (TOC mAHD) provided in Table 5-5.

Table 5-5: Lot 500 – Groundwater Elevation Data

Well ID	Top of Collar (m AHD)	Total Depth (TOC)	Standing Water Level (m from TOC)	Standing Water Level (m AHD)
MW01	369.46	39.37	32.53	336.93
MW02	372.54	38.12	34.25	338.29
MW03	378.96	41.60	36.58	342.38

In addition to the above groundwater level and flow information, groundwater samples were tested for a range of metals and other contaminants to provide a measure against which to assess the potential for any future contamination. The criteria proposed for the assessment of groundwater contamination were sourced from the following references:

- ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
- National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM 2013).

A summary of measured groundwater parameters including pH, temperature, redox potential, conductivity and dissolved oxygen, were recorded in the field prior to sampling, as summarised in Table 5-6. The analytical results of groundwater physio-chemistry, metals, cyanide and nutrients are shown in Table 5-7 and Table 5-8.

All hydrocarbons and VOC/SVOC within the three groundwater samples were reported below the laboratory limits of reporting.

Table 5-6: Lot 500 – Measured General Groundwater Quality

Parameters	MW01	MW02	MW03
pH	3.69	6.67	6.43
Temperature ©	28.3	26.3	27.2
Redox Potential (mV)	347	134	104
Dissolved Oxygen (mg/L)	2.65	2.31	2.90
Conductivity (µs/cm)	83,945	51,422	48,701
Total Dissolved Solids (mg/L)	52,400	32,100	32,800
Fluoride (mg/L)	0.3	2.6	3.1
Total Hardness as $CaCO_3$	9,090	7,100	7,350
Total Alkalinity as $CaCO_3$	<1	601	598
Sulfate as SO_4	3,500	2,310	2,350

Table 5-7: Lot 500 – Measured Dissolved Metals within Groundwater Samples

Dissolved Metals (mg/L)	MW01	MW02	MW03
Arsenic	0.013	<0.005	<0.005
Beryllium	<0.010	<0.005	<0.005
Barium	0.258	0.275	0.273
Cadmium	0.0024	0.0007	0.0006
Chromium	<0.010	<0.005	<0.005
Cobalt	0.269	0.008	0.008
Copper	0.104	0.007	0.008
Lead	0.017	<0.005	<0.005
Manganese	4.85	2.56	2.65
Nickel	0.419	0.031	0.03
Selenium	<0.10	<0.05	<0.05
Vanadium	<0.10	<0.05	<0.05
Zinc	0.462	<0.025	<0.025
Boron	6.61	3.77	3.84
Mercury	<0.0001	<0.0001	<0.0001
Total Cyanide	<0.040	<0.040	<0.040
Weak Acid Dissociable Cyanide	<0.040	<0.040	<0.040

Table 5-8: Lot 500 – Measured Major Cation and Nutrients within Groundwater Samples

Analyte (mg/L)	MW01	MW02	MW03
Calcium	341	683	717
Magnesium	2,000	1,310	1,350
Potassium	25	77	80
Sodium	19,000	10,200	10,400
Ammonia as N	0.76	0.08	0.07
Nitrite as N	<0.01	<0.01	<0.01
Nitrate as N	0.9	8.82	9.04
Kjeldahl Nitrogen as N	2	1.4	1.4
Total Nitrogen as N	2.9	10.2	10.4
Total Phosphorous as P	0.28	0.3	0.23
Reactive Phosphorous as P	<0.01	<0.01	<0.01

Field water quality parameters are consistent between MW2 and MW3 but MW1 shows some distinct variation. The pH is lower (3.7 verses ~6.5) and the EC is higher (84,000 verses ~50,000 µs/cm) in MW 1 compared to MW2 and 3. As MW1 is downgradient from the other two bores this which may explain its lower pH and higher EC as it is somewhat closer to the palaeodrainage and more saline and acidic groundwater that is often present in the upper parts of these features (Kern, 1995).

The measured dissolved metals show generally consistent results, with some metals having the elevated concentrations typical of the Kalgoorlie area due a natural abundance of mineralisation as well as the area being a long-term centre for mining.

Total Nitrogen (TN) in groundwater of the site are mildly elevated however this is typical for arid parts of Western Australia. TN (as N) varies from 2.9 to 15.7 mg/L, but this is likely occurring due to the breakdown of nitrogen fixing vegetation, a common phenomenon in the Western Australian Rangelands. Total Phosphorous (as P) varies from 0.18 to 0.3 mg/L.

5.5.2 BSF Site

The local geology and regolith profile underlying the BSF site is currently being investigated. General information on the local geology and regolith profile has therefore been included as a basis from work carried out on nearby locations. This include publicly available information from the Mining Proposal for the Kalgoorlie Clay Project being developed by Ambrose Mining on Mining Lease (M26/835), which is located approximately 1 km north of the proposed BSF. The results of geotechnical investigations carried out by Green Geotechnical (May 2020) in support of this project indicate that no groundwater was intercepted during the drilling of eighteen (18) holes to maximum depths from 62 to 105 m (average of 77 m). All drill holes bottomed in dry mudstone and only three (holes) had minor wet sections.

The detailed baseline survey for the BSF site is currently being undertaken and this section will be updated once the results of this survey are finalised.

Preliminary results from the Ramboll assessment at Yarri Road are set out below,

Table 5-9: Yarri Road BSF – Preliminary Groundwater Depths

Bore number	BH01	BH02	BH03
Depth drilled	54	72	72
Depth and length of screening	52.14 – 46.14 (6 m)	68.48 – 62.48	44.5 – 38.5
Water depth in AHD and mbgl 24 hrs after drilling	46.76 (2 hr after drilling)	25.45 (12 hrs after drilling)	27.8 (24 hrs after drilling)

Additionally, field reports are as follows:

- Groundwater is present in the bedrock (that may be at various stages of weathering), which was recovered during the drilling as a Silt (SM); low plasticity, white and pale yellow/brown, W<WP (i.e., recovered materials were dry).
- Groundwater levels have recovered slowly in the BH 24 hours after construction and seem to have settled around 25 to 30 mbgl.

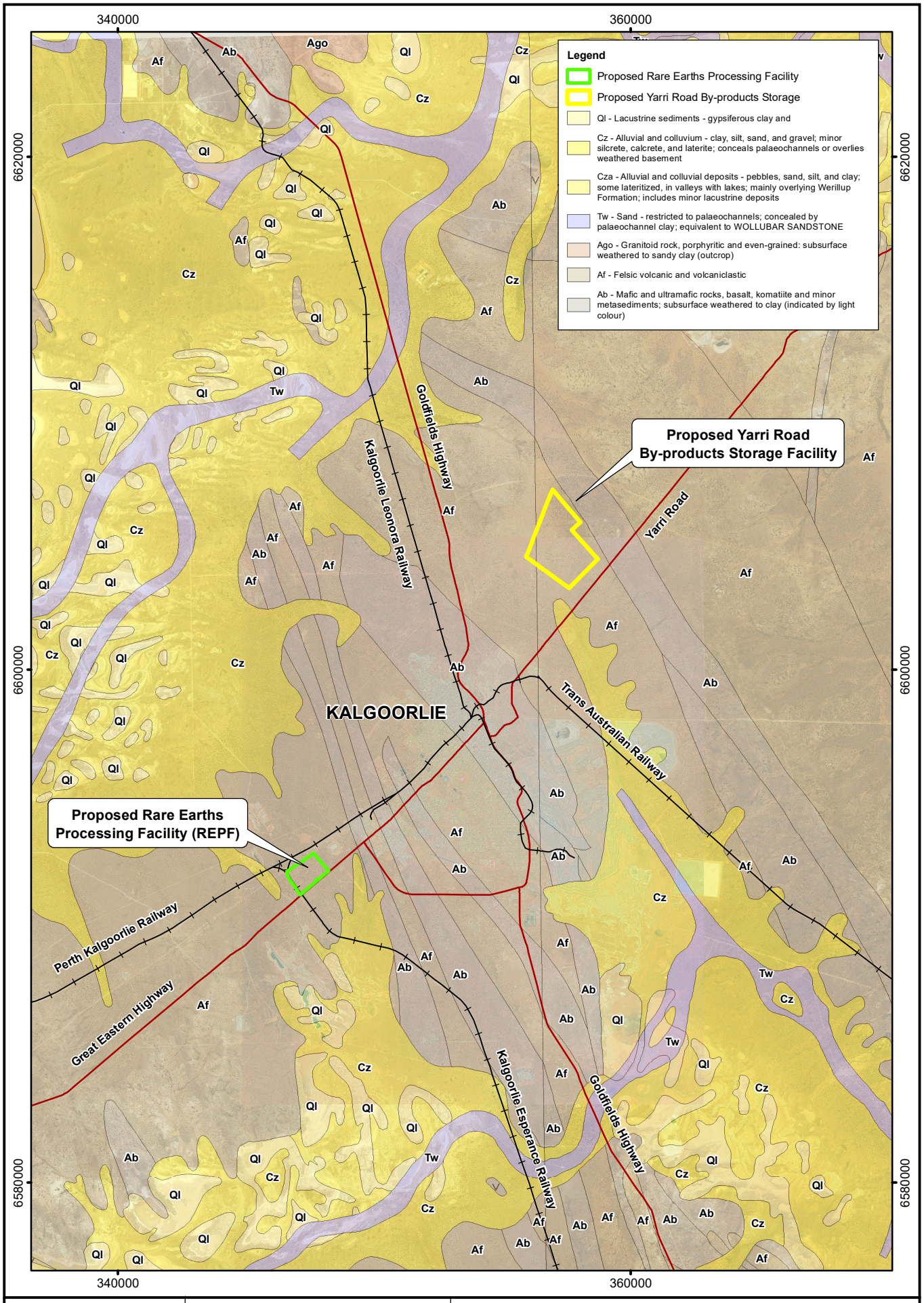
5.5.3 Implication for Mine Closure Planning

The groundwater at the REPF site occurs as a thin layer above the basement material and is saline to hypersaline hence of little to no ecological or potable value. Groundwater is flowing to the south, south-west but hydraulic gradients are low, and any contaminant travel time would be extremely long, with retardation of contaminant species likely to occur based on clay mineralogy.

Depth to groundwater is high (<35 m), whilst the overlying soils and saprolite material are clay rich and therefore will severely limit seepage rates from of any unintentional plant discharge.

The nearest ecological receptors are approximately 6.5 km downgradient which are hypersaline lakes not dependent on groundwater inflow. These environments typically have high levels of naturally occurring metals in sediment and groundwater due to the very high evapo-concentration rates.

Site-specific data on groundwater at the BSF site has been identified as an interim information gap which will be filled following completion of a baseline hydrogeological survey currently being undertaken in March/April 2021.



Imagery: © Landgate (December 2018) ~ Regional Hydrology: The Department of Water and Environmental Regulation

0 2 4 km
Scale: 1:200,000
MGA94 (Zone 51)

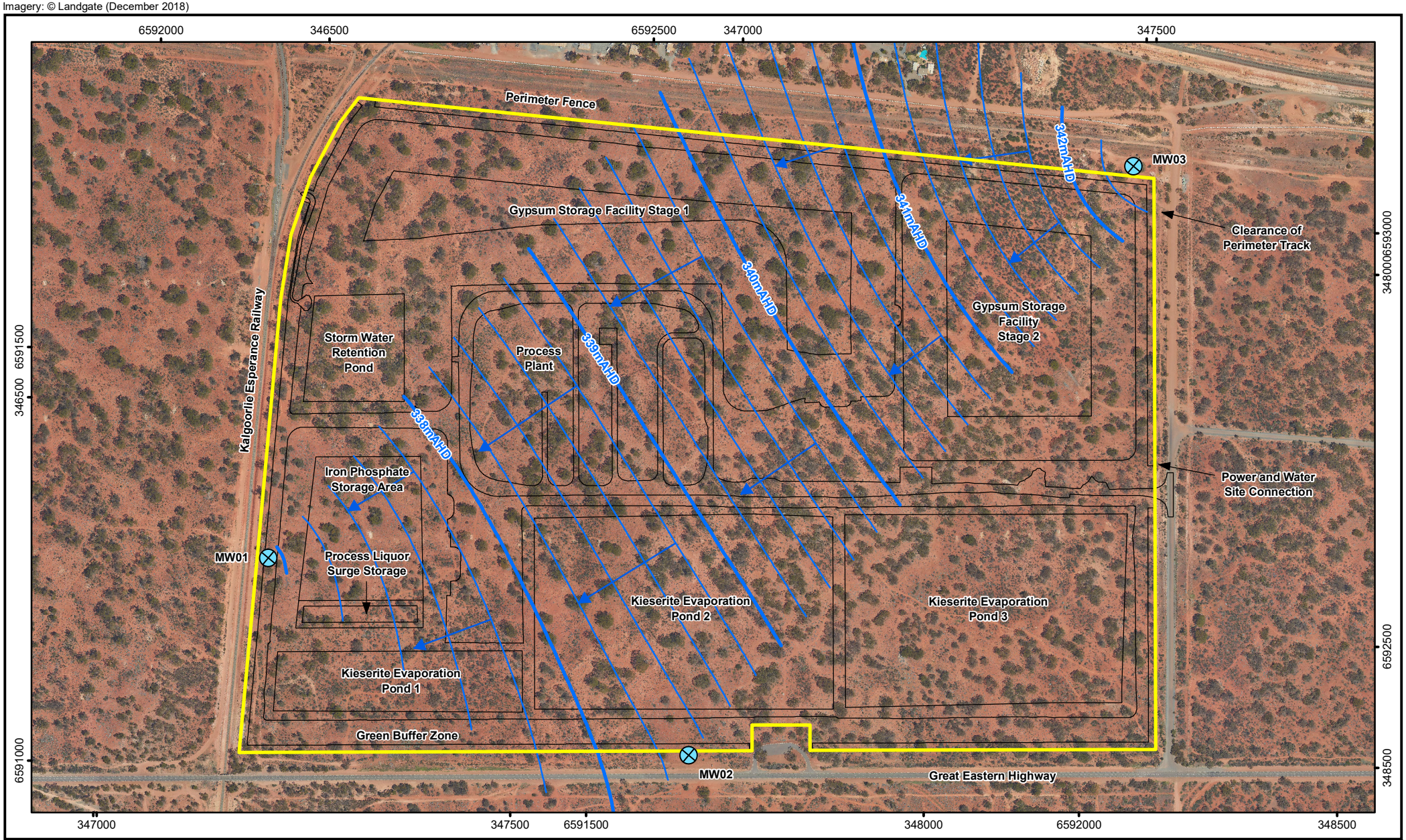
Lynas KALGOORLIE PTY LTD

CAD Ref: a2769_ERD04_31	Author: P. Jansen	Kasa Consulting Pty Ltd
Date: April 2021	Rev: A A4	Drawn: CAD Resources ~ www.cadresources.com.au

Figure 5-1

Regional Hydrology

Imagery: © Landgate (December 2018)



Legend

- Lot 500 Great Eastern Hwy, Yilkari
- Proposed Layout
- Monitoring Well
- Groundwater Flow Direction
- Groundwater Contour (0.2m)

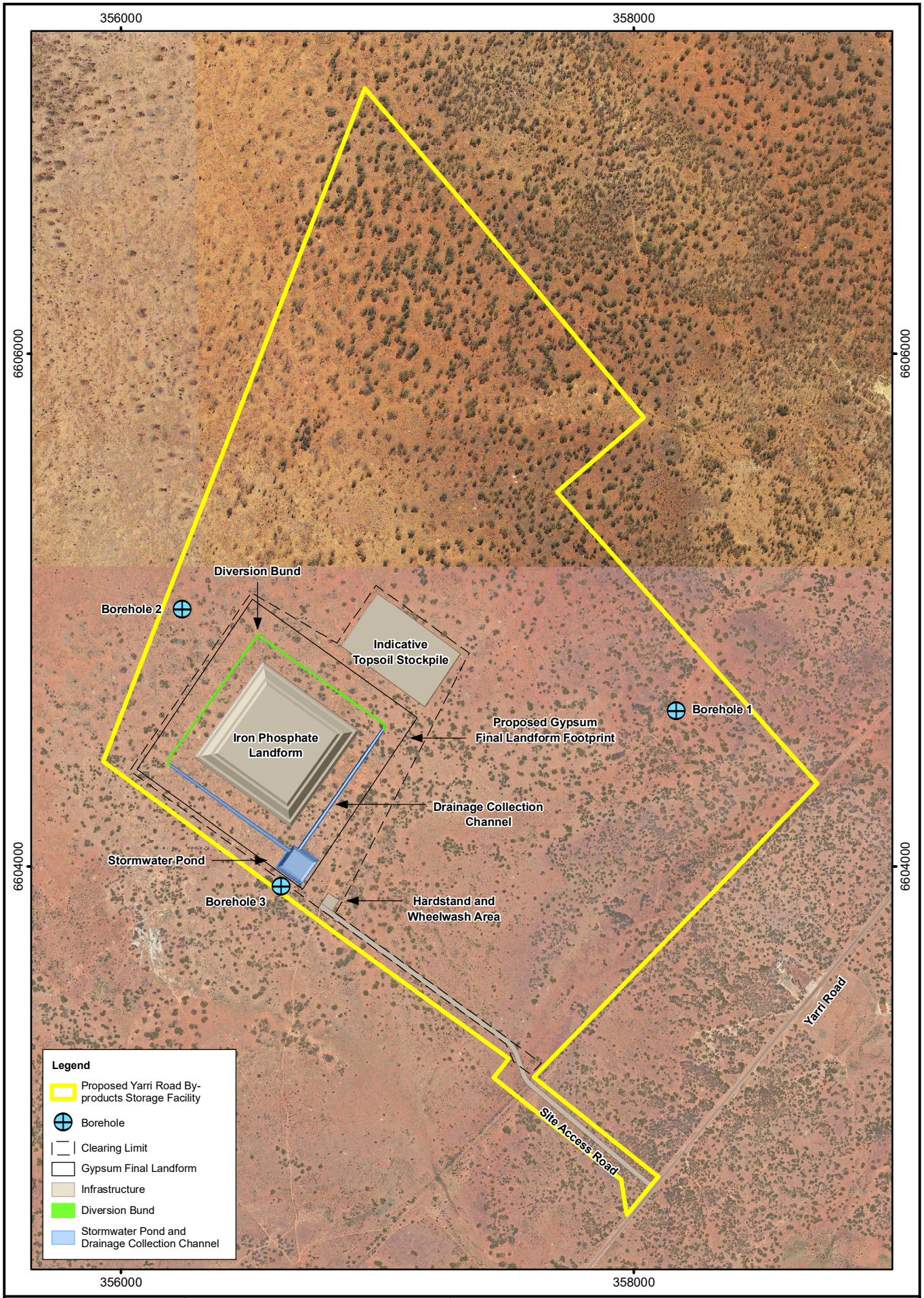
0 100 200m

Scale: 1:8,000
MGA94 (Zone 51)

Lynas Kalgoorlie Pty Ltd

CAD Ref: a2769_ERD04_12	Author: P. Jansen	Kasa Consulting Pty Ltd
Date: March 2021	Rev: A	A4
	Drawn: CAD Resources ~ www.cadresources.com.au	

Figure 5-2
Lot 500 - Groundwater Monitoring Wells and Inferred Flow Direction



Imagery: © Landgate (December 2018)

0 200 400m

Scale: 1:20,000
MGA94 (Zone 51)

N

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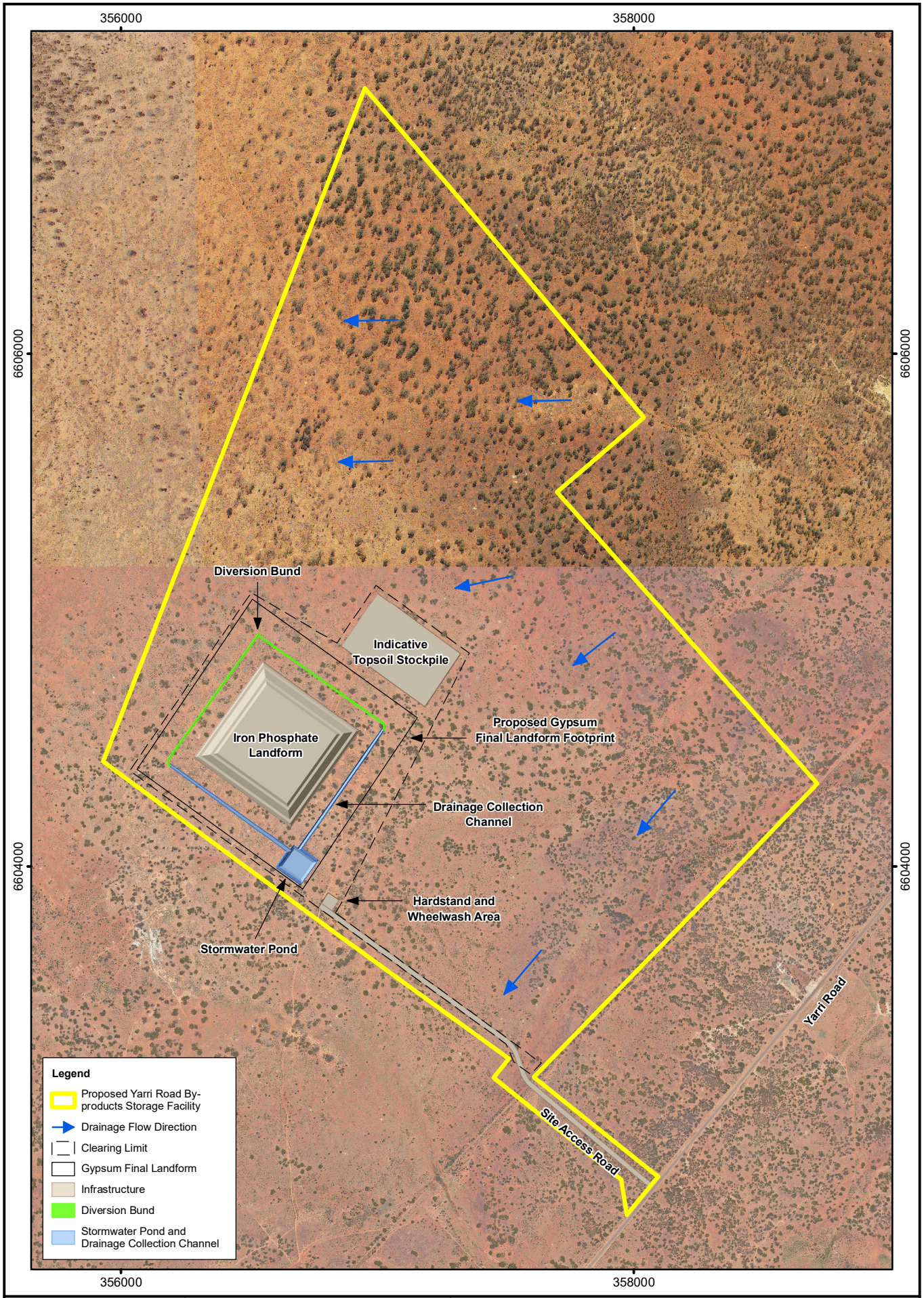
CAD Ref: a2769_ERD04_16		Author: P. Jansen	Kasa Consulting Pty Ltd
Date: May 2021	Rev: A	A4	Drawn: CAD Resources ~ www.cadresources.com.au

Figure 5-3
Yarri Road BSF - Soil and Groundwater Investigation Locations



Imagery: © Landgate (December 2018)

0 200 400m

Scale: 1:20,000
MGA94 (Zone 51)

N

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CAD Ref: a2769_ERD04_15		Author: P. Jansen	Kasa Consulting Pty Ltd
Date: May 2021	Rev: A	A4	Drawn: CAD Resources ~ www.cadresources.com.au

Figure 5-4
Yarri Road BSF
Flow Direction

5.6 Surface Hydrology

5.6.1 REPF Site

Due to the location of the REPF site completely bounded by major infrastructure with surface water diversion components owned and administered by the City of Kalgoorlie-Boulder, a detailed flood model was not considered necessary.

There are no recorded surface water bodies found on or within the vicinity of Lot 500. There are a collection of playa lakes located to the south-east, approximately 2.5 km away. No proclaimed surface water bodies are within proximity to Lot 500. No Ramsar wetlands were found to occur within 100 km of the Lot 500 on the DWER Clearing Permit System Map (DWER 2019).

5.6.2 BSF Site

No proclaimed surface water bodies or Ramsar wetlands occur in proximity to the Yarri Road site based on publicly available DWER Clearing Permit System Map (DWER, 2019). A system of playa lakes is evident some 16 km to the north west of the BSF site. White Flag Lake is the most defined hydrological feature in this system and is located to the northwest.

A surface hydrology assessment was carried out by Soilwater Consultants (January 2021)) for the proposed BSF site. The assessment determined surface flow directions, delineated water catchment areas, and provided a first pass estimate of likely flood extent, depth and flows for rare flood events up to a 1% AEP storm event.

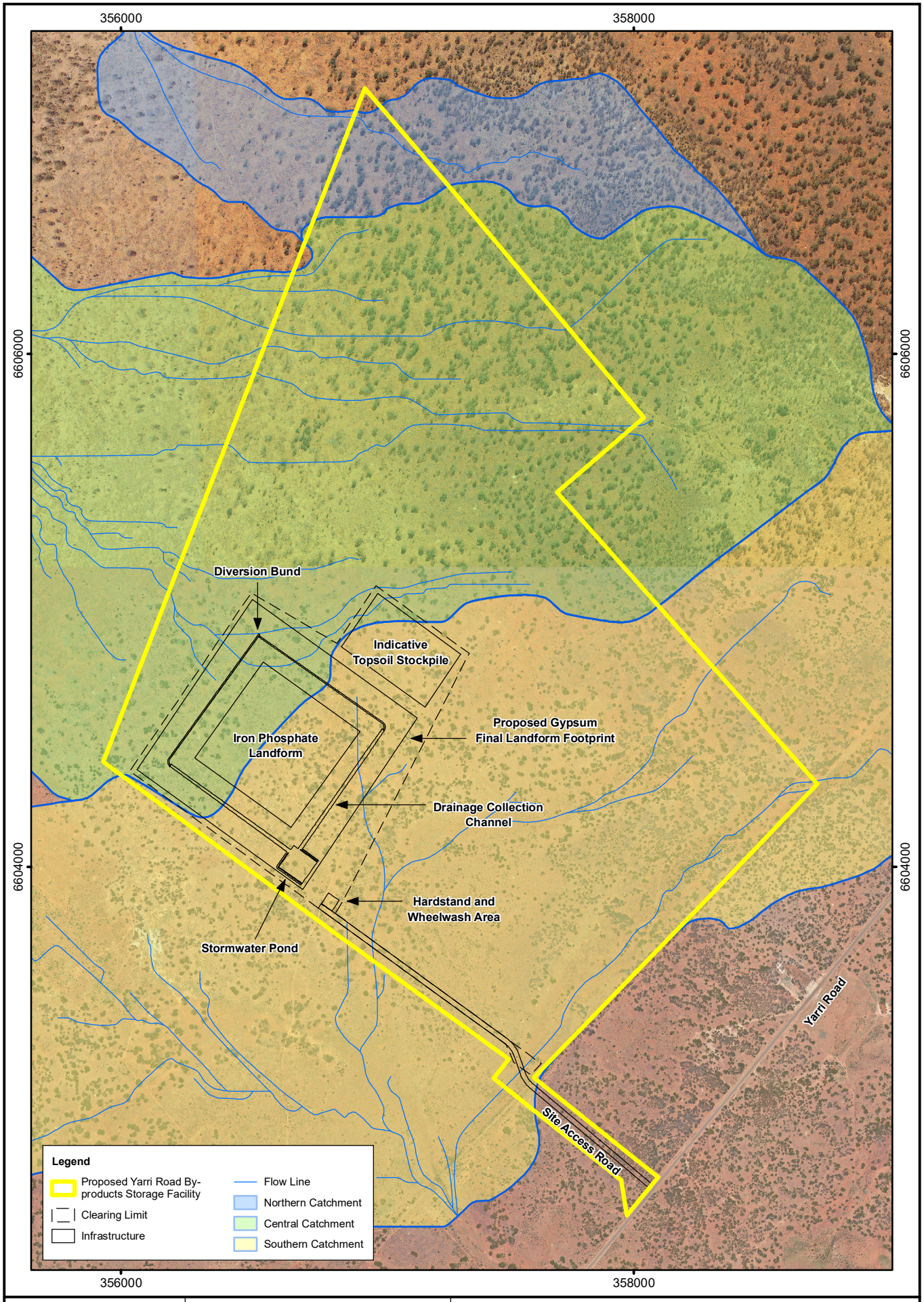
The drainage morphology and associated hydrological responses across the project area are characterised by ephemeral stream, creek and drainage networks consisting of a gently undulating plains with scattered break-away features and ill-defined streamlines. Two linear features cut through the area which impacts the surface drainage morphology; Yarri Road and a raised earth bund which was formerly a rail line approximately 1.5 m in height.

The modelled local surface water drainage paths and catchments are shown in Figure 5-5. The study determined that surface water flow volumes would be severely limited due to the position of the BSF site on the boundary of the regional catchments of Raeside-Ponton Salt Lake basin and the Lake Lefroy Salt Lake basin, inherently limiting the upstream catchment area and hence potential surface flows impacting the site.

5.6.3 Implications for Mine Closure Planning

Due to the location of both the REPF, which is located within an area with already developed surface water infrastructure, and BSF, which is located on a topographic high with severely limited upstream catchment, the scale of surface water flows impacting either site will be small, limiting the size and scale of surface water infrastructure and any downstream impacts which may occur.

Additional surface water control infrastructure will be required to manage surface water at the BSF site; these will require management and/or removal to facilitate closure of the site.



0 200 400m

Scale: 1:20,000
MGA94 (Zone 51)

Lynas KALGOORLIE PTY LTD

CAD Ref: a2769_ERD04_14	Author: P. Jansen	Kasa Consulting Pty Ltd
Date: May 2021	Rev: A A4	Drawn: CAD Resources ~ www.cadresources.com.au

Figure 5-5
Yarri Road BSF
Drainage Catchments

Imagery: © Landgate (December 2018) ~ Hydrology: SoilWater Group

5.7 By-Products Material Characterisation

Two by-products will be produced from the REPF, an IP material and a gypsum material. Information on these two products is summarised here.

5.7.1 Iron Phosphate

The IP material is a mixture of IP, iron hydroxide, aluminium hydroxide, and other minor components. It is like a rock phosphate in composition and includes all of the components that do not dissolve during leaching, as well as the components removed during refining of the RE sulphate solution. It is also the by-product that the radioactivity reports to.

5.7.2 Gypsum

The gypsum is produced during water treatment essential for the water recycling inherent to the processing. Lime is added to wastewater to (i) neutralise acid and (ii) reduce total dissolved solids (TDS) by precipitating manganese, magnesium and sulphate. This reduction in total dissolved solids allows for a 75% water recovery during reverse osmosis, and is critical to the viability of the flowsheet in water scarce Kalgoorlie.

5.7.3 Physical Characteristics

The measured physical properties of the material produced via the same processing method in Malaysia are summarised in Table 5-10.

Table 5-10: Physical Properties of the By-product Materials

Property	Unit	Gypsum	IP
Particle Size Distribution			
Sand (2 – 0.02 µm)	%	0	0
Silt (0.02 – 0.002 µm)	%	60	65
Clay (<0.002 µm)	%	40	35
d50	µm	6-10	6-9
Bulk Density			
Wet	t/m^3	1.55	1.45
Dry	t/m^3	0.74	0.65
Upper Plastic Limit (liquid limit)	%	105	103
Lower Plastic Limit	%	48.3	48
Shrinkage Limit	%	33	45
Particle Density	t/m^3	2.3	2.2
Ksat	m/day	0.005	0.005
Total Porosity	% v/v	55	52
Field Capacity	% v/v	50	48
Air-Filled Porosity	% v/v	5	4
Air-Entry Potential	cm	71.4	62.5

The Atterberg limits are included for IP as it is essentially 'dry stacked'. The lower plastic limit is the point at which the material becomes friable. The discharge moisture content from the filters tends to be within +/-4% of this figure, from 7 years of operational experience in Malaysia. The upper plastic limit (the point at which the material becomes fluid, PL) is over double the placed moisture content. The material stacks well and forms a stable structure.

5.7.4 Chemical Characteristics

The dominant oxides present within the two by-product materials are summarised in Table 5-11. Also included is the measured average radioactivity in Becquerel's per gram (Bq/g).

Table 5-11: Chemical and Radiological Properties of the By-product Materials

Composition (reported as oxide)	By-product	
	Gypsum	Iron Phosphate
Al_2O_3	<0.1	4
CaO (%)	31	3
Fe_2O_3 (%)	<0.1	30
MgO (%)	11	2
Na_2O (%)	<1	<0.1
REO (%)	<0.5	4
SiO_2 (%)	<0.1	3
SO_3 (%)	36	12
Carbonate (%)	<1	0
Phosphate (%)	<0.1	22-25
Water of hydration (%)	21	20
Activity (Bq/g)	<<0.5 (non-radioactive)	5-7

The gypsum by-product is a high magnesium containing gypsum. It is very similar in composition to much naturally occurring gypsum, and similar in composition to Ground Magnesium Limestone, which is used as a soil ameliorant in SE Asia.

The IP is like naturally occurring rock phosphates, and like many naturally occurring rock phosphates, contains some radioactivity; the assessed level against IAEA guidelines is very low level waste, suitable for landfill disposal. The radioactivity level (5-7 Bq/g) is like final product zircons (3-6 Bq/g) manufactured in Australia, and an order of magnitude lower than monazite exported from Australia. The radioactivity level sits below the level required for placards for transportation in Australia and for International Shipping.

5.7.5 Leaching Characteristics

Extensive testing has been conducted in Australia and in Malaysia on the IP and gypsum products. A report by Golder Associates (2014) found the magnesium rich gypsum contributed:

- Negligible human health risk,
- Negligible risk to aquatic ecosystems,
- Negligible risk to terrestrial ecosystems.

More extensive testing has been done on both the IP and gypsum by-products in Malaysia by ERA Laboratory to determine:

- Leachability of inorganic and organic compounds (TCLP – Toxicity Characteristic Leaching Procedure, as per USEPA guidelines),
- Total Threshold Limit Concentrations (TTLC).

The intent of the leachate procedures is to simulate the conditions that may be present in storage facility and determine what proportion of the material available to be leached and potentially transported.

The Toxicity Characteristic Leaching Procedure determines the soluble portion of the analytes and is the preferred testing methodology under USEPA guidelines. The alkalinity of the sample must first be determined to know which of two different extraction fluids should be used. Samples with a low alkalinity use extraction fluid #1 which is a sodium acetate solution with a pH of 4.93. Samples with a high alkalinity use extraction fluid #2 which is a dilute acetic acid solution with pH of 2.8. The sample is then tumbled in the appropriate extraction fluid for 18 hours.

The Total Threshold Limit Concentration is a California state test that is an additional leach procedure that exceeds the USEPA guidelines.

The third-party testing using TCLP and TTLC standards has shown that leaching of inorganic and organic materials from both the IP and the Gypsum falls well within Malaysian DOE guidelines for the management of scheduled waste.

5.7.6 Seepage Assessment

A seepage assessment for both the REPF and BSF sites was conducted by Soilwater Consultants (March 2021). The assessment used standard un-saturated zone modelling techniques to determine the potential risk of seepage from the REPF storage cells and the permanent BSF reaching the underlying groundwater and potentially impacting on groundwater quality and surrounding receptors.

The seepage modelling was undertaken using HYDRUS 2D/3D which explicitly solves the Richards' Equation, whereby the permeability of the soil / material is dependent on its moisture content or matric suction. In contrast, seepage models that rely on Darcy's Equation do not vary permeability based on soil matric suction. The set-up of the two different models is illustrated in Insert 5-4.

The modelling determined the predicted seepage which was likely to occur through the estimated 35 m deep unsaturated zone profile beneath Lot 500, assuming typical rainfall and pan evaporation conditions (Table 5-12).

Table 5-12: Lot 500 – Model Results for REPF Site Storage Conditions

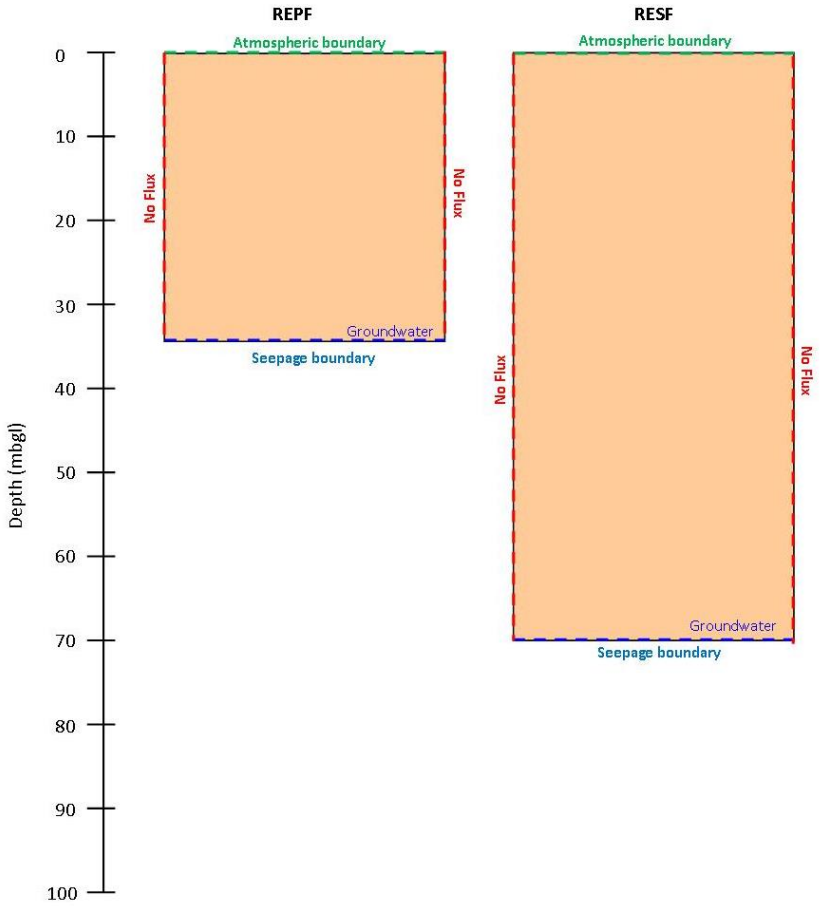
Parameter	Initial matric suction of *in-situ* regolith profile	
	Field Capacity (10 kPa)	100 kPa
Total seepage over model period (12 years)	1.12 m	0.002 m
Seepage rate	93.75 mm/yr (2.0 x 10^{-9} m/s)	0.17 mm/yr (5.39 x 10^{-12} m/s)
% of rainfall over model period (12 years)	2.78 %	0.005 %

The predicted seepage likely to occur through the deep unsaturated zone profile beneath the BSF site, assuming typical rainfall and pan evaporation conditions, is provided Table 5-13.

Table 5-13: Yarri Road BSF – Model Results for BSF

Parameter	Initial matric suction of *in-situ* regolith profile	
	Field Capacity (10 kPa)	100 kPa
Total seepage over model period (12 years)	0.41 m	0.001
Seepage rate	33.54 mm/yr (1.0 x 10^{-9} m/s)	0.06 mm/yr (1.92 x 10^{-12} m/s)
% of rainfall over model period (12 years)	1.0 %	0.002 %

Insert 5-4: Unsaturated Zone Model Setup[1]



5.7.7 Implication for Mine Closure

Both the gypsum and IP materials exhibit extremely fine particle size ranges, which makes them susceptible to erosion by both water and wind. Therefore, the closure of the proposed above ground facilities which will be built to permanently store these two by-products will need to provide adequate cover systems which do not allow for the exposure of either product to wind / water erosion forces.

Whilst the gypsum by-product is relatively inert, the IP material is considered slightly radioactive, with a measured average activity level of between 5 – 7 Bq/g. Therefore, management and monitoring of the IP material will be required to ensure that the minor radioactivity is not transported away from the designated storage facilities through dust or groundwater seepage.

[1] Preliminary hydrogeological investigations at the BSF site indicate that groundwater lies approximately 28 mbgl, however this is not considered to alter the seepage assessment conclusions above.

5.8 Flora & Vegetation Communities

5.8.1 REPF Site

Desktop assessments of the Lot 500 Proposal area, Targeted Surveys and a Detailed Survey, as defined in Sections 4.2 and 4.3 of the Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016), have been undertaken to gain an understanding of the flora and vegetation composition of Lot 500.

In addition to terrestrial surveys completed specifically to support this Proposal, the flora and vegetation composition for the Proposal area and surrounds are well understood as a result of surveys that have been conducted for a previous proposal for Lot 500. Flora and vegetation studies relevant to Lot 500 are provided in Table 5-14.

Table 5-14: Flora and Vegetation Studies of Lot 500

Flora Study	Details
Native Vegetation Solutions, (2018). Reconnaissance Flora and Vegetation Survey of Lot 500 Great Eastern Highway Kalgoorlie	Commissioned by the CKB for the Neometals Lithium Hydroxide Plant.
Onshore Environmental, (February 2020) Detailed Flora and Vegetation Survey for Lot 350 and Lot 500, Great Eastern Highway, Yilkari	Commissioned by KASA Consulting for the Lynas REPF.

5.8.1.1 Broad Vegetation Groups on Lot 500

The vegetation type within Lot 500 can be generally defined as an ‘open eucalypt woodland with a mixed understory of scattered shrubs and chenopods’ (Native Vegetation Solutions, 2018). More specifically, Native Vegetation Solutions (2018), grouped vegetation on Lot 500 into six distinct vegetation groups, a summary of these can be seen in Table 5-15 and Figure 5-6.

Table 5-15: Flora and Vegetation Groups on Lot 500

Vegetation Group	Hectares (ha)	Percentage of Survey Area (%)
Eucalyptus griffithsii over sclerophyll shrubland	5.66	3.86%
Eucalyptus oleosa and *Eucalyptus lesouefii* over *Maireana sedifolia* and mixed shrubland	43.15	29.43%
Eucalyptus salmonophloia and *Eucalyptus transcontinentalis* open woodland	84.79	57.83%
Eucalyptus yilgarnensis over sclerophyll shrubland	6.21	4.24%
Sclerophyll shrubland	2.11	1.44%
Acacia acuminate thicket	4.70	3.20%

The most recent flora and vegetation survey (Onshore Environmental, February 2020) was completed in November 2019. The key outcomes of this survey are summarised below.

5.8.1.2 Taxa

A total number of 118 plant taxa from 27 families and 58 genera was recorded from the study area. Species representation was greatest among the Chenopodiaceae, Poaceae, Scrophulariaceae, Fabaceae, Myrtaceae and Asteraceae families. The most speciose genus was *Eremophila* (13 taxa), followed by *Eucalyptus* (10 taxa), *Maireana* (10 taxa), *Acacia* (7 taxa), *Atriplex* (4 taxa) and *Sclerolaena* (4 taxa).

None of the plant taxa recorded from the Lot 500 study area were gazetted as Threatened Flora pursuant to the BC Act or listed under the EPBC Act.

5.8.1.3 Introduced Species

Ten introduced species were recorded by Onshore Environmental Consultants (Onshore Environmental) in November 2019. An additional two weed species were recorded during the previous reconnaissance flora and vegetation survey of Lot 500 in June 2018 (Native Vegetation Solutions, 2018). None of the 12 introduced species recorded from the study area are listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act 2007).

5.8.1.4 Vegetation Associations

A total of ten vegetation associations classified as seven broad floristic formations and occurring on five broad landforms were described and mapped from the study area.

None of the vegetation associations were aligned with any federal or state listed Threatened Ecological Communities (TECs), or state listed Priority Ecological Communities (PECs) documented from the Coolgardie bioregion.

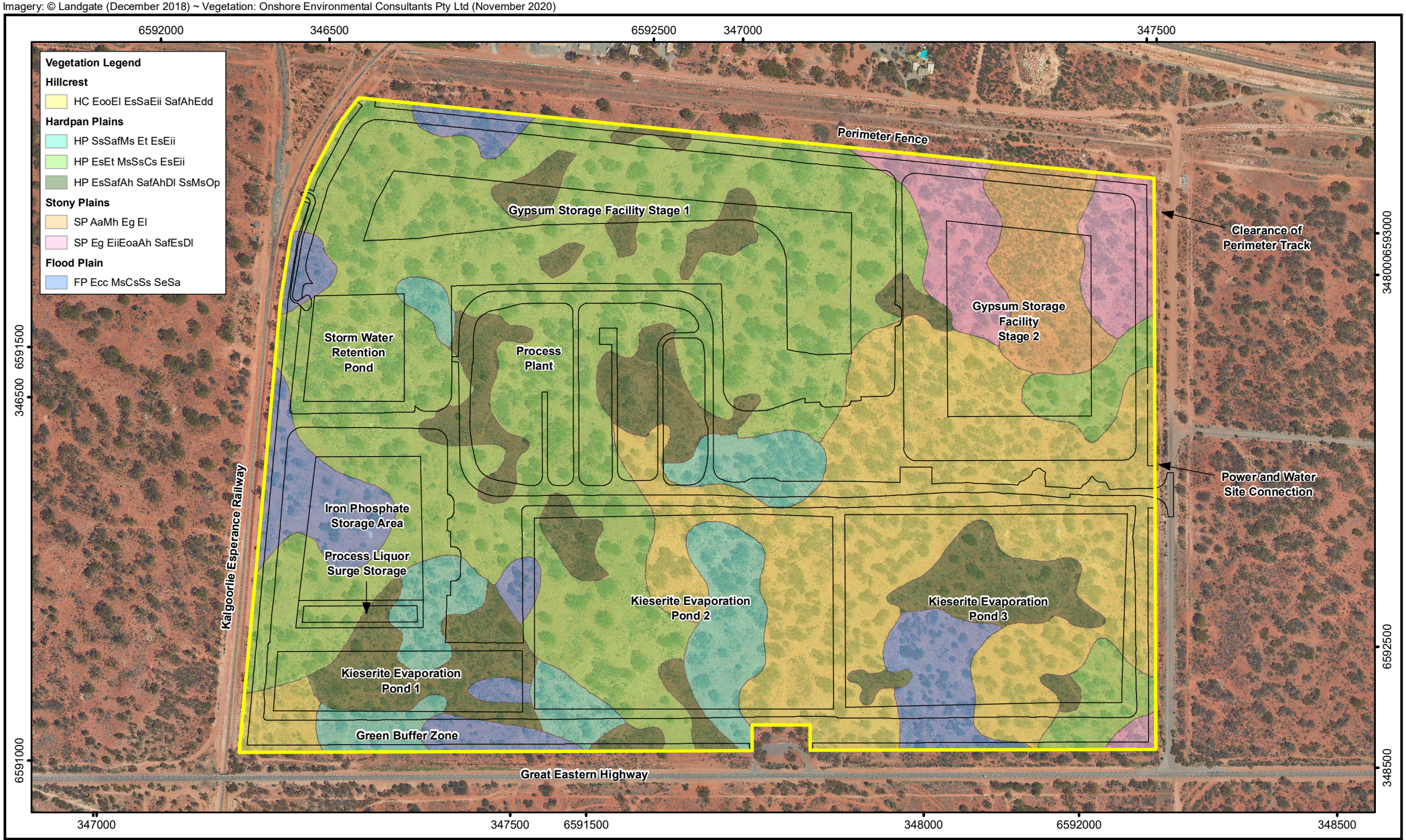
5.8.1.5 Vegetation Representation

Vegetation within the study area was determined to be well represented at all levels (state-wide, bioregional [IBRA region and IBRA sub-region] and local), with greater than 96.2% of the pre-European extent remaining for the one Beard (1978) vegetation association represented. The proportion of the same vegetation association occurring within secure (Class I-IV) reserves ranged from 8.1% to 11.3% at the state level, bioregional and local levels, which is under the 15% minimum standard. However, given that the proposed development will not significantly reduce the pre-European extent of the Beard (1978) vegetation association represented (i.e., it will remain well above the 30% threshold within the bioregion), the reservation status is determined to be of least concern for biodiversity conservation.

5.8.1.6 Vegetation Condition

Vegetation condition in the study area (Lot 350 and Lot 500) ranged from *very good* to *degraded* with disturbances including roads and access tracks, historic ground disturbance activities, rubbish dumping, mine exploration, sandalwood cutting, timber cutting, historical revegetation, grazing by rabbits, motorbike tracks and unauthorised camping activities. Vegetation condition across the largest proportion of the study area was rated as *very good* (317 ha or 91% of the study area), with minor pockets rated as *good* (15 ha or 4%), *poor* (3 ha or <1%) and *degraded* (13 ha or 4%) typically occurring adjacent to roads and access tracks on Lot 350, refer Figure 5-7.

Imagery: © Landgate (December 2018) ~ Vegetation: Onshore Environmental Consultants Pty Ltd (November 2020)



Legend

- Lot 500 Great Eastern Hwy, Yilkari
- Proposed Layout

0 100 200m

Scale: 1:8,000
MGA94 (Zone 51)

CAD Ref: a2769_ERD04_06		Author: P. Jansen	Kasa Consulting Pty Ltd
Date: March 2021	Rev: A	A4	Drawn: CAD Resources ~ www.cadresources.com.au

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Figure 5-6
Lot 500 - Detailed Flora and Vegetation Survey

Vegetation: Onshore Environmental Consultants Pty Ltd (November 2020)

Vegetation Legend

Hillcrest

HC EooEl EsSaEii SafAhEdd	Open Tree Mallee of Eucalyptus oleosa subsp. oleosa and Eucalyptus lesouefii (sometimes with Eucalyptus griffithsii and/or Eucalyptus ravida) over Open Scrub of Eremophila scoparia, Santalum acuminatum and Eremophila interstans subsp. interstans over Open Low Scrub A of Senna artemisioides subsp. filifolia, Acacia hemiteles and Eremophila decipiens subsp. decipiens over Open Dwarf Scrub C of Scaevola spinescens, Halgania andromedifolia and Maireana sedifolia over Open Dwarf Scrub D of Olearia muelleri, Eremophila parvifolia subsp. auricampa and Westringia rigida (Ptilotus obovatus, Atriplex vesicaria) on brown loamy sands on undulating low hills

Hardpan Plains

HP SsSafMs Et EsEii	Dwarf Scrub C of Scaevola spinescens, Senna artemisioides subsp. filifolia and Maireana sedifolia with Open Woodland of Eucalyptus transcontinentalis (Eucalyptus salmonophloia) over Open Scrub of Eremophila scoparia and Eremophila interstans subsp. interstans over Open Low Scrub A of Senna artemisioides subsp. filifolia, Acacia hemiteles and Eremophila scoparia over Open Dwarf Scrub D of Olearia muelleri, Atriplex vesicaria and Scaevola spinescens on orange sandy loam on hardpan plains
HP EsEt MsSsCs EsEii	Woodland of Eucalyptus salmonophloia (Eucalyptus transcontinentalis) over Dwarf Scrub C of Maireana sedifolia, Scaevola spinescens and Cratystylis subspinescens (Cratystylis conocephala) with Open Scrub of Eremophila scoparia and Eremophila interstans subsp. interstans over Open Low Scrub A of Senna artemisioides subsp. filifolia and Eremophila scoparia over Open Dwarf Scrub D of Atriplex vesicaria, Maireana triptera, Sclerolaena diacantha and Olearia muelleri on orange sandy clay loam on hardpan plains
HP EsSafAh SafAhDl SsMsOp	Scrub of Eremophila scoparia, Senna artemisioides subsp. filifolia and Acacia hemiteles over Low Scrub A of Senna artemisioides subsp. filifolia, Acacia hemiteles and Dodonaea lobulata over Dwarf Scrub C of Scaevola spinescens, Maireana sedifolia and Olearia pimelioides over Open Dwarf Scrub D of Ptilotus obovatus, Scaevola spinescens and Eremophila decipiens subsp. decipiens on brown sandy loam on hardpan plains

Stony Plains

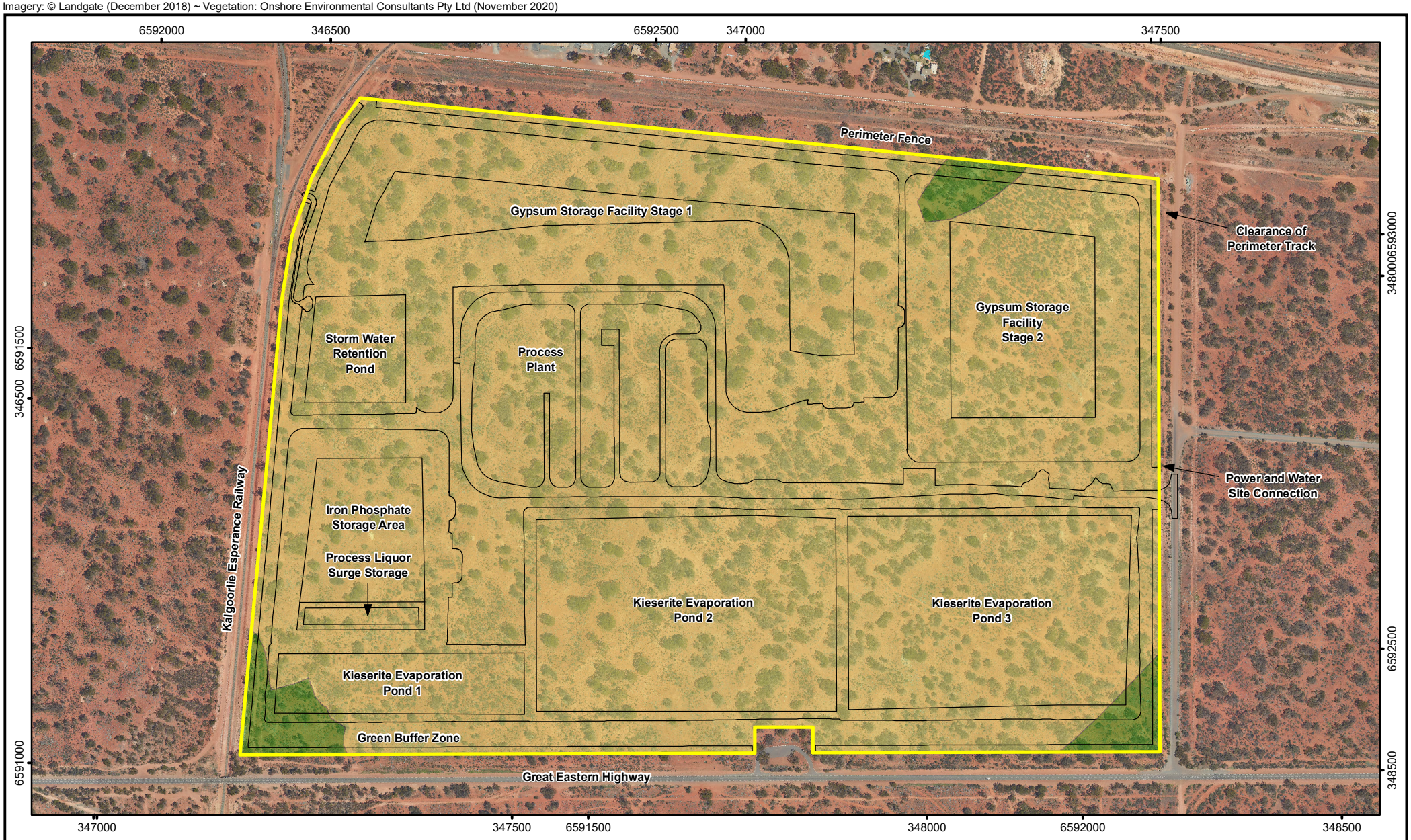
SP AaMh Eg El	Thicket of Acacia acuminata and Melaleuca hamata over Low Scrub A of Eremophila granitica with Scattered Shrub Mallee of Eucalyptus longissima and Scattered Herbs of Cheilanthes sieberi on orange brown silty loam on stony
SP Eg EiiEoaAh SafEsDl	Open Tree Mallee of Eucalyptus griffithsii over Scrub of Eremophila interstans subsp. interstans, Eremophila oldfieldii subsp. angustifolia and Acacia hemiteles over Low Scrub A of Senna artemisioides subsp. filifolia, Eremophila scoparia and Dodonaea lobulata over Open Dwarf Scrub C of Scaevola spinescens and Maireana sedifolia over Open Dwarf Scrub D of Olearia muelleri, Ptilotus obovatus and Westringia rigida on orange loamy sands on sandy / stony plains

Flood Plain

FP Ecc MsCsSs SeSa	Open Shrub Mallee of Eucalyptus celastroides subsp. celastroides (with Scattered Trees of Eucalyptus salmonophloia, Eucalyptus transcontinentalis and Eucalyptus ravida) over Dwarf Scrub C of Maireana sedifolia, Cratystylis subspinescens and Scaevola spinescens (Halgania andromedifolia) with Open Scrub of Eremophila scoparia and Santalum acuminatum over Open Low Scrub A of Eremophila scoparia and Senna artemisioides subsp. filifolia over Open Dwarf Scrub D of Ptilotus obovatus, Olearia muelleri and Atriplex vesicaria on red sandy clay loams on drainage areas and floodplains

		Lynas KALGOORLIE PTY LTD	**Figure 5-6a** **Lot 500 - Detailed Flora and Vegetation Survey Legend**
	Ref: a2769_ERD04_06_Legend	Author: P. Jansen	Kasa Consulting Pty Ltd
	Date: March 2021 Rev: A A4	Drawn: CAD Resources ~ www.cadresources.com.au	

Imagery: © Landgate (December 2018) ~ Vegetation: Onshore Environmental Consultants Pty Ltd (November 2020)



Legend

- Lot 500 Great Eastern Hwy, Yilkari
- Proposed Layout
- Very Good Condition
- Good Condition

0 100 200m

Scale: 1:8,000
MGA94 (Zone 51)

CAD Ref: a2769_ERD04_07		Author: P. Jansen	Kasa Consulting Pty Ltd
Date: March 2021	Rev: A	A4	Drawn: CAD Resources ~ www.cadresources.com.au

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Figure 5-7
Lot 500
Vegetation Condition Mapping

5.8.2 BSF Site

Lynas commissioned Onshore Environmental (April 2021) to undertake a detailed flora and vegetation survey of the 535 ha Yarri Road Site and the 8 ha Miscellaneous Licence area required for the site access corridor. A two-season detailed flora and vegetation survey was completed by Onshore Environmental personnel. The first season survey was completed under fair seasonal conditions between 12 and 18 June 2020. A second season survey was completed under poor seasonal conditions between 27 October and 2 November 2020. An additional phase of survey work was undertaken in March 2021 following significant summer rainfall during February 2021. The additional phase of survey work included reassessment of the 48 permanent quadrats and targeted searches for annual and ephemeral plant taxa.

Table 5-16: Flora and Vegetation Studies of BSF Site

Flora Study	Details
Onshore Environmental (December 2020), Detailed Flora and Vegetation Survey for By-product Storage Site	Commissioned by Lynas for the Lynas REPF.
Onshore Environmental (March 2021), Targeted Flora and Vegetation Survey for By-product Storage Site.	Report pending

5.8.2.1 Broad Vegetation Groups at BSF Site

Onshore Environmental grouped vegetation at the BSF site into 12 distinct vegetation types, classified as nine broad floristic formations and occurring on two landform features were described and mapped from the study area.

5.8.2.2 Taxa

A total of 160 plant taxa from 37 families and 91 genera were recorded from the study area. Species representation was greatest among the Chenopodiaceae, Fabaceae, Poaceae, Scrophulariaceae and Asteraceae families. The most speciose genera were Eremophila (15 taxa), Maireana (ten taxa), Acacia (nine taxa), Eucalyptus and Senna (both with six taxa), refer Figure 5-8.

None of the plant taxa currently identified from the study area were gazetted as Threatened Flora pursuant to the BC Act or listed under the EPBC Act. Based on the database searches completed as part of the desktop assessment, no Threatened flora species are likely to occur within the study area.

One species recorded from the study area was listed as a Priority flora taxon by the Department of Biodiversity Conservation and Attractions (DBCA); Eremophila praecox (Priority 2). Eremophila praecox was recorded as a total of seven plants from six point locations within the study area, refer Figure 5-9 below. The identified Eremophila praecox reached a maximum height of one metre and was recorded on hardpan plains (refer Insert 5-5 below).

Insert 5-5: Eremophila Praecox

The DBCA definition of Priority 2: Poorly-known species is as follows:

> *Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g., national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.*

5.8.2.3 Introduced Species

13 introduced species were recorded from the study area:

- *Carrichtera annua;
- *Carthamus lanatus;
- *Cenchrus ciliaris;
- *Citrullus amarus;
- *Cucumis myriocarpus;
- *Cuscuta cf.epithymum;
- *Erigeron bonariensis
- *Lysmachia arvensis;
- *Medicago laciniata
- *Oligocarpus calendulaceus;
- *Salvia verbenaca;
- *Stapelia sp. Indet; and
- *Sonchus oleracea.

None of these species are Declared Plants listed under the BAM Act 2007.

5.8.2.4 Vegetation Associations

A total of twelve vegetation types were described and mapped from the study area.

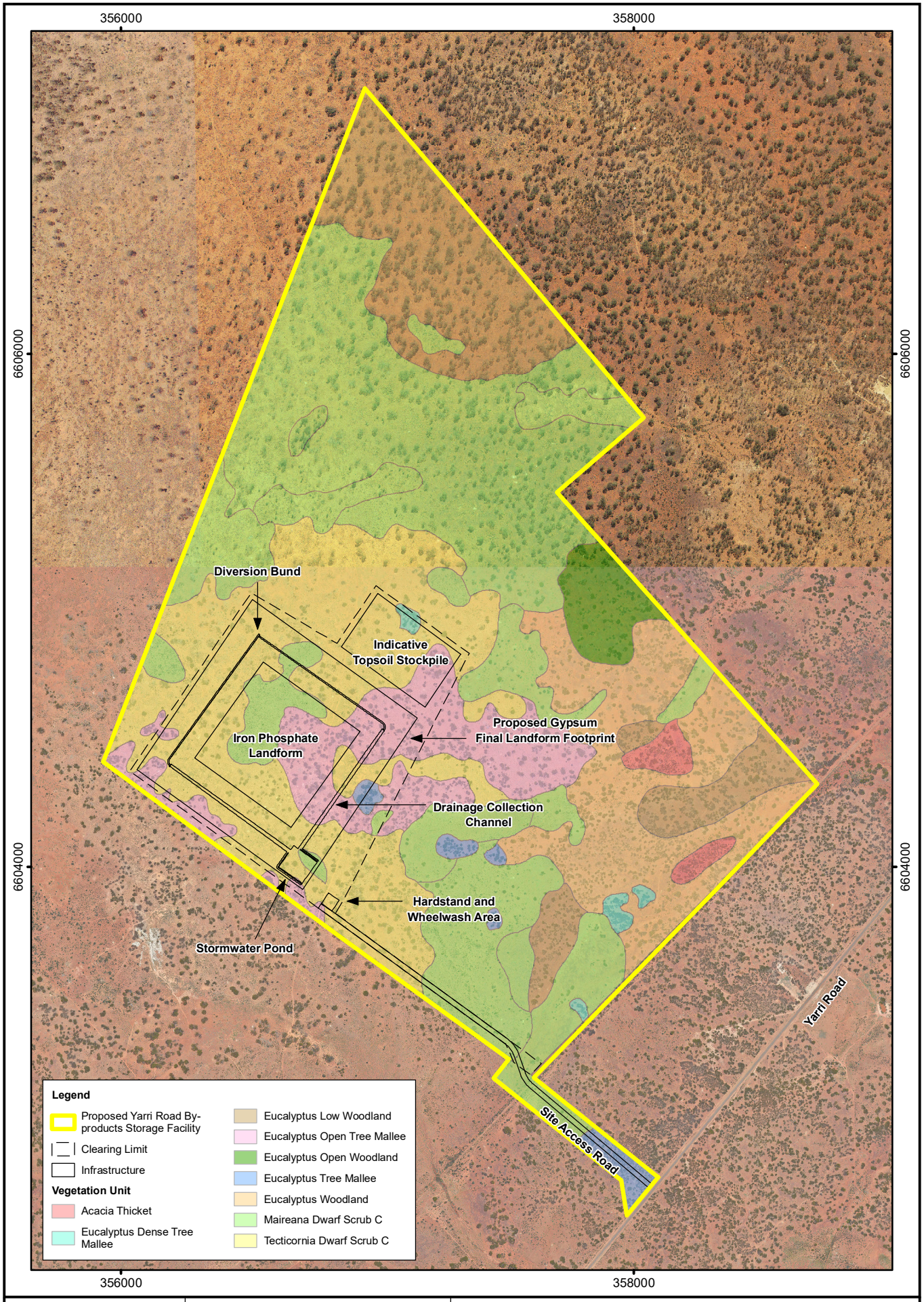
None of the vegetation types were aligned with any federal or state listed TECs or state listed PECs known to occur within the Goldfields region.

5.8.2.5 Vegetation Representation

Vegetation within the study area was determined to be well represented at all levels (state-wide, bioregional (IBRA region and IBRA sub-region) and local), with approximately 99% of the pre-European extent remaining for the two Beard (1978) vegetation associations occurring within the study area. The proportion of these vegetation associations occurring within secure (Class I-IV) reserves ranged between 3% and 14% at the state level.

5.8.2.6 Vegetation Condition

Vegetation condition was rated as being very good with disturbances including roads and access tracks, timber cutting, rubbish dumping, and mine exploration.



Imagery: © Landgate (December 2018) ~ Vegetation: Onshore Environmental Consultants Pty Ltd (June 2020)

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Scale: 1:20,000
MGA94 (Zone 51)

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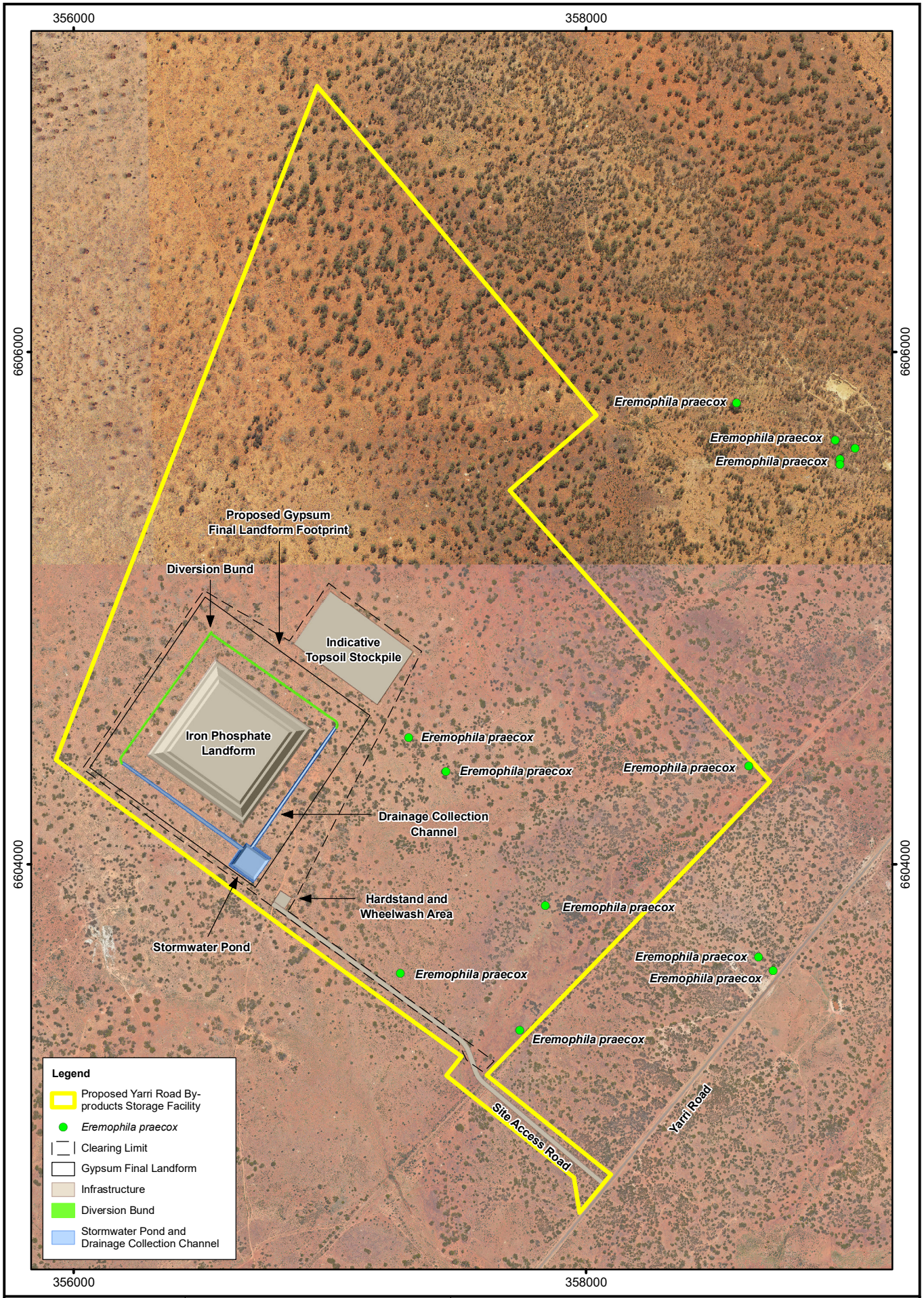
Figure 5-8
Yarri Road BSF
Detailed Flora and Vegetation Survey



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Scale: 1:20,000
MGA94 (Zone 51)

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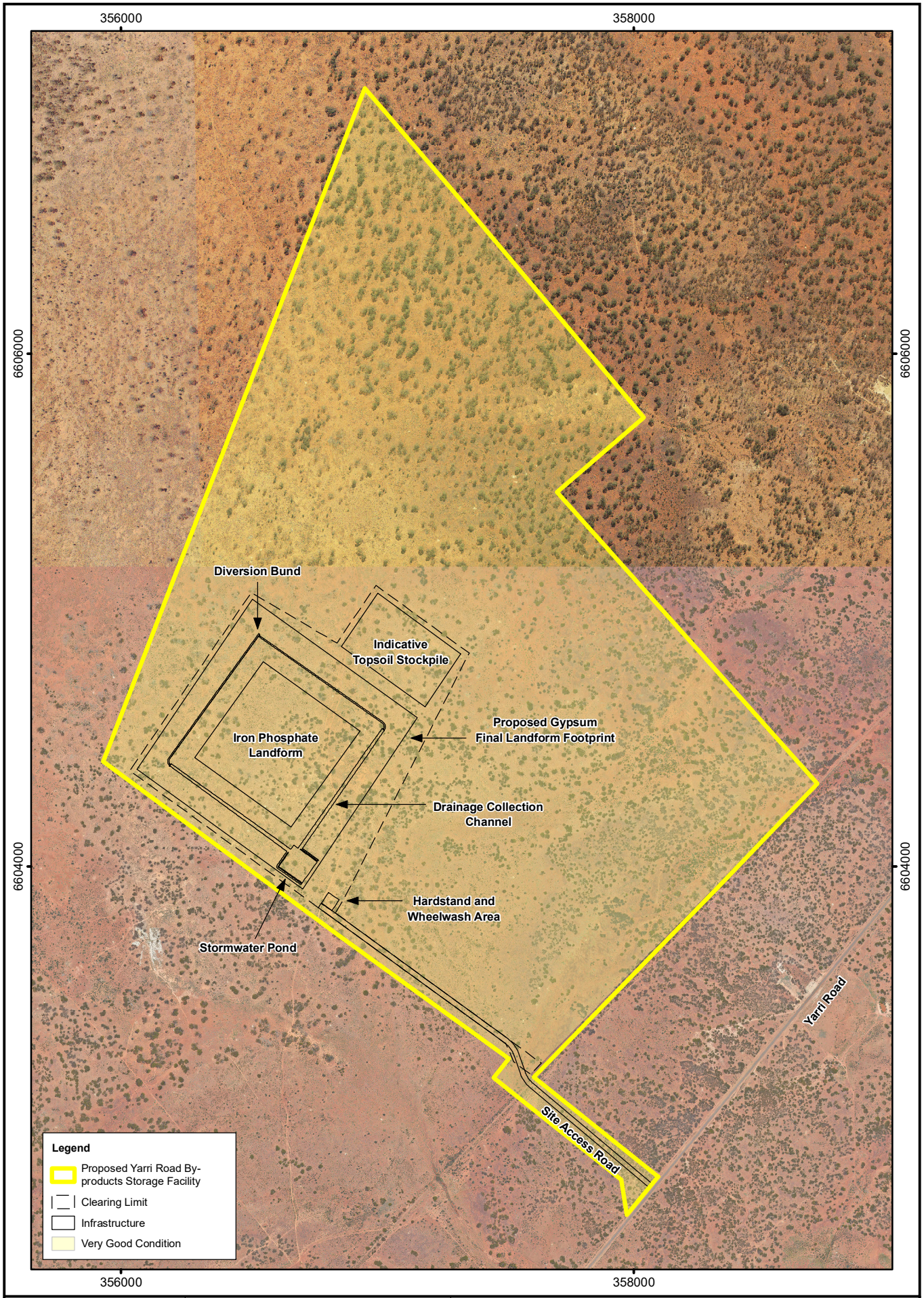
Figure 5-9
Yarri Road BSF - Distribution of Species of Conservation Significance



Imagery: © Landgate (December 2018) ~ Vegetation: Onshore Environmental Consultants Pty Ltd (June 2020)

0 200 400m

Scale: 1:20,000
MGA94 (Zone 51)

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Figure 5-10
Yarri Road BSF
Vegetation Condition Mapping

5.8.3 Implications for Mine Closure

5.8.3.1 REPF Site

A direct impact to flora and vegetation will occur from ground disturbance of approximately 120 ha. Surveys have shown that all flora and fauna species, vegetation types and habitat are well represented outside of the development envelope.

None of the plant taxa recorded from the REPF study area were gazetted as Threatened Flora pursuant to the BC Act or listed under the EPBC Act.

None of the vegetation associations were aligned with any federal or state listed Threatened Ecological Communities (TECs) or state listed Priority Ecological Communities (PECs) documented from the Coolgardie bioregion.

Impacts on vegetation from fugitive or point source emissions including particulates are not anticipated to present a significant risk at either site. Air dispersion modelling of particulates and other pollutants demonstrate that ground level concentrations of all key parameters are well below the relevant air quality assessment criteria.

5.8.3.2 BSF Site

Surveys have shown that all flora and fauna species, vegetation types and habitat are well represented outside of the development envelope, and design consideration of the BSF footprint has been made, in order to avoid impact to Priority 2 species identified at the site.

No Threatened Flora (T) gazetted under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the *Biodiversity Conservation Act 2016* (BC Act) were recorded from within the Project area.

As previously detailed, one Priority flora species, as listed by the Department of Biodiversity Conservation and Attractions (DBCA), was recorded from the Project area; *Eremophila praecox* (Figure 5-9). *Eremophila praecox* (Priority 2) is a broom shaped shrub reaching up to 3 metres high and flowering purple in October or December.

As of March 2021, over three separate surveys, *Eremophila praecox* was recorded as a total of seven plants from six spot locations within the Project area (Figure 5-9). Plants reached a maximum height of 1 metre and occurred on hardpan plains.

Eremophila praecox does not occur within the infrastructure disturbance footprint and will not be disturbed as part of project development. The nearest plants are located 60 metres to the north of the access road and 100 metres to the east of the additional clearing areas (Figure 5-9).

Additionally, *Eremophila praecox* was recorded at an additional seven locations outside the Project area by Onshore Environmental during a targeted flora survey conducted in March 2021. These locations occur between 500 metres and one kilometre northeast of the Project area. The plants occurred on stony hillslopes dominated by *Eucalyptus lesouefii* and in a drainage zone with *Eucalyptus ravida* and *Eucalyptus salubris.* Plant numbers were low with between one and three plants recorded at each location, and nine plants recorded in total. The species is considered likely to occur more widely in the general area.

The impact of the BSF on the recorded population of *Eremophila praecox* is considered to be low. Lynas has redesigned the layout of the BSF such that no plants will be directly impacted as they occur outside the infrastructure disturbance footprint and minimum 50 m buffer zone for each colony.

5.9 Terrestrial Fauna & Habitat

5.9.1 REPF Site

A Level 1 Vertebrate Fauna Risk Assessment by Terrestrial Ecosystems was undertaken at the REPF site (Terrestrial Ecosystems, 2018) to determine the degree of risk that development and clearing may have on existing wildlife. A desktop analysis of several databases was carried out to prepare a list of potential vertebrate fauna that may occur, and a one-day field survey conducted to verify the findings of the desktop.

The Terrestrial Ecosystems (2018) report found that the fauna habitat in area is open eucalypt woodland with a mixed understory of scattered shrubs and chenopods. There are variations in the densities of trees, shrubs and ground cover, but these differences are not enough to support a significantly different vertebrate fauna assemblage. Much of the area is in reasonable condition, however, there is evidence of well used tracks through the area, prior ground disturbance and rubbish has been dumped in some areas.

A peer review of the Level 1 Vertebrate Fauna Risk Assessment was conducted by Onshore Environmental. The review concluded the following (Onshore Environmental, 2020):

- The previous vertebrate fauna report by Terrestrial Ecosystems (2018) assessed all the relevant conservation significant fauna species for the Lot 500 area located at Lot 500 Great Eastern Highway, Yilkari.
- A review of the current assessment guideline for EPBC Act referrals, as well as taxonomic and conservation status changes to potentially occurring fauna showed no alterations that would alter the findings of the initial report.

5.9.2 BSF Site

Lynas also commissioned Onshore Environmental Consultants Pty Ltd (Onshore Environmental) to undertake a detailed fauna survey of the 535 ha site. The detailed fauna survey was completed by personnel from Onshore Environmental between the 4 and 12 of September 2020.

The desktop study identified a total of 283 vertebrate fauna as potentially occurring within or surrounding the study area, including 5 amphibians, 173 birds, 36 mammals and 69 reptiles.

A total of 71 fauna species were identified during the field survey including 45 birds, 16 reptiles and 10 mammals. Four of the seven mammal species were introduced species.

No evidence of conservation significant fauna species was recorded from the study area.

Three significant species have the potential to occur within the study area: the Malleefowl, Rainbow Bee-eater and Carnaby's Cockatoo. While suitable habitat exists for the Rainbow Bee-eater and Carnaby's Cockatoo, the study area is not considered suitable breeding habitat for these species. The area was extensively ground truthed for evidence of Malleefowl and no nesting mounds or evidence of this species was recorded.

A further species of interest, the Arid Bronze Azure Butterfly (Ogyris subterrestris petrina) is a Threatened species that is listed as Critically Endangered under the EPBC Act and the BC Act. The current conservation rating relates to its low abundance and severely fragmented distribution, with only two extant subpopulations being recorded in Western Australia. These subpopulations are at Barbalin Nature Reserve, and at a second site about 100 km from Barbalin. A third subpopulation (the first discovered, in the 1980s) occurred near Lake Douglas, 12 km southwest of Kalgoorlie, but is now locally extinct. Threats include land clearing and habitat degradation (DBCA 2020).

The Arid Bronze Azure Butterfly has an obligate association with a sugar ant Camponotus sp. nr. terebrans. The butterfly larvae live entirely within the ant's nest during their development. The ants protect the larvae from predators and are thought to be rewarded with secretions produced by the larvae. The larvae are cryptic and extremely difficult to detect. The most critical factor for habitat occupancy by the butterfly is the presence of large colonies of the host ant; only large colonies can support the Arid Bronze Azure Butterfly because, being a parasitic species, it requires large numbers of hosts.

A five day/night survey carried out in March 2021, found no evidence of suitable colonies for the host sugar ant (Camponotus sp. nr. terebrans) at any of the 235 trees sampled across the two sites. It is therefore concluded that the likelihood of direct or indirect impact on the Arid Bronze Azure Butterfly is low to negligible.

A total of two fauna habitat types were described and mapped within the study area: Eucalyptus Woodland and Shrublands. All fauna habitats were well represented within the Murchison and Coolgardie bioregions.

5.9.3 Implications for Mine Closure Planning

In addition to vegetation clearing, infrastructure (particularly the security fence line) can fragment habitat. Cleared linear tracks of land are 'unnatural' in much of the habitat. These linear structures that partition existing activity areas, isolate sections of established communities and may alter long and medium-term patterns of movement around established home ranges particularly for small mammals and reptiles. A reduction in the population because of this infrastructure would be difficult to detect given our current knowledge of the spatial ecology for most of the small mammals known to be in the area.

Consideration will therefore need to be given during the closure phase of the operation to re-instating where possible suitable habitat for the small mammals and reptiles local to the area.

5.10 Social Environment

5.10.1 REPF Site

The CKB has a current program aimed at attracting large scale mineral processing industries to Kalgoorlie. As such, Lot 500 and other surrounding properties have been identified by the CKB as a strategic industrial area, with Lot 500 currently zoned as *General Industry* in the CKB Town Planning Scheme No. 1 (TPS). Under this zoning the REPF is a permitted use,

The proposed REPF site is located approximately 8 km west of the Kalgoorlie central business district. It is situated within a developing industrial area, where other large scale, industrial type uses currently exist, and where CKB wishes to attract future large-scale mineral processing to this unencumbered location.

Industrial uses within this area include land occupied by Western Power, north east of Lot 500, which bounds a site occupying two Synergy (formerly Verve Energy) gas turbines. A BIA Communications broadcast tower occupies a site approximately 1 km to the north of the proposed REPF site. The Janet Ivy Gold Mine is located to the north west of the proposed site, and the Fort Scott and Fort William open pits are located south of the mine. Additionally, the Binduli gold project area covers approximately 100 km^2 to the west and north west of Lot 500.

The proposed REPF site is bounded by Great Eastern Highway on the southern boundary and Johns Road on the eastern boundary. The corridor for the water pipeline from Mundaring Weir runs along the northern boundary, and there is an active rail freight line (Kalgoorlie Esperance railway) on the western boundary of the site. Figure 5-11 shows Lot 500 in relation to surrounding land uses and the Kalgoorlie Town site.

Two residences and two businesses are established in the area north of the water pipeline corridor and are bounded to the north by the Perth Kalgoorlie railway, which runs near the REPF site. This residence is the nearest residence to Lot 500 and is located approximately 500 m from the centre of the site in an area zoned Freight / Transport. A Water Corporation covered storage reservoir is situated on the lot to the north east of Johns Road, and the Eastern Goldfields Clay Target Club occupies the lot south of Great Eastern Highway to the east of the proposed site. There are no other notable land uses in the immediate area.

The nearest sensitive population group (residential) to Lot 500 lies within the Kalgoorlie Town site, 3 km to the north east.

5.10.1.1 Aboriginal Heritage

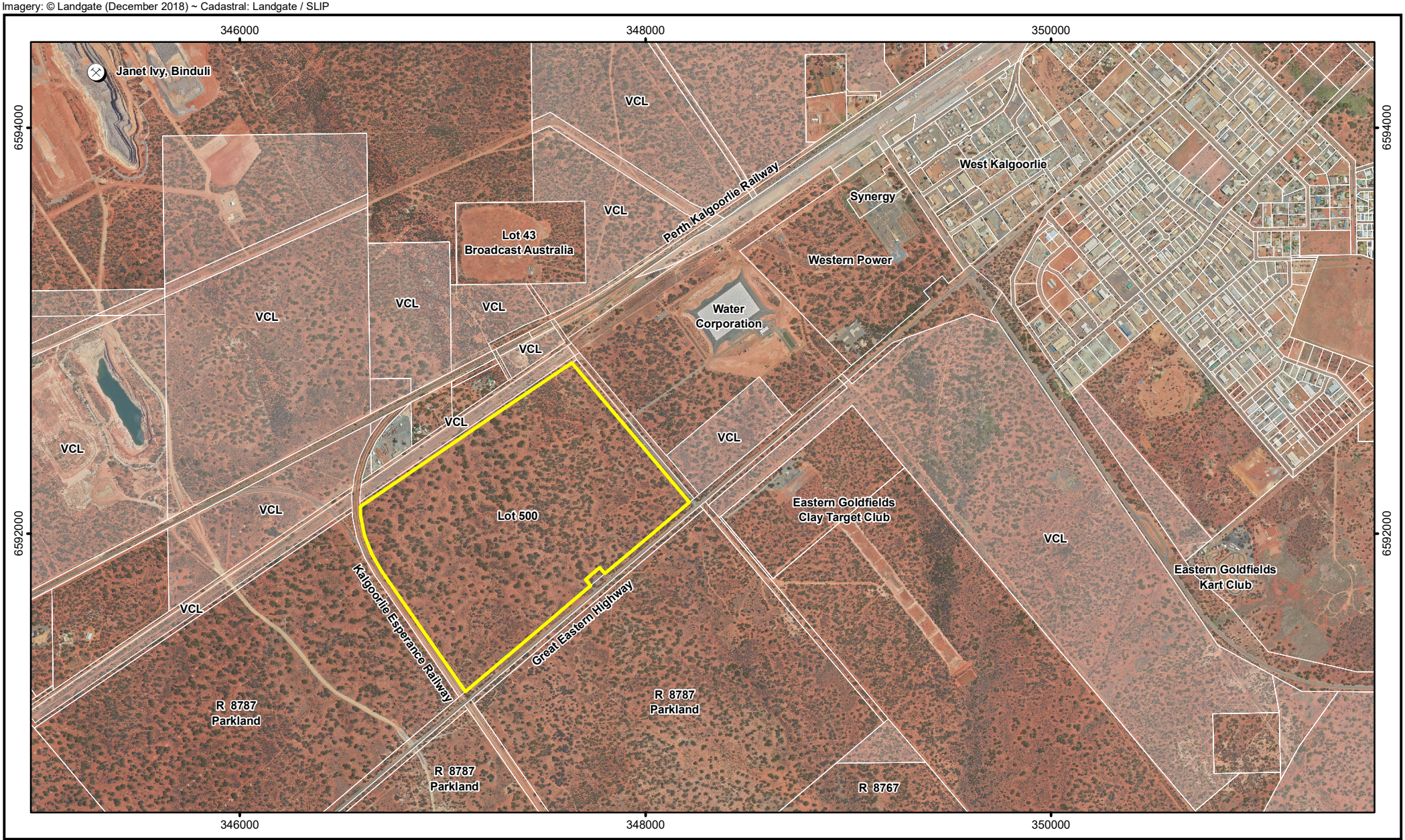
An Indigenous Heritage Archaeological and Ethnographic survey was carried out in 2003 over a broad area encompassing Lot 500. It was found in Report AHIS20850 that there were no Registered Aboriginal Sites or Other Heritage Places recorded at the Premises. The closest Registered Aboriginal Site is the *'Binduli Rock Hole'* situated approximately 830 m to the north.

It is also worth noting that the Marlinyu Ghoorlie, Maduwongga and the Goldfields Land and Sea Council were notified of the proposed clearing approved under Clearing Permit 8322/1. No submissions were received in relation to the granting of the Clearing Permit application.

A search of the State Government Aboriginal Heritage Inquiry System (April 2020) indicates that there are no identified sites within the proximity of this development.

Lynas Corporation will ensure it complies with all requirements of the *Aboriginal Heritage Act (WA) 1972.* Through its agreements with contractors, it will require personnel to be trained in the implications of the *Aboriginal Heritage Act (WA) 1972* during the construction period.

Imagery: © Landgate (December 2018) ~ Cadastral: Landgate / SLIP



Legend

Lot 500 Great Eastern Hwy, Yilkari

N

0 300 600m

Scale: 1:25,000
MGA94 (Zone 51)

CAD Ref: a2769_ERD04_22		Author: P. Jansen	Kasa Consulting Pty Ltd
Date: March 2021	Rev: A	A4	Drawn: CAD Resources ~ www.cadresources.com.au

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Figure 5-11
Lot 500
Surrounding Land Uses

5.10.2 BSF Site

The BSF site is located north east of the Kalgoorlie town site. The nearest residential areas are in the suburb of Hannan's which is about 5 km to the west, and the Ningamia indigenous settlement which is about 3 km to the south west.

Being located on the fringe of the town the surrounding locality contains a variety of land uses described below:

- The Yarri Road municipal waste facility is located to the south and is a DWER licenced landfill catering for municipal and other wastes.
- The Parkeston industrial area located to the south-west comprises industries such as a cement making facility (Cockburn Cement) and Duratec (engineering, construction and remediation operations).
- West of Parkeston are the mining operations of the Hannans North Tourist Mine and to the south west is the indigenous community of Ningamia.
- To the north west is the Kalgoorlie International Speedway at Mullingar.

5.10.2.1 Aboriginal Heritage

Native title has not been extinguished over the BSF site or the easement required for the access road. The recent applications for a GPL and Miscellaneous Licence under the *Mining Act 1978*, is an action which attracts the right to consult under the *Native Title Act. 1993*.

Yarri Road falls wholly within the following overlapping undetermined Native Title Claims:

- Maduwongga (WAD186/2017 registered on 08 August 2017; and
- Marlinyu Ghoorlie (WAD647/2017 registered on 28 March 2019.

Lynas has committed to progressing Native Title negotiations including identification of heritage survey monitors endorsed by Traditional Owners to conduct archaeological and ethnographic assessments at the BSF site prior to land disturbance. Lynas has commenced early consultation with both Native Title claimants, and all engagements to date are recorded in Table 4-1.

Data relating to indigenous heritage sites in the area surrounding the BSF site has been sourced from the Aboriginal Heritage Inquiry System (AHIS), which showed that there are several indigenous heritage sites north east of the Kalgoorlie townsite, associated with landscape and landform features not found at the proposed BSF location.

The BSF site itself is free from indigenous heritage constraints, although a registered indigenous heritage site (No. 152) is close to the south eastern boundary of the BSF site. Indigenous heritage site No. 152 is also known as the Yarri Road Quarry site.

5.10.3 Implications for Mine Closure Planning

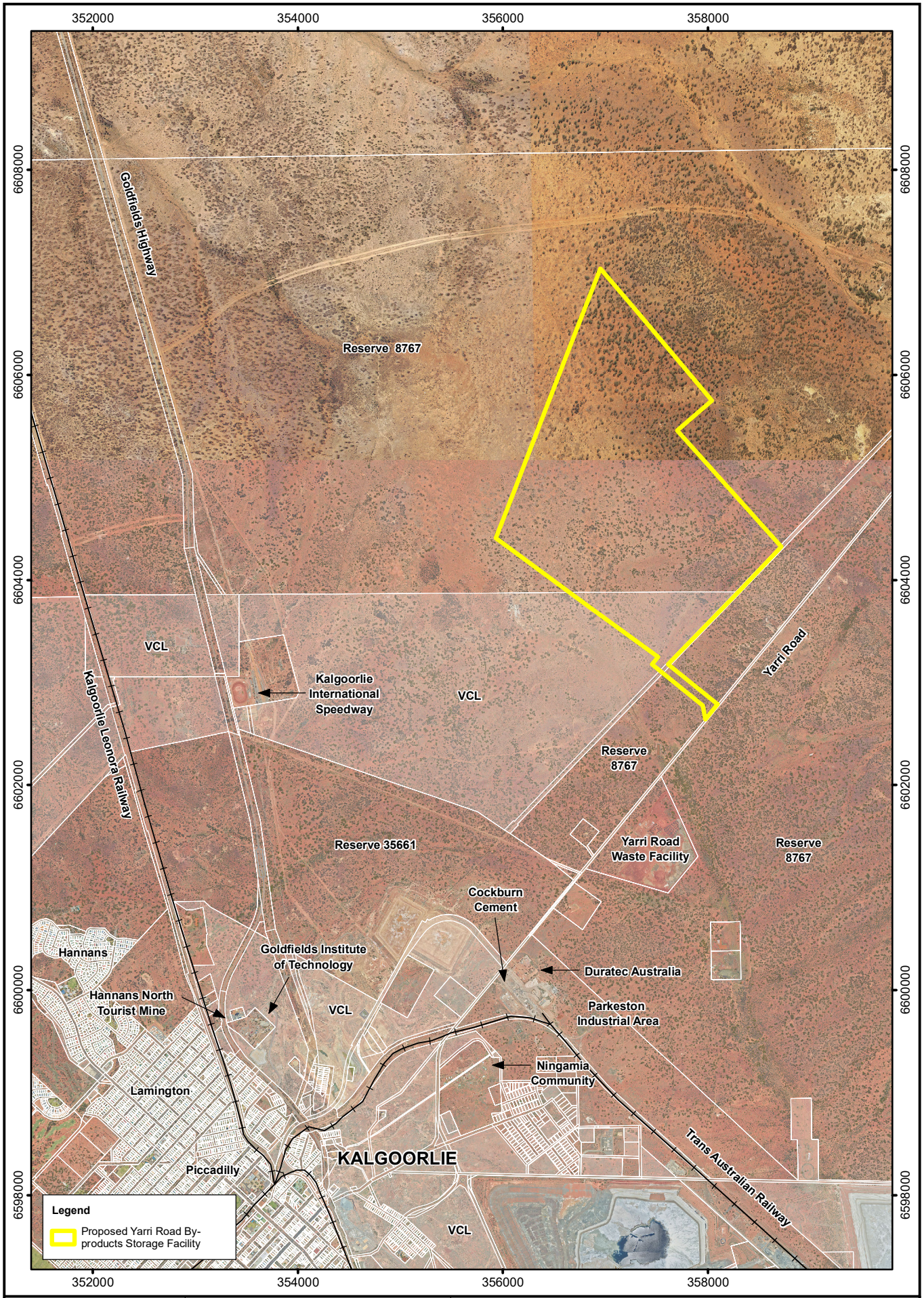
As the REPF site is currently zoned *General Industry* by the CKB, it is expected that this zoning will continue after closure has occurred, therefore planning for post-closure land use(s) should include the possibility of an industrial use.

Notwithstanding, Lynas will ensure it complies with all requirements of the *Aboriginal Heritage Act (WA) 1972.* Through its agreements with contractors, it will require personnel to be trained in the implications of the *Aboriginal Heritage Act (WA) 1972* during the construction period for the BSF which is anticipated to commence in several years time, subject to grant of required approvals.

In light of the current pending status of Native Title determinations at Yarri Road, as part of its commitment to ensuring heritage matters are appropriately addressed and managed, Lynas will develop and implement a Cultural Heritage Management Plan in consultation with the EPA and Traditional Owners that reflects the outcomes and any recommendations of the Native Title determination process, including the scope of proposed archaeological and ethnographic surveys at the Yarri Road site.

Additionally, as demonstration of Lynas' commitment to investigating and mitigating potential cultural heritage constraints, Lynas has provided a letter of commitment to the EPA which includes the acceptance/non-objection to any pre-construction Ministerial Condition that EPA recommends be imposed on the organisation to address this matter prior to commencement of ground disturbance at Yarri Road BSF.

It is considered that the pending resolution to Native Title and heritage aspects for the BSF site should not compromise the commencement of construction activities at the REPF site on Lot 500.



Imagery: © Landgate (December 2018) ~ Cadastral: Landgate / SLIP

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MGA94 (Zone 51)

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Figure 5-12
Yarri Road BSF
Surrounding Land Uses

5.11 Air Quality

5.11.1 Dispersion Modelling Study

The potential air quality impacts of the REPF and BSF were determined through a dispersion modelling study undertaken by subject matter experts – Environmental Technologies and Analytics. (Kalgoorlie Rare Earths Processing Plant – Air Quality Impact Assessment (ETA March 2021)).

The study incorporated meteorological data, emissions information, source characteristics, and the location of key sensitive receptors. An inventory of emissions was developed for the proposed REPF at its maximum designed operational throughput. Emission rates were estimated using recognised and accepted methods of emissions estimation and referenced the existing LAMP operations in Malaysia where possible.

Emission rates at the Yarri Road BSF were based on the facility operating a maximum capacity which is reached by 2029. The worst-case operating conditions were also assumed for the modelling assessment. The study adopted a conservative approach, consistent with similar assessments in the region, using CALPUFF software (version 7.3).

A site-specific meteorological dataset was generated using the CALMET meteorological processor, using a combination of observations at the nearest representative automated weather station (AWS) and meteorological data produced by the prognostic model TAPM. These were then used to drive the CALPUFF dispersion model to predict ground-level concentrations of pollutants at identified sensitive receptors and the surrounding environment.

Ground-level particulates (as TSP, PM_{10}, and $PM_{2.5}$ concentrations) and gaseous emissions (carbon monoxide, sulphur dioxide, nitrogen dioxide) as well as process gases (H_2SO_4, HF, HCl, and Cl_2), predicted at the sensitive receptors and the surrounding environment, were compared with the relevant air quality assessment criteria. Predicted project contributions were presented in isolation of non-project related emission sources, and with the inclusion of background concentrations (assessed to represent existing conditions), to present the potential cumulative impact.

An iterative approach was undertaken for the Air Quality Assessment whereby multiple modelling scenarios were conducted to inform the design of pollution controls, site layout and stack height configurations, in order to optimise the REPF and BSF designs to achieve the desired environmental outcome and full conformance with adopted assessment criteria.

5.11.2 Dispersion Modelling Study Findings

5.11.2.1 Project Discrete Impacts

The assessment determined that the discrete impact of the Project on predicted maximum ground level concentrations (GLC) for all modelled pollutants are below the relevant air quality assessment criteria and present a low risk of potential impact to the sensitive receptors identified.

Specifically, the Project only, results show the maximum predicted concentration at any identified receptor for:

- PM_{10} (24-hour) is 19.8% of the assessment criteria (Receptor R_8), at the road entrance / exit to the Yarri Road BSF. The highest at any of the sensitive receptors (i.e., residences) is 7.6% of the assessment criteria (at R_4 and I1).
- $PM_{2.5}$ (24-hour) is 13.2% of the assessment criteria (Receptor R_8). The highest at any of the sensitive receptors (residences) is 7.4% of the assessment criteria (at R_4).
- SO_2 (1-hour) is between 1.9% and 3.2% of the assessment criteria (Receptors R1, R2 and I1), being sensitive receptor locations on Hall Road (residents).
- SO_2 (24-hour) is 2.9% of the assessment criteria (Receptor I1), a sensitive receptor location.
- NOx (1-hour) is 5.2% of the assessment criteria (Receptor I1), a sensitive receptor location.
- NO_2 (1-hour) is 35.5% of the assessment criteria when atmospheric conversion is included.
- CO (8-hour) is less than 0.2% of the assessment criteria at all receptor locations.

For the process gases, the maximum predicted ground level concentrations for all the process gas pollutants are all below the relevant air quality assessment criteria, and generally present a low risk of potential impact to sensitive receptors identified.

5.11.2.2 Cumulative Impacts

Where regional ambient monitoring data is available (particulates and combustion gases only), potential cumulative impacts have been assessed. The cumulative results (with background concentrations included) show that the existing ambient concentration of the modelled pollutants are more dominant than the REPF related emissions. The predicted cumulative results are less than the assessment criteria and indicate a low risk of potential impact to sensitive receptors identified.

Specifically:

- PM_{10} (24-hour) is 79.2% of the assessment criteria when background air quality is included (Receptor R-8, Yarri Road BSF) being the highest of any receptor, and 67% of the assessment criteria at sensitive receptors I1 and R_4 (Ningamia)
- $PM_{2.5}$ (24-hour) is 76.8% of the assessment criteria when background air quality is included (Receptor R_8) being the highest of any receptor, and 71% (R-4) of the assessment criteria being the highest at a sensitive receptor.
- SO_2 (1-hour) is between 50.8% and 51.1% of the assessment criteria when background air quality is included (Receptors R1, R2 and I1) being sensitive receptors along Hall Road near the REPF (Lot 500).
- SO_2 (24-hour) is 12.1% of the assessment criteria when background air quality is included (Receptor I1).

5.11.2.3 Emissions during plant upset and worst-case conditions

The modelling results show that the plant emissions contribution during upset operating conditions presents a relatively low to moderate change in predicted in air quality ground level concentrations. The maximum concentration at any identified receptor during upset plant operating conditions, for:

- PM10 (24-hour) is 40.2% of the assessment criteria.
- SO_2 (1-hour) is 5.6% of the assessment criteria.
- SO_2 (24-hour) is 4.4% of the assessment criteria.
- NO_2 (1-hour) is 63.0% of the assessment criteria.
- H_2SO_4 (1-hour) is 34.5% of the assessment criteria.
- H_2SO_4 (24-hour) is 44.0% of the assessment criteria.

The results show that the plant emissions contribution during worst case operating conditions presents a relatively low to moderate change in predicted in air quality ground level concentrations. The maximum concentration at any identified receptor during worst case operations, for:

- PM10 (24-hour) is 31.8% of the assessment criteria at Receptor I1, a sensitive receptor on Hall Road near to the REPF at Lot 500.
- SO_2 (1-hour) is 4.5% of the assessment criteria at Receptors R2 a sensitive receptor on Hall near to the REPF at Lot 500.
- SO_2 (24-hour) is 3.2% of the assessment criteria (Receptor R1 a sensitive receptor on Hall Road near to the REPF at Lot 500).
- NO_2 (1-hour) is 50.7% of the assessment criteria (Receptor I1).
- H_2SO_4 (1-hour) is 27.8% of the assessment criteria at Receptor R2.
- H_2SO_4 (24-hour) is 27.8% of the assessment criteria at Receptor R2.

These concentrations will only be present for a short period as the plant would be in the process of shutting down, and generally present a low risk of potential impact to sensitive receptors identified. For this assessment the Yarri Road operation has not been included in the modelling

5.11.2.4 Fugitive Sources

For Lynas activities, the air quality modelling analysis assumed a reasonable level of particulate (dust) mitigation, for potential fugitive sources, including efficient dust control (e.g., watering) of the stockpiles during the dry periods of the year. In addition, good dust management practices will ensure that any effect associated with material handling and transportation of materials is minimised.

By-products of interest from the process are gypsum and IP, which are stored temporarily on Lot 500. IP will also be stored on the Yarri Road site. Both the gypsum and IP have a high moisture content when stockpiled and therefore have a low potential to be affected by wind erosion. Wind eroded dust is typically an event-driven emission, since particles are not suspended unless a sufficient wind speed is reached, typically 5.4 m/s for low moisture content material.

For this assessment it was assumed that wind erosion from the gypsum and IP storage areas would be minimal due to the chemical composition and moisture content of the products. As a result, any emissions from the stockpiles were not included in the modelling assessment.

5.11.3 Mitigation

5.11.3.1 Construction Phase

The operation of diesel-powered vehicles, heavy equipment and power generation during construction will result in generation of combustion emissions. Emissions generated are expected to rapidly disperse upon release given their limited nature.

Typically, during early stages of construction, dust is also generated from vegetation clearing activities, and activities on unsealed surfaces. Lynas will undertake dust suppression activities on an as needs basis to minimise potential impacts to the workforce and nearby sensitive receptors.

Uncontrolled, dust can cause reduced air quality, impact on public health, and reduce amenity due to reduced visibility and settling on surfaces causing soiling and staining. The potential impact of dust is determined by particle size, chemicals composition and concentration. The total suspended solid (TSP) fraction of dust is typically responsible for nuisance or loss of amenity whereas the smaller PM_{10} and $PM_{2.5}$ fractions are more commonly associated with the potential for health impacts due to their ability to penetrate the lungs.

Based on the use of dust suppression techniques by Lynas at the Mt Weld mine site and the LAMP in Malaysia, air emissions arising from vehicles, heavy equipment and generator use or dust emissions are not considered to represent a significant or long-lasting impact to air quality, health or aesthetics during the construction phase.

Management controls during the construction phase have been documented in a Construction Environmental Management Plan which include management of dust during construction. Conventional management actions will be implemented, including:

- Regular visual inspections by the contractor's environmental personnel.
- Appropriate training and inductions for construction personnel.
- Traffic control to maximise use of non-dust generating internal roads and parking locations.

In addition, a meteorological station and a network of continuous particulate monitors will be installed at key locations to monitor baseline particulate concentrations as well as construction phase dust level.

5.11.3.2 Operational Phase

RE concentrate from Mt Weld will be transported to the REPF and unloaded directly from containers into a hopper fitted with an extraction system discharging via a baghouse filter. This results in negligible fugitive emissions from the handling of the concentrate.

Other raw materials used in the process are delivered to site in enclosed bulk containers. These raw materials are pneumatically transferred from the bulk container to storage silos on site, which are fitted with baghouse filters to control any potential emissions.

The air quality modelling analysis assumed a reasonable level of particulate (dust) mitigation, including efficient dust control (e.g., watering) of the stockpiles during the dry periods of the year. In addition, good dust management practices were implemented to ensure that any effect associated with material handling and transportation of materials is minimised.

Lynas will install a meteorological station and a network of continuous particulate monitors at key locations to monitor particulate concentrations upwind and downwind of the site during operations.

Other points to note with respect to operational dust management are:

- A radioactive waste management strategy has been prepared as part of the approval required for the Proposal from the Radiological Council and DMIRS. This strategy has been included in the RMP for the Proposal and prescribes detailed management actions and targets for the handling and storage of RE concentrate and the IP by-product. This statutory document includes dust controls which require compliance.
- An Operational Environmental Management Plan (OEMP) has been prepared for the project which outlines a systematic and prescriptive approach to environmental management including air quality management on the REPF and BSF sites.
- The IP and gypsum by-product storage methods are based on an approach which acknowledges the high moisture content of both by-products. The high moisture content results in minimal dust generation. The make-up of the by-product creates a crust which further minimises dust generation.
- The design of the by-product storage areas incorporates the IP encapsulated within the gypsum and further protected by rock armouring. This infrastructure further reduces the potential impact of fugitive dust impacts.
- Particulate monitors will be installed at key locations to monitor operation-phase dust levels.
- An Air Quality Monitoring Programme will be developed in consultation with DWER as part of the detailed design process and applications under Part V of the EP Act. This will include continuous monitoring of ambient particulate concentrations.

5.11.4 Radionuclides in Dust

5.11.4.1 Overview

The IP solid by-product contains the iron, aluminium, phosphorous and residual REs from the concentrate. It will also contain low levels of NORM (Naturally Occurring Radioactive Material). The radiation level of the IP by-product will be like that of the Mt Weld concentrate, ore, and tailings, which are all safely managed in accordance with an approved Radiation Management Plan (RMP).

The IP is not a waste material. Research in Malaysia has shown it can potentially be used in soil conditioning for a range of crops and for mine site rehabilitation.

The IP storage facility will be specifically designed to ensure radionuclides within the IP are appropriately contained, monitored, and managed. The design will ensure radiation doses from IP to workers, members of the public and non-human species are as low as reasonably achievable throughout operations and following closure.

5.11.4.2 ERICA Assessment

The Radiation Impact Assessment (RIA) assessed the impact to the surrounding environment through the Environmental Risk from Ionising Contaminants: Assessment (ERICA) software tool as endorsed by ARPANSA.

In response to cautionary advice provided by DAWE regarding the application of Malaysian conditions to the Kalgoorlie environment in assessing impacts, the ERICA assessment employed Lot 500 site-specific air quality and dust deposition modelling conducted by Environmental Technologies & Analytics rather than adapting Malaysian monitoring data to ensure the most representative results were obtained for the radiological assessment.

The ERICA assessment in the RIA was modelled over a 20-year period thereby providing an indication of the cumulative effect of dust deposition impacts. The assessment utilised the following conservative factors to demonstrate the low radiological risk to the surrounding environment from REPF operations:

- The highest dust deposition modelling result used to model environmental impact.
- All dust dispersed into surrounding environment assumed to be 100% radionuclide-bearing IP (in reality, a portion of fugitive dust would be barren of radionuclides).
- A custom 1.0 µGy/hr screening rate employed that is 10 times more stringent than the standard assessment framework.

The conservative ERICA assessment in the RIA demonstrates that the assessed total dose rate per organism is well below the stringent 1.0 µGy/hr screening rate. The result of the REPF ERICA assessment (as endorsed by the Calytrix Consulting independent peer review) as well as the BSF ERICA assessment confirm that there is low radiological risk to non-human biota from the REPF and BSF operations with no further assessment warranted.

5.11.4.3 Iron Phosphate Physical Properties

A key deterrent to dust generation at the IP storage facilities is the high moisture content of the material. Through the long-standing experience with IP at the LAMP in Malaysia, Lynas have robust scientific data indicating that during storage, the IP filter-cake is at 45% moisture at deposition.

The permeability of the IP is also low and therefore moisture reduction by drainage is further retarded.

Lynas have undertaken a core sampling program for the stockpiles in Malaysia and the only stockpile that has seen significant reduction in moisture is a stockpile with underdrainage (sump in base of dam). Even so, after seven years, this moisture is down to 20% at depth, but still above 40% from the surface to 9 m depth.

IP is typically of a clay like consistency and does not become dusty until it gets to around 20% moisture. If the stockpile does become dusty, a proven management method that can be adopted at the proposed REPF is to utilise a chemical dust suppressant (e.g., Gluon® or waterglass (sodium silicate)) which is sprayed onto completed stockpiles for dust control.

Lynas is aware that this method has been used in Geraldton for similar by-product management associated with the Geraldton synthetic rutile facility at Narngulu (where it is subject to significantly stronger winds) and has been demonstratively successful in mitigating dust.

Lynas has actively tried to dry both Gypsum and IP mixes in Malaysia by spreading in 0.5 m stockpiles undercover and ripping every day with a dozer. These investigations have indicated that it takes around three months of actively ripping stockpiles with a dozer before any visible signs of dust is evident.

As evidence of the moisture content of the IP and gypsum, testing results for these materials that was carried out by consultant engineers ATC Williams are available.

Given the above experience, and whilst appreciating that the climate in Kalgoorlie is notably less humid and is drier than in Malaysia, Lynas is confident that significant dust generation from by-product stockpiles will be unlikely.

Notwithstanding, where there is an increased potential for dusting from these stockpiles, the chemical dust suppressant will be applied in a similar manner to that described above.

Lynas will adopt this management practice as standard and will detail these measures including any other operational controls and a monitoring program in an operational dust management plan for the premises.

5.11.5 Implications for Mine Closure Planning

Findings from the air quality impact assessment predict that maximum ground level concentrations for all modelled pollutants are below the relevant air quality assessment criteria, and generally present a low risk of potential impact to the sensitive receptors identified.

It should be noted that the air quality modelling analysis assumed a reasonable level of particulate (dust) mitigation, for potential fugitive sources, including efficient dust control (e.g., watering) of the stockpiles during the dry periods of the year. Therefore, good dust management practices will be essential to ensure that any effect associated with material handling and transportation of materials is minimised.

5.12 Other Closure Related Data

5.12.1 Landform Evolution Modelling (LEM)

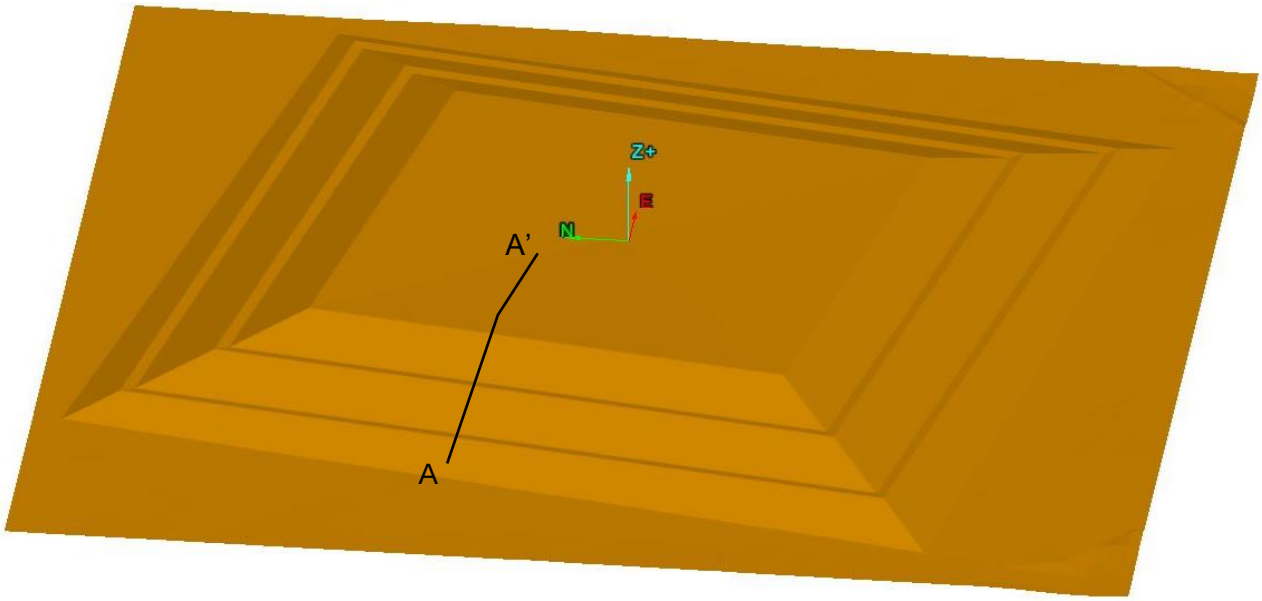
LEM was undertaken by Soilwater Consultants (Soilwater Consultants, 2021) using soil and by-product information summarised in Sections 5.3 and 5.7. Given the nature of the by-product materials, the need for a cover system was identified and included in the LEM scenarios. The LEM modelling was based on a standard local climate sequence which included a probable maximum precipitation event.

The LEM was conducted using generic (experienced based) rill and interrill erodibility values for a cover scenario utilising competent material for rock armouring as a stabilising agent in a 50:50 ratio with the by-product gypsum. The rock armouring material was assumed to be a competent, fresh rock sourced from nearby mining operations (e.g., Super pit) and either mafic or felsic in composition.

The closure design is shown in Insert 5-6. The closure landform was developed to meet the following design parameters:

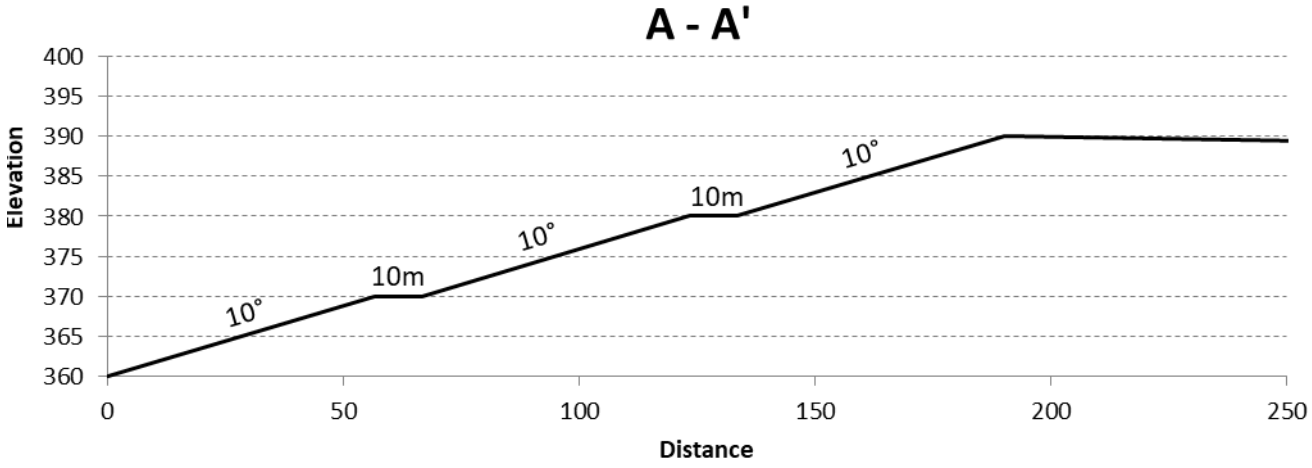
- Batter / berm design will be used to minimise the overall slope length and provide additional sufficient safety factors to minimise erosion and sediment loss.
- Batter slope angle = 10°
- Berm width = 10 m which is back sloped to 5° to prevent overtopping of the berm during heavy rainfall event and prevent surface water ponding close to the batter crest.
- Lift height = 10 m

Insert 5-6: DEM of BSF Closure Design



The total footprint of the closure design is approximately 62 ha and it consists of three 10 m lifts, reaching a maximum height of 390 mRL.

Insert 5-7: By-Product Landform Rehabilitation Design (Cross-section A-A')



The LEM modelling determined that the use of gypsum and rock in a 50:50 ratio provided moderate resistance to erosion; however, the modelling outcome of this cover scenario was not considered to be stable over the long term for closure purposes.

5.12.2 Implications for Mine Closure Planning

The results of LEM modelling of the two cover scenarios (using gypsum and gypsum/rock) show that the stockpile landforms at Yarri Road will be stable for the first 500 years of their existence.

Beyond this timeframe, these structures would benefit from re-enforcement because sediment movement and loss may occur over the longer-term modelled timeframe (500+years) in both scenarios.

Based on these outcomes, SWC suggest that:

- Erodibility and surface runoff / permeability characteristics of the cover material be measured in a laboratory setting for the different components of the cover system(s).
- Consider different cover system materials and/or proportions to re-enforce long term surface stability of the closure design.

Lynas will adopt these recommendations in the detailed design and implementation process for the IP storage. Lynas will use rock armouring to stabilise the landform and prevent erosion of the gypsum cap in the very long term. This will ensure that impacts from potential erosion are highly unlikely and extremely low risk.

5.12.3 Provisional Cover Design

Based on the LEM already conducted, it is proposed that a cover system is investigated which is based on the following material compositions:

- A thin layer of Topsoil won from the facility footprint (~10cm thick).
- A thicker layer of subsoil taken from the facility footprint during construction (~25 cm thick).
- A layer of competent material for rock armouring, sourced from nearby mining operations, preferably granite or basalt (at least 50 cm thick).
- Shallow ripping to a depth of ~0.5 m on contour into the cover system after placement will act to stabilise the overlying topsoil/subsoil layer further.

The soil layer will act as a growth medium for small local flora species which will act to stabilise the cover and also as a limited store release system to prevent excessive internal drainage through the rock layer which may potentially cause tunnelling erosion within the gypsum material. A moderate amount of drainage through the soil material is likely to be acceptable but will require further investigation. The underlying rock armouring material which has been somewhat mixed through the overlying soil material through the shallow ripping action will act to stabilise the cover system from surface erosion.

Due to the long storage times of the stockpiled soil, there will likely be no requirement to handle and store the topsoil separately to the subsoil, as seed stores and nutrient stores which make the topsoil unique will have been cycled through the new ecosystem that will be created by the soil stockpile prior to replacement on the BSF.

The above provisional cover system will require the following volumes to cover the planned BSF at Yarri Road (assuming a 100-ha final landform).

Table 5-17: Estimated Rehabilitation Material Volumes for Provisional BSF Cover System

Material	Cover system thickness (m)	Required Volume (m^3)
Topsoil / subsoil	0.35	362,250
Competent material for rock armouring	0.50	517,500

5.13 Knowledge Gaps & Further Work

The data gaps identified which need to be closed as a part of the mine closure process are summarised in Table 5-18 along with the proposed studies and timeframes.

Table 5-18: Summary of identified Information Gaps and Proposed Actions

Information Gap	Proposed Action	Indicative Timeframe	Comment
Weed and pest fauna species	Prepare management plan for weed and pest fauna species.	Short term (6-18 months)	Required to set out management actions for weeds and pest fauna species.
Materials characterisation	Carry out laboratory studies on erosive characteristics of both soils and competent materials proposed for use in BSF cover system.	Immediate	Required to finalise cover design prescriptions and entire rehabilitation landform.
Materials characterisation	Determine water holding capacity and erosion hazard for water for both soils and competent materials proposed for use in BSF cover system.	Medium term (3-5 years)	This is required to determine the carrying capacity of the proposed cover design and based on this capacity identify the revegetation species that can be supported.
Groundwater	Finalise baseline groundwater study at the BSF site.	Immediate – currently scheduled April 2021 completion.	Required to gather baseline data in the medium term and validate assumptions made in seepage modelling report.
Species mix for rehabilitation	Determine species to be used in rehabilitation across the project site (including seed mix)	Medium to long term (5-10 years)	Seed mixes for rehabilitation of disturbed areas need to be determined to aid in the progressive rehabilitation of the various disturbance areas. Appropriate seed mixes will be determined prior to application of seed. Flora studies conducted in 2018 and 2020 will provide information to assist in this determination. Seed mixes need to consider the region's drying climate and the diversity and function of the areas to be rehabilitated.
Rehabilitation material performance	Undertake progressive rehabilitation trails to determine suitable growth media and rehabilitation methods	Medium to long term (10-15 years)	Progressive rehabilitation trials will be completed to determine the performance of the various seed mixes / revegetation species on the proposed cover system provided in Section 5.12

Information Gap	Proposed Action	Indicative Timeframe	Comment
Analogue Site	Identify representative analogue sites to compare rehabilitation performance	As soon as practicable but within 2 years	At present no analogue sites have been identified for which rehabilitation performance will be assessed against. As specified in Section 10 (Closure Monitoring & Maintenance) analogue sites must be identified for each of the different geomorphic regions to be rehabilitated.
Stakeholder acceptability of final land uses and mine closure criteria	Undertake consultation regarding final land use and mine closure strategy with Stakeholders identified in Section 4.1 as having a primary interest in closure activities	Ongoing	As part of ongoing mine closure planning consultation with stakeholders will occur throughout the project lifespan and updated with each iteration of the project and developments of closure strategy and final land uses. Visual amenity of landforms within the landscape needs to be considered.

6 POST-MINING LAND USE(S)

The REPF site is located within a developing industrial area, where other large scale, industrial uses currently exist, and where CKB wishes to attract future large-scale mineral processing to this unencumbered location. It is currently zoned as *General Industry* in the CKB Town Planning Scheme No. 1 (TPS).

The BFS site is located on a mixture of reserved land (R 8767 Common reserve) and Unallocated Crown Land (UCL). Overlapping Native Title Claims (WAD186/2017 and WAD647/2017) have been registered for the site both of which are yet to be determined.

In the absence of an underlying tenure, the preferred land use hierarchy is:

- Reinstate “natural” ecosystems as similar as possible to the original ecosystem.
- Develop an alternative land use with higher beneficial uses than the pre-mining land use.
- Reinstate the pre-mining land use.
- Develop an alternative land use with beneficial uses other than the pre-mining land use.

As the REPF has a designated preferred land use of General Industry, it is recognised that this land use may be preferred upon closure. Therefore, at this early stage in the project, consideration of multiple Post Mining Land Use (PMLU) scenarios is supported by the (WABSI, 2021) framework.

The Australian Land Use and Management (ALUM) classification for these two PMLUs are listed below in Table 6-1 below.

Table 6-1: ALUM Classification of PMLUs

PMLU	Primary Class	Secondary Class
Reinstate “natural” ecosystem	Conservation and Natural Environments	Other minimal uses
General Industry	Intensive Uses	Industry

6.1 Project Closure Objectives

The overarching closure objective is to establish safe, physically, and chemically stable landforms in a non-contaminating state. Where the re-establishment of “natural” ecosystem is the preferred end-land use, a self-sustaining and resilient vegetative cover like that of the surrounding landscape will be sought. Where General Industry use will continue upon site closure, consideration will be given to what, if any, infrastructure may be desirable in consultation with potential future land users and regulatory authorities.

Several underlying objectives have been developed to assist in achieving the post mining land use and the overarching closure objective. These are detailed within Table 6-2.

It is recognised that as closure planning progresses, specific closure objectives are likely to be developed to provide more detailed guidance to closure. The objectives provided are considered suitable for this pre-development stage of the project.

Table 6-2: Project Closure Objectives

Aspect	Objectives
Safety	• Ensure site closure activities (decommissioning and rehabilitation) are undertaken in a manner that ensures the safety and health of workers as well as the public. • Ensure all contaminated materials are managed in a manner such that no impacts to human health or the environment will occur.
Physical and surface stability	• Ensure long-term stability of final landforms. • Attain stable landforms with conditions compatible with the establishment of a self-sustaining vegetation community.
By-products and hazardous materials	• Ensure materials which may cause environmental impact are contained or encapsulated, preventing release. • Ensure no pollution will migrate into the surrounding environment (e.g., radiation migration). • Ensure stable geochemical conditions post-closure. • Ensure soils are free of contamination.
Ecosystem function and sustainability	• Re-establish self-sustaining ecological communities on disturbed areas. • Rehabilitate disturbed areas to enable sustainable post project land use.
Visual amenity	• Final landforms integrate with the natural surroundings as far as practical.
Social	• Retain infrastructure facilities considered of value to stakeholders, where practical.
Water and drainage	• Ensure that the medium to long term water quality of local and regional surface and groundwater resources are not compromised. • Ensure long-term stability and functionality of drainage structures. • Ensure drainage flows are reinstated where possible.

7 CLOSURE RISK ASSESSMENT

The risk assessment process is currently ongoing and is being developed in tandem with development of the Mining Proposal documentation. As recommended by the DMIRS guidelines, a holistic risk assessment is being developed to consider both closure and operational risks. The Risk Register combines the outcomes of the desktop risk assessment. The risk assessment approach undertaken generally aligns with the processes outlined in Risk Management Standard – Principles and guidelines (AS/NZS ISO 31000:2009) and Environmental risk management – Principles and process (HB 203:2012). The following aspects were considered when determining the consequence of each potential impact:

- Type of impact (direct or indirect)
- Geographic extent, size, and scale.
- Duration, frequency, reversibility of the potential impact.
- Whether the potential impacts are from planned or unplanned events.
- Sensitivity of the receptor/resource and the value of the receptor / resource and whether impacts are likely to be from planned or unplanned events.

Each risk event was assigned a level which is determined as a factor of probability and the associated environmental consequence. The risk matrix (Table 7-1) combines the level of likelihood (Table 7-2) and consequence (Table 7-3) to determine the level of associated risk. 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 are then included and the risk rating is re-categorised. As discussed above, all of the risks identified at this stage which are related to closure have been compiled into a provisional Risk Register, included as Table 7-4. It is recognised that this risk register will be updated throughout the project life as conditions change and new information / processes are developed.

Table 7-1: Risk Matrix

		Consequence				
		Insignificant	Minor	Moderate	Major	Severe
Likelihood	Almost Certain	LOW	MEDIUM	HIGH	EXTREME	EXTREME
	Likely	LOW	MEDIUM	HIGH	EXTREME	EXTREME
	Possible	LOW	LOW	MEDIUM	HIGH	EXTREME
	Unlikely	LOW	LOW	MEDIUM	HIGH	HIGH
	Rare	LOW	LOW	LOW	MEDIUM	HIGH

Table 7-2: Likelihood Descriptions

Description	Explanation
Rare	May occur in exceptional circumstances (would be considered highly unusual); may occur in the next 20 years or more (<5% per year).
Unlikely	Not likely to occur, may occur within the next 10 – 20 years (5%-10% probability).
Possible	May occur within 5 – 10 years (10% – 50% probability).
Likely	Known to occur or has occurred in the past; likely to occur in the next 1-5 years (50-80% probability).
Almost Certain	Expected to occur in the next year (80 – 100% probability).

Table 7-3: Consequence Descriptions

Insignificant	Minor	Moderate	Major	Catastrophic
Health and Safety				
First Aid Injury E.g. Any injuries requiring first aid treatment onsite only	**Medical Treatment Injury (MTI):** E.g. Any injury requiring further treatment from a Medical Practitioner or any administration of a drug requiring the approval of a Dr **E.g**. Dislocation requiring pain relief	**Minor Lost Time Injury (LTI):** Work injury that results in the worker being impaired and unable to return to the workplace for < 2 weeks **Restricted Work Injury (RWI):** Any work injury that results in the worker being deemed unfit to return to full duties by a medical practitioner.	**Serious LTI:** Work injury that results in the worker being impaired and unable to return to work > 2 weeks Permanent disability < 30% **E.g.** Total loss of a digit.	One or more Fatalities Permanent Disability > 30% **E.g**. Loss of leg/ arm
Environment				
No or very low environmental impact. Insignificant fauna/flora, habitat, soil, aquatic & land ecosystems, atmosphere or water resources affected. E.g. Oil spill < 5Lt within a contained area.	Low environmental impact. Minor impact on fauna/flora, habitat, and soil, aquatic & land ecosystems, atmosphere or water resources. **E.g**. Wildlife death	Moderate environmental impact. Moderate impact on fauna/flora, habitat, and soil, aquatic & land ecosystems, atmosphere or water resources. **E.g.** Machinery tramming on uncleared bush land without an internal permit to clear.	Major environmental impact. Major impact on fauna/flora, habitat, soil, aquatic & land ecosystems, atmosphere or water resources.	Severe impact on fauna/flora, habitat, soil, aquatic & land ecosystems, atmosphere or water resources
Community/ External Relations				
Isolated complaint received. No media coverage. No damage to reputation or relationships with stakeholders	Multiple or sporadic complaints received. No media coverage. Short-term damage with relationship with one or more stakeholders but no damage to reputation.	Repeated or serious rate of complaints. Local media interest and coverage Reversible damage with stakeholders and to reputation.	Ongoing complaints from local groups or regulators. Regional/national media interest. Protests by external stakeholders. Local or regional damage to reputation.	High level concern from community, regulators, shareholders and/or stakeholders. Adverse national or international media coverage. International damage to reputation.
Legal				
Questionable or minor non-compliance with operating condition. No fine or prosecution. Unlikely to attract regulatory interest. Easy to resolve.	Non-compliance with operating condition. Could attract low level administrative response from regulator. No court appearance required.	Breach of local or national law with potential prosecution by regulator. Continuing occurrence of minor breaches.	Major breach of local or national law. Prosecution or penalties by regulator likely. Short term threat to operations continuing Civil action initiated	Significant breach of national or international law with potential jail sentences Operations suspended or cease (short or long term). Licenses withdrawn or revoked Class action initiated
Operational / Cost				
Minor impact, easily corrected with no loss of production < $2,000	Minor damage to equipment or infrastructure with minimal loss of production (< 1 day) $2,000 - $50,000	Damage to equipment or infrastructure causes temporary loss of production (< 1 week) $50,000 - $100,000	Damage to equipment or infrastructure causes production to cease for < 1 month $100,000 - $500,000	Damage to equipment or infrastructure causes production to cease for > 1 month > $500,000

Table 7-4: Provisional Closure Risks Register

Risk No.	Mining Proposal Environmental Factor or MCP Risk Category	Activity	Risk / Opportunity Description / Cause	Impact / Consequence	Likelihood	Consequence	Raw Risk Rating	Treatment	Likelihood	Consequence	Treated Risk Rating
1	Landforms	Closure Planning/Closure/Post-closure	IP and Gypsum material may not be fully contained due to: • Structural failure of coverage materials • Erosion resulting from high rainfall and/or strong winds.	IP and gypsum materials may cause significant environmental impact from accidental release.	**Unlikely**	**Moderate**	**Medium**	• Engineering design of the storage facilities to ensure that accidental spill or leaching of by-product material does not reach the surrounding environment. • Contaminated soil and groundwater is remediated in accordance with the requirements of the Contaminated Sites Act. • Operational reports on by-products material movement and placement are to be audited and are compliant with designed storage locations. • Geotechnical assessment of the design is to be audited to ensure stability of facility(s) post closure.	**Rare**	**Moderate**	**Low**
2	Landforms	By-product Landform	Erosion of, or sediment discharge from, storage facilities due to structural instability or incorrect placement of dispersive materials	• Not a safe, sustainable landform to achieve closure objectives. • Death of vegetation due to smothering. • Deteriorating water quality in receiving surface water bodies impacting dependant flora and fauna and hydrological function. • Landform failure (collapse).	**Unlikely**	**Moderate**	**Medium**	• Storage facilities will be designed, constructed, and rehabilitated to create a safe, stable, non-polluting landform. • Toe bunds may be constructed at the base of facilities to prevent erosion into the landscape. • Identify locations and timing where erosion and sediment control measures are likely to be required in MCP. • Include regular inspections of erosion control measures in monitoring and maintenance program.	**Rare**	**Moderate**	**Low**
3	Biodiversity / Flora / Fauna / Ecosystem	Rehabilitation	Poor take up by proposed rehabilitation species due to the minimum depth of cover for revegetation not currently being known. The precision in spreading by different machinery types is still being investigated.	• The volume of soil and competent material for rock armouring required for storage facility cover system currently hasn't been quantified. • Insufficient space to store soil to meet rehabilitation requirements. • Insufficient, unsuitable, or unavailable volumes of competent material for rock armouring from local sources.	**Unlikely**	**Moderate**	**Medium**	• Investigate sources of locally available competent material for rock armouring and begin process of negotiation to gain access. • Undertake investigation of topsoil/subsoils depth requirements for identified vegetation. • Undertake investigation of appropriate plant for topsoil spreading.	**Rare**	**Moderate**	**Low**
4	Landforms	Closure Planning/Operations/Post-closure	Approvals process protracted due to the surface water control infrastructure for the BSF Site not yet been designed in detail.	Surface water diversion infrastructure may be required to be permanent features post closure and environmental approvals may not be granted without its final design.	**Likely**	**Minor**	**Medium**	• Undertake detailed design of required surface water control infrastructure for BSF Site. This will be required for the works approval in any case.	**Rare**	**Moderate**	**Low**

Risk No.	Mining Proposal Environmental Factor or MCP Risk Category	Activity	Risk / Opportunity Description / Cause	Impact / Consequence	Likelihood	Consequence	Raw Risk Rating	Treatment	Likelihood	Consequence	Treated Risk Rating
5	Biodiversity / Flora / Fauna / Ecosystem	Land Disturbance	Ineffective establishment of designed vegetation and habitat because of poor soil characteristics and/or design of rehabilitation program.	• Rehabilitation does not meet regulatory or stakeholder expectations and does not support planned post-mining land use. • Site does not support self-sustaining ecological community. • Additional rehabilitation costs incurred.	**Unlikely**	**Minor**	**Low**	• Implement Mine Closure Plan including progressive rehabilitation trials. • Cleared vegetation will be stockpiled and retained for use on rehabilitated areas where possible. • Progressive rehabilitation will be undertaken where practicable in accordance with accepted industry best practice. • Disturbed areas will be ripped on the contour where appropriate to remove compaction, improve soil structure and improve infiltration capacity. • Stockpiled topsoil will be respread over rehabilitated areas to act as a seed source, to protect the soil from erosion and provide habitat for fauna. • Local provenance seed will be used where necessary to rehabilitate disturbed areas. • Monitoring will be implemented once areas are rehabilitated to ensure progression towards completion criteria. • Monitoring will be undertaken of analogue and rehabilitated areas to ensure short, medium and long-term rehabilitation objectives are achieved. • Monitoring will be carried out on a regular basis to assess the success of revegetation in rehabilitated areas. • Ongoing development of monitoring methodology and rehabilitation techniques will occur during the life of the project. • Development and submission of triennial revisions of the Mine Closure Plan.	**Rare**	**Moderate**	**Low**
6	Landforms	Closure Planning / Closure / Rehabilitation	Final landform design does not integrate well with natural surroundings due to poor communication of landform scale at the approvals stage, lack of appreciation of the landform by stakeholders, and/or poor rehabilitation results.	Loss in visual amenity and community perception of the area is significantly damaged. Loss in stakeholder trust of Lynas also occurs.	**Unlikely**	**Minor**	**Low**	• Final landform design to be agreed upon by stakeholders and landforms post construction are compliant with landform design. • Community consultation of landform designs to be captured in stakeholder engagement register. • Photographic monitoring and ongoing stakeholder engagement for the endorsement of the final rehabilitated landforms during closure and post-closure. • Design final landforms to conform to boundaries & setbacks. • Landforms to be constructed in accordance with appropriate rehabilitation guidelines.	**Rare**	**Moderate**	**Low**
7	Economic	Closure planning	Unplanned or early closure due to economic changes, commodity price changes.	Closure plans not fully developed or funded.	**Unlikely**	**Major**	**Medium**	• MCP updated in accordance with regulatory requirement. • Contributions to MRF in accordance with regulatory obligations. • Review current and outstanding legal obligations and associated costs every year; make and disclose adequate provisions in line with accounting standards and ASX rules. • Make adequate risk provisions for current residual risks and/or uncertainties.	**Rare**	**Major**	**Medium**
8	Regulatory	Post-closure	Regulators question veracity of closure program due to insufficient evidence that closure criteria will be met in long term site forecasts	Delay or prevention of tenement relinquishment post-closure.	**Possible**	**Moderate**	**Medium**	• Conduct studies over the life of the project to determine practicable criteria and modify closure criteria to ensure that the requirement is met for closure; adequate risk to be allocated to closure criteria. • Continued collection of data and to inform closure criteria for closure objectives to be attained. • Design and conduct post-closure monitoring that aligns with and can demonstrate sufficient progress towards agreed upon closure criteria within a reasonable forecast time frame. • Maintain stakeholder engagement over life of mine to renegotiate practicable closure criteria where appropriate.	**Unlikely**	**Moderate**	**Medium**

Risk No.	Mining Proposal Environmental Factor or MCP Risk Category	Activity	Risk / Opportunity Description / Cause	Impact / Consequence	Likelihood	Consequence	Raw Risk Rating	Treatment	Likelihood	Consequence	Treated Risk Rating
								• Maintain risk provisions where uncertainty remains over liability to meet closure criteria. • Ensure adequate provision is made during operations for post closure monitoring and rehabilitation programmes.			
9	Regulatory / Economic	Closure Planning/Closure	Assets and/or infrastructure handed over without full transfer of all associated liabilities.	Unexpected costs or legal actions against Lynas.	**Possible**	**Moderate**	**Medium**	• Engage legal consultants to assist with legal framework and binding agreements with transfer of liability as, and when opportunities for transfer of assets are identified. • Conduct technical and legal risk assessment for handover of assets/ infrastructure to ensure that all potential risks are identified and liabilities (including financial, community, safety, environment and monitoring are all clearly transferred. • Ensure that transfer agreements clearly set out preconditions and responsibilities for hand-over (e.g., worked to be completed or modifications made, transfer of licences and ownership, etc.).	**Unlikely**	**Moderate**	**Medium**
10	Biodiversity / Flora / Fauna / Ecosystem	Rehabilitation	Unsuccessful rehabilitation of disturbed areas – poor species diversity, viability, and ecological function due to: • Inappropriate vegetation chosen for rehabilitation • Inadequate planning or design of rehabilitation	• Rehabilitation does not meet regulatory or stakeholder expectations and does not support planned post-mining land use. • Site does not support self-sustaining ecological community.	**Unlikely**	**Moderate**	**Medium**	• Undertake baseline assessment of flora (completed). • Undertake rehabilitation trials with a variety of seed mixes.	**Rare**	**Moderate**	**Low**
11	Biodiversity / Flora / Fauna / Ecosystem	Rehabilitation	Climate change (temperature, rainfall, surface water and groundwater regimes) impacts diversity, viability, and ecological function of rehabilitated mining features.	• Rehabilitation does not meet regulatory or stakeholder expectations and does not support planned post-mining land use. • Site does not support self-sustaining ecological community.	**Possible**	**Moderate**	**Medium**	• MCP to consider climate change scenarios.	**Rare**	**Moderate**	**Low**
12	Biodiversity / Flora / Fauna / Ecosystem	Contamination	Spread of weed species, dieback, or other pathogens during rehabilitation due to insufficient quarantine for personnel and equipment	• Loss of rehabilitated flora and fauna. • Rehabilitation areas do not support self-sustaining ecological communities.	**Possible**	**Moderate**	**Medium**	• Operational and closure procedures to consider environmental threats.	**Rare**	**Moderate**	**Low**
13	Biodiversity / Flora / Fauna / Ecosystem	Rehabilitation	Reduced take up of revegetation, increased runoff and erosion due to compaction of soils through equipment and machinery use.	Prevents revegetation. Increased erosion.	**Almost certain**	**Minor**	**Medium**	• Heavily compacted areas to be ripped during rehabilitation.	**Unlikely**	**Minor**	**Low**

Risk No.	Mining Proposal Environmental Factor or MCP Risk Category	Activity	Risk / Opportunity Description / Cause	Impact / Consequence	Likelihood	Consequence	Raw Risk Rating	Treatment	Likelihood	Consequence	Treated Risk Rating
14	Biodiversity / Flora / Fauna / Ecosystem	Land Disturbance	Loss of viability of topsoil due to poor clearing practices, topsoil handling procedures, and/or topsoil storage methods	• Rehabilitation does not meet regulatory or stakeholder expectations and does not support planned post-mining land use (failure to relinquish tenure). • Site does not support self-sustaining ecological community. • Additional rehabilitation costs incurred.	**Possible**	**Moderate**	**Medium**	• Implement Mine Closure Plan. • Develop designated areas for stockpiling cleared soil. The topsoil stockpiles will be marked with signage and identified on a site plan. The signs will advise year stockpiled and estimated volume. • Topsoil and growth media stockpiles will be located away from potential sources of contamination such as by-product stockpiles, fuel storage tanks, refuelling facilities, and workshops. • Vegetation and topsoil will be left in-situ for as long as possible. • Avoid topsoil stripping in extreme wet conditions. • Clearing of vegetation will be done progressively over the project life. • The site induction program will provide information on ground disturbance requests and authorisation procedures. • A procedure will be implemented to record the amount of clearing undertaken and report the cumulative total in the Annual Environmental Report. • Stockpile cleared vegetation and topsoil in designated areas away from general operations and surface water flow paths to avoid any pollution/contamination or erosion impacts to this rehabilitation material. • Store cleared topsoil and other rehabilitation materials appropriately to ensure it is effectively preserved for progressive rehabilitation and mine closure, including topsoil stockpiles being limited to a maximum of 2.5 m in height and the storage time kept to a practicable minimum to reduce loss of seed viability and soil biota.	**Rare**	**Moderate**	**Low**
15	Biodiversity / Flora / Fauna / Ecosystem	Contamination / Closure / Engineering Design	Risk of groundwater contamination at the BSF is created because pathway is poorly understood at this stage. Precise groundwater levels are presently unknown although site observations indicate that groundwater is between 25 mbgl and 45 mbgl.	Groundwater could present a contamination pathway if it is very shallow and impacts to the groundwater system are incurred due to incorrect hydrogeological interpretation, remedial works required at substantial cost.	**Unlikely**	**Minor**	**Low**	• Undertake further hydrogeological investigations to determine viability of groundwater as contamination pathway. Results from these investigations will be available in April 2021.	**Rare**	**Moderate**	**Low**
16	Social	Stakeholder	Stakeholders fail to commit to closure objectives or provide direction for closure.	Closure cost increase and closure/rehabilitation objectives are not achieved in given timeframe.	**Possible**	**Moderate**	**Medium**	• Develop effective stakeholder communications strategy.	**Unlikely**	**Minor**	**Low**
17	Social	Closure/Post-closure	Disturbance to Aboriginal Heritage sites during operations or closure. due to lack of communication with contractors about heritage protocols or absence of contemporary heritage survey information.	• Public reputation and media impacts, community, and government trust. • Legal implications due to breach of tenement conditions. • Damage to relationships with traditional owners.	**Possible**	**Moderate**	**Medium**	• Develop and implement an indigenous heritage management plan supported by an Aboriginal heritage survey.	**Rare**	**Moderate**	**Low**

Risk No.	Mining Proposal Environmental Factor or MCP Risk Category	Activity	Risk / Opportunity Description / Cause	Impact / Consequence	Likelihood	Consequence	Raw Risk Rating	Treatment	Likelihood	Consequence	Treated Risk Rating
18	Landforms	Rehabilitation	The opportunities for progressive rehabilitation are still being investigated for the site and actual outcomes are unknown and/or poorly implemented.	Progressive rehabilitation may be limited.	**Likely**	**Minor**	**Medium**	• Assess feasibility of progressive rehabilitation on completed zones of the BSF. • Update closure plan if determined to be feasible.	**Rare**	**Minor**	**Low**
19	Regulatory	Closure Planning / Operations / Post-closure	Legal obligations are not fulfilled due to • Incomplete or out of date legal obligations register • Failure to assign roles/responsibilities • Inadequate data management	Financial, regulatory, and reputational consequences.	**Possible**	**Minor**	**Low**	• Regularly review and update MCP in accordance with Mining Proposal conditions. • Data management to be completed in accordance with MCP.	**Unlikely**	**Minor**	**Low**
20	Social	Closure Planning/ Closure	Significant stakeholder concerns are not identified or are misunderstood due to limited engagement through the stakeholder consultation program.	Stakeholder expectations not met causing a loss of trust and reputation and potential regulatory/civil action.	**Possible**	**Minor**	**Low**	• Maintain and refine stakeholder engagement program over life of operations. • Maintain register and records of stakeholder consultation over life of operations. • Invite all relevant stakeholders to review and comment on Annual Environmental Reports (AER), detailing progress on closure planning and progressive rehabilitation. • Invite all relevant stakeholders to review and comment on periodic MCP revisions.	**Unlikely**	**Minor**	**Low**
21	Economic	Closure Planning/Post-closure	Increases in closure costs not identified leading to inadequate provision of resources due to inaccurate financial assessment of closure commitments and/or changes in cost structures due to market forces.	Financial, regulatory, and reputational consequences.	**Possible**	**Minor**	**Low**	• Review closure costs estimates at least every 3 years over life of operations, including current industry rates. • Engage decommissioning and earthworks / mining engineers to assist with refining closure cost estimates as site approaches closure.	**Unlikely**	**Minor**	**Low**
22	Safety	Closure	Unsafe demolition of infrastructure caused by human error and/or poor communication of protocols.	Death or injury to personnel.	**Unlikely**	**Major**	**High**	• Review safe working practices of demolition contractors.	**Rare**	**Major**	**Medium**
23	Safety	Closure	Inadequate Occupational Health and Safety management and emergency response services maintained during suspension of operations including infrastructure decommissioning and removal	Occupational illness, injury, or death to site personnel.	**Possible**	**Major**	**High**	• A detailed Care and Maintenance plan to be developed and used during decommissioning activities; needs to address all occupational health safety and environmental regulatory requirements. • A Project Management Plan (PMP) to be developed which addresses operational suspension, Care and Maintenance (C&M) and operational recommencement. • Maintain adequate OHS/ER resources throughout Care & Maintenance according to the PMP and C&M plans.	**Rare**	**Major**	**Medium**

8 CLOSURE OUTCOMES AND COMPLETION CRITERIA

Completion criteria set targets against which closure implementation, performance and relinquishment can be assessed. WABSI (2019) indicates that the achievement of criteria can be used to demonstrate that financial assurances and liabilities may be removed. WABSI (2019) and the Strategic Framework for Mine Closure; Australian and New Zealand Minerals and Energy Council and the Minerals Council of Australia (ANZMEC/MCA, 2000) collectively state that closure criteria should:

- Be specific enough to reflect a unique set of environmental, social, and economic circumstances.
- Be flexible enough to adapt to changing circumstances without compromising objectives.
- Include environmental indicators suitable for demonstrating that rehabilitation trends are heading in the right direction.
- Undergo periodic review resulting in modification, if required, due to changed circumstances or improved knowledge.
- Be based on targeted research which results in more informed decisions (evidence based).
- Be agreed between key stakeholders.
- Be supportive of the post-mining land uses.
- Be SMART (specific, measurable, achievable, relevant and time)

The development of completion criteria has followed the WABSI (2019) framework. The results are documented in Table 8-1. Due to the long-term nature of the project and the current early stage, the completion criteria are largely conceptual at this stage. Future iterations of completion criteria development will explicitly address aspects and closure objectives, references, attributes, description of the risk, risk-based prioritisation, completion criteria and monitoring for all intended PMLUs. It is recognised that this table will be continually updated with subsequent revisions of this MCP.

Table 8-1: Conceptual Closure Outcomes and Preliminary Completion Criteria

Closure Aspect	Closure Objectives	Preliminary Completion Criteria
Safety	Ensure site closure activities (decommissioning and rehabilitation) are undertaken in a manner that ensures the safety and health of workers as well as the public.	Work method statements or equivalent are to be approved and signed off by Site Manager prior to activities commencing.
	Ensure all contaminated materials are managed in a manner such that no impacts to human health or the environment will occur	A PSI has been carried out according to the requirements of the Contaminated Sites Act 2003.
Physical and surface stability	Ensure long-term stability of final landforms.	Monitoring indicates erosion on rehabilitated areas is stabilising (i.e., not actively eroding).
	Attain stable landforms with conditions compatible with the establishment of a self-sustaining vegetation community.	
By-products and hazardous materials	Ensure by-product materials contained or encapsulated, preventing release.	By-product storage facilities are constructed and remediated as per engineering designs

Closure Aspect	Closure Objectives	Preliminary Completion Criteria
	Ensure no pollution will migrate into the surrounding environment (e.g., radiation migration).	By-product storage facilities are constructed and remediated as per engineering designs. Monitoring of groundwater shows no indication of pollution / migration.
	Ensure soils are free of contamination.	A PSI has been carried out according to the requirements of the Contaminated Sites Act 2003.
Ecosystem function and sustainability	Re-establish self-sustaining ecological communities on disturbed areas.	Monitoring results trend towards baseline conditions for: • Plant density, species diversity, erosion rates and weed density. • Flora population's density/diversity. Refer to Table 8-2.
	Rehabilitate disturbed areas to enable sustainable post project land use.	Targets for vegetation reestablishment comparable to baseline conditions. Refer to Table 8-2.
Visual amenity	Final landforms integrate with the natural surroundings as far as practical.	Constructed landforms comply with design criteria. Stakeholder(s) agreement of design criteria and final landforms.
Social	Retain infrastructure facilities considered of value to stakeholders, where practical.	Formal agreement on management and maintenance of remaining infrastructure with Lynas and future land custodian(s).
Water and drainage	Ensure that the medium to long term water quality of local and regional surface and groundwater resources are not compromised.	Monitoring of groundwater shows no indication of pollution/migration
	Ensure long-term stability and functionality of drainage structures.	Drainage structures are performing as designed regarding erosion, sedimentation, and surface water flow controls.
	Ensure drainage flows are reinstated where possible.	Remove drainage structures not required post-closure and reinstate previous drainage paths.

Table 8-2: Specific Completion Criteria for Native Rehabilitation

Criterion		Intent	Guidelines for Acceptance	Standard	Corrective Action
1. PLANNING					
Baseline Surveys	1.	Baseline surveys of flora and vegetation and vertebrate fauna have been conducted.	Baseline survey reports have been reviewed and finalised. Issues of significance identified from each survey have been addressed in management plans.	Baseline surveys completed and required management plans implemented.	Management plans to be regularly reviewed.
Mine Closure Plan	2.	A Mine Closure Plan (MCP) has been developed, addressing any closure risks that may have been identified.	The MCP has been reviewed and accepted by relevant government departments.	MCP has been completed.	MCP reviewed and resubmitted as required by DMIRS.
End Land Use	3.	A post-mining land use has been determined in consultation with relevant stakeholders.	The end land use has been agreed by the relevant stakeholder groups.	A vegetation community is rehabilitated which has elements of the surrounding undisturbed vegetation types.	The agreed end land use is periodically reviewed by Lynas.
Fire	4.	Appropriate fire management strategies are in place to prevent fire within the project area.	Fire management plan been developed for the site.	The plan addresses the long-term requirements of fire management of the region including: • Reduction of fuel level in the surrounding vegetation to reduce the risk of wildfire; and • Reduction of fire risk in the rehabilitation to allow integration with unmined rangeland management.	Burning, silvicultural treatment or flattening of understorey may be considered as outlined in the plan.

Criterion		Intent	Guidelines for Acceptance	Standard	Corrective Action
Rehabilitation Strategies	5.	Work instructions (or similar) have been developed to guide critical rehabilitation operations and ensure design outcome objectives are met.	Revegetation strategies (or research programs aimed at refining these strategies) have been developed by Lynas. These include clearing of native vegetation, topsoil stripping and handling, site preparation techniques, and seed mix composition and individual species sowing rates.	Lynas have agreed on and documented an adaptive rehabilitation strategy.	Rehabilitation strategies may be progressively updated following feedback from annual monitoring programs.
Rehabilitation Monitoring	6.	Implement a rehabilitation monitoring program that provides quantitative data and a feedback loop allowing for continuous improvement and assessment of completion criteria standards.	A rehabilitation monitoring program has been developed that provides meaningful data that can be used to determine the effectiveness of rehabilitation strategies being implemented, and ultimately contribute to continuous improvement and progress aimed at meeting completion criteria standards.	A rehabilitation monitoring program incorporating surrounding analogue sites developed to assess the effectiveness of rehabilitation strategies being implemented. The monitoring program has been reviewed and accepted by DMIRS.	Allow the monitoring protocol to remain adaptive to account for feedback from assessment outcomes and input from regulators.
2. REHABILITATION IMPLEMENTATION					
Landform Safety and Stability	7.	Constructed landforms are safe, structurally stable, and blend in with the surrounding undisturbed landscape.	Self-certification by Lynas annually in AER and audit by DBCA confirms landform design is acceptable.	No landscaped landform is to have a slope greater than 18 degrees for more than 10 m. There are to be no cuttings or drains narrower than 3 m, nor with a face steeper than 15 degrees (i.e., no short, steep topographical disruptions).	Re-landscaping or re-rehabilitation maybe required if deemed necessary during DMIRS audits.

Criterion		Intent	Guidelines for Acceptance	Standard	Corrective Action
Surface Hydrology	8.	Rehabilitation drainage patterns have been engineered to control surface runoff.	Drainage systems have been designed and constructed to effectively manage surface water flows and blend in with drainage patterns of adjacent landforms, where appropriate.	No uncontrolled water runoff or unacceptable soil erosion. Unacceptable erosion is that which: • Restricts access through the area by a four-wheel drive vehicle. • Is unstable and degrading; or • Will compromise land use objectives. Erosion is identified as part of the Lynas rehabilitation monitoring regime at 15-months and annually for the subsequent three years.	Rehabilitated areas that do not meet the standard will have remedial erosion control methods applied.
Soil Profile Reconstruction	9.	Spoil materials with chemical and / or physical properties that have potential to limit plant growth are identified and handled appropriately.	The depth and characteristics of surface topsoil are suitable for plant growth in terms of their structure, water holding capacity, and absence of materials that might affect plant growth or survival (i.e., they are suitable for establishing target vegetation communities and supporting the agreed final land use).	Sodic soil (white in colour) or other soil likely to inhibit plant growth is appropriately positioned within the final landform and are separated from the upper strata supporting plant growth.	Remedial earthworks may be required where inappropriate materials are placed in the final landform.
Soil Profile Reconstruction	10.	A suitable growth medium has been reconstructed in the upper soil profile to facilitate plant establishment and growth.	Topsoil has been replaced on the final rehabilitation landform.	A topsoil cover will be applied to the final landform.	Remedial earthworks may be required where the rehabilitation area has not received a minimum depth of growth medium in the remade upper profile.
Rehabilitation Surface Preparation	11.	Surface preparation is undertaken to prevent turbid water runoff and soil erosion and maximise the area for plant establishment within rip lines.	Ripping must be to a minimum depth of 400 mm depth, with at least three rip lines established behind each dozer pass.	Self-certification by Lynas via Rehabilitation Earthworks Compliance Checklist.	Remedial surface preparation to be completed where ripping does not meet required standard.

Criterion		Intent	Guidelines for Acceptance	Standard	Corrective Action
3. ESTABLISHING REHABILITATION (<15 months)					
Erosion	12.	There are no areas where early signs of surface erosion are likely to be exacerbated in the mid to longer term.	Qualitative visual site inspection is undertaken following significant rainfall or wind events.	The rehabilitation landform is stable and shows no visual evidence of uncontrolled surface runoff or commencement of soil erosion.	Undertake remedial earthworks aimed at removing the source problem and amend future landform design.
Vegetation	13.	Successful native seed germination and seedling establishment.	Native species from the seed mix have germinated consistently across the rehabilitation site, and planted seedlings are healthy.	Qualitative assessment of seed germination and seedling survival in the field confirms that native taxa have germinated consistently across the rehabilitation site and there are no signs of seedling decline.	Review surface rehabilitation for problem areas, and potentially undertake remedial sowing and planting.
Weeds	14.	Introduced (weed) species not impacting establishment of native plant taxa in the rehabilitation, or likely to pose longer term issues to development of the rehabilitation cover.	Self-certification by Lynas annually combined with feedback from annual rehabilitation monitoring program by independent botanist confirms rehabilitation does not support Declared Pests and environmental weeds are not impacting native species establishment.	Declared Pests (as defined under the *Biosecurity and Agriculture Management Act 1976*) and environmental weeds are not impacting on the establishment of native revegetation taxa.	Undertake appropriate weed control programs.
4. DEVELOPING REHABILITATION (15 months onwards)					
Landform Stability	15.	Final landforms are safe and structurally stable.	Rehabilitation surfaces are stable with no signs of gully erosion, tunnelling, accumulated silt in low lying areas, exposed subsoil.	Landforms show no visual evidence of slumping or areas inhibiting plant growth. No hazards to humans or wildlife have developed thorough erosion, subsidence, or otherwise.	Undertake remedial earthworks aimed at removing the source problem and amend future landform design.

Criterion		Intent	Guidelines for Acceptance	Standard	Corrective Action
Vegetation	16.	Appropriate foundation is in place for longer term vegetation development.	Rehabilitation areas to be monitored annually for the first three years following commencement, and on a triennial basis thereafter, until determined meet standard.	At 15 months no areas of rehabilitation greater than 0.01 ha without native vegetation cover.	Review surface rehabilitation for problem areas, and potentially undertake remedial surface preparation and direct sowing as required.
Vegetation	17.	Species richness levels support adequate diversity in developing rehabilitation.	As above	At 27 and 39 months species richness of native plant species to be at least 20 within rehabilitation blocks.	As above
Vegetation	18.	Long term monitoring of plant biodiversity parameters confirms mean values reflect a functional community.	As above	At 75 months, rehabilitation is progressing towards success, as evidenced by predicted trends for plant biodiversity values being monitored.	As above
Vegetation	19.	Creation of a self-sustaining heath community with selected attributes compatible with surrounding jarrah-marri forest.	As above	At 75 months, native revegetation cover is greater than 30 percent.	As above
Weeds	20.	Introduced (weed) species not impacting on development of the native vegetation cover.	Self-certification by Lynas confirms rehabilitation does not support Declared Pests, and environmental weeds are not impacting native species establishment.	Annual rehabilitation monitoring completed by a botanist at 15, 27, 39 and 75 months confirms that Declared Pests (as defined under the *Biosecurity and Agriculture Management Act 1976*) and environmental weeds are not impacting on development of the native vegetation cover.	Undertake appropriate weed control programs.

Criterion		Intent	Guidelines for Acceptance	Standard	Corrective Action
Resilience	21.	Vegetation is sustainable and resilient to likely impacts such as fire and drought.	Self-certification by Lynas confirms vegetation resilience.	At 75 months, monitoring confirms there is recruitment of native perennial species in the rehabilitation, as evidenced by flowering, fruiting, soil seed bank or second-generation seedlings. Rehabilitation has reached the age where tree species are likely to tolerate fire based on bark thickness, and understorey show the ability to regenerate post-fire. Rehabilitation monitoring has confirmed that rehabilitation can survive one or more seasons of low rainfall (total annual rainfall <50% of average, or more than two consecutive years of rainfall <75% of average) (or comparable definition of drought).	Reworking of areas that do not demonstrate resilience
5. CLOSURE					
Safety	22.	The site is safe for use by humans and wildlife under the agreed final land use.	All hazards that could endanger the safety of any person or animal have been identified and eliminated where practical. All residual safety and health hazards have been identified, controlled through appropriate active controls and appropriate isolations (e.g., fences) and warning signs have been put in place.	Written sign-off from DMIRS – Mining Environment Division.	All remaining safety hazards identified to be removed as required.

Criterion		Intent	Guidelines for Acceptance	Standard	Corrective Action
Weeds	23.	There are no Declared Pests (as defined under the BAM Act) present within the rehabilitation.	Mining activities has not led to a spread of weeds into surrounding undisturbed vegetation areas. * Weeds are defined as perennial invasive shrub or tree species that are unwanted and threaten to invade the surrounding native vegetation areas.	The annual rehabilitation monitoring program confirms that weeds rehabilitation areas do not support Declared Pests, and weeds are not spreading into surrounding state forest areas.	Undertake appropriate weed control programs.
Hydrology	24.	All mine drainage structures have been rehabilitated.	Relevant stream water quality standards are met.	Rehabilitated landforms are stable with no signs of recent erosion.	Sites that do not meet the standard must be reviewed to determine site specific corrective actions.
Contaminated Sites	25.	Contaminated sites need to be identified, assessed, and remediated.	Contaminated sites have been identified, assessed, and remediated as required.	All commitments relating to the identification and management of contaminated sites have been fulfilled, as per *Contaminated Sites Act 2003.*	Remediate sites that have not been accepted by DMIRS.
Ongoing Management	26.	Long-term management requirements have been addressed.	At the time mine closure is considered complete; site land management requirements will be no greater than those of areas prior to mining (or comparable unmined areas). Alternatively, where ongoing management actions are required at the time mine closure is considered complete, these areas will be identified in agreement with regulators, and provisions will be made to ensure that this additional management can be undertaken by either Lynas or the new land manager.	Agreements for long-term management responsibility are in place with end land use managers.	Lynas maintains management responsibility until a formal management agreement is in place with the new land manager.

9 CLOSURE IMPLEMENTATION

To simplify the closure implementation discussion, the components of the project at both Sites have been divided into several physically distinct domains which share the same attributes in terms of closure implementation and rehabilitation requirements. Table 9-1 summarises the project domains and features,

Table 9-1: Summary of Defined Closure Domains

Domain	Feature(s)
Access & Site Roads	• BSF access road • Processing plant road (REPF) • Compacted parking areas (REPF & BSF Sites) • All infrastructure associated with roads, including culverts and windrows (REPF & BSF Sites)
Rare Earth Process Plant Infrastructure	• Cracking and Leaching Plant • Electrical, water and gas utility connections • Hardstands, including concentrate and product storage • Reagent storage • Fuel Storage • Buildings
Critical Containment Infrastructure – Water	• Evaporation pond (REPF Site) • Storm water storage facilities (REPF & BSF Sites)
Critical Containment Infrastructure – By-Products	• IP Storage Facility (REPF Site) • Gypsum Storage Facility (REPF Site) • By-Products Storage Facility (combined gypsum and IP at BFS Site)

9.1 Closure Work Program by Domain

Sections 9.1.1 to 9.1.4 outline the work programs to be undertaken for each closure domain identified in Table 9-1. For each domain the following information is provided:

- Applicable land use objectives, landform designs, closure completion criteria, and/or performance indicators for each domain or feature;
- A schedule of work for research, investigation and trials tasks – showing key tasks and key milestones and approximate timing required for each task;
- A schedule of work for progressive rehabilitation tasks – showing key tasks and key milestones and approximate timing required for each task;
- Availability and management of closure material sources – including topsoil, competent material for rock armouring and subsoil;
- Identification and management of information gaps, including review of monitoring data and other data;
- Key tasks for premature closure;
- Decommissioning tasks – including management of contaminated sites; and
- A schedule of work for performance monitoring and maintenance tasks.

9.1.1 Access & Site Roads

9.1.1.1 Applicable Land Use Objective

To date no discussion with stakeholders has occurred with regards to the future of the access and site roads. It is expected that site access roads will remain in place from a strategic perspective to enable access to areas in the event of a fire etc. For site roads, particularly large haul roads it is expected that they will be removed, as they will potentially influence surface drainage patterns across the site. In areas where site roads are removed, they will be rehabilitated and returned to a natural ecosystem or General Industry PMLU.

9.1.1.2 Implementation of rehabilitation and closure works

Where roads are identified which will not be needed by post closure land use objectives, the road building materials will be excavated to the underlying *in-situ* soil profile and appropriately disposed of. Once the road building material has been removed the following rehabilitation works sequence will take place.

- Ripping or scarifying the soil surface to alleviate any vehicle compaction and improve the infiltration capacity of the surface soils.
- Ripping or scarifying should only extend to a depth of 150 mm as bringing the underlying subsoil to the surface should be avoided. The role of ripping and scarifying is simply to break any compaction layers and create an undulating soil surface that encourages vertical infiltration of rainfall and minimises surface water runoff.
- Spreading of any available previously cleared vegetation over the ripped and scarified area to provide fauna habitat.
- Rehabilitated road areas will be seeded with local endemic revegetation species identified from baseline surveys and the closure criteria development process.

9.1.1.3 Research and Trials

As the access and site roads will be one of the last project features to be removed and rehabilitated there is no opportunity for research and trials to be undertaken.

9.1.1.4 Performance monitoring and maintenance tasks

Where site roads are returned to natural ecosystems then the performance of the rehabilitation will be assessed as part of the overall site monitoring. The key maintenance tasks that are likely to be required are small-scale earthmoving tasks fixing up small erosional features.

9.1.1.5 Availability of Resources

During construction of the various roads, topsoil will be stripped and stockpiled adjacent to the road where possible, or within designated stockpile areas. Upon closure this topsoil will be used to cover the road footprint meaning no additional soil resources will be required. These areas will then be seeded with local endemic revegetation species which will be sourced from seed collectors working locally.

9.1.1.6 Identification and management of information gaps

There are no information gaps that could impact on the management of these areas.

9.1.1.7 Key Tasks for Premature Closure

In the unlikely event that the project is closed prematurely the access and site roads will remain intact as they could be used in the future to re-start the project.

9.1.2 Rare Earth Process Facility Infrastructure

9.1.2.1 Applicable Land Use Objective

As discussed, it is possible that the REPF Site may continue to be designated as General Industry land, however for the purposes of this preliminary MCP, the applicable land use objective is return to natural ecosystem.

9.1.2.2 Implementation of rehabilitation and closure works

The following implementation schedule is proposed for the Rare Earth Process Plant:

- Decommission all plant components to make safe for demolition.
- Demolition and removal of all above and below ground infrastructure.
- Undertake a contaminated sites assessment to establish the presence / absence and spatial extent of any contamination.
- Remove and appropriately dispose of any contaminated material.
- Re-instate the natural surface drainage patterns.
- Apply a thin soil cover (<50 cm thick) over retained below-ground concrete infrastructure.
- Deep rip all areas (where possible) to alleviate compaction.
- Seed with local revegetation species.

9.1.2.3 Research and Trials

As the process plant will be one of the last project features to be removed and rehabilitated there is no opportunity for research and trials to be undertaken.

9.1.2.4 Performance monitoring and maintenance tasks

Performance monitoring of the rehabilitation within the Process Plant area will be assessed as part of the overall site monitoring.

9.1.2.5 Availability of Resources

During construction of the various concrete footing pads required by the infrastructure, topsoil and subsoil will be stripped and stockpiled within designated stockpile areas. Upon closure this soil will be used to cover the infrastructure footprints where necessary meaning no additional soil resources will be required.

9.1.2.6 Identification and management of information gaps

Identified information gaps on closure implementation include the following:

- Optimal seed mix to promote sustainable rehabilitation and reinstate native ecosystem function.
- Seed application rates and timing to promote sustainable rehabilitation and reinstate native ecosystem function.

These information gaps will be addressed by carrying out small rehabilitation trials during the operations phase of the project or through information sharing agreements with surrounding land users with similar rehabilitation requirements.

9.1.2.7 Key Tasks for Premature Closure

The key tasks for premature closure involve making the Process Plant areas safe, stable, and removing hazardous materials and reagents within the plant or storage tanks with the potential for environment risk.

9.1.3 Water Storage Infrastructure

9.1.3.1 Applicable Land Use Objective

It is expected that the pre-mine land use for the project water storage infrastructure can be re-established. Therefore, the land-use objective is to reinstate the natural ecosystem.

9.1.3.2 Implementation of rehabilitation and closure works

Rehabilitation of the features within this domain will generally be the same and will involve the following steps:

- All pipelines, holding tanks and storm water drainage ponds to be dismantled and/or recycled and removed.
- Decontaminate, dismantle, and remove the evaporation pond and supporting infrastructure.
- Identification and remediation / removal of any contaminated soil or infrastructure to appropriate disposal locations.
- Reshaping of the land-surface to restore hydraulic function as far as practicable.
- Spreading of stored topsoil won prior to earthworks / excavation of material commencing.

- Ripping or scarifying the soil surface to alleviate any vehicle compaction and improve the infiltration capacity of the surface soils. Improving the infiltration rate of the surface soils will facilitate the remediation of areas affected by saline groundwater as the salts will be mobilised and dispersed into the soil profile reducing their effect on plant germination and early establishment.
- Spreading of previously cleared vegetation over the ripped and scarified area to provide fauna habitat. In these areas the cleared vegetation has typically been pushed to the side of the disturbance, therefore it can be simply respread over the area.
- Once the soil surface has been ripped or scarified it can be seeded with an appropriate native seed mix that takes into consideration the geomorphic position of the area and its hydraulic function.

9.1.3.3 Research and Trials

No rehabilitation trials are planned for this domain.

9.1.3.4 Performance monitoring and maintenance tasks

Monitoring of the rehabilitation progress will be carried out utilising industry standard quadrat vegetation monitoring plots which will be compared to appropriate analogue sites and data (see Section 10).

9.1.3.5 Availability of Resources

The topsoil present within each feature in this closure domain will be stripped to a depth of approximately 10cm and subsequently stored in nearby designated stockpile areas prior to excavation commencing. The stored topsoil will then be respread over the domain to a nominal depth of 10cm to restore the soil profile prior to ripping and seeding etc.

9.1.3.6 Identification and management of information gaps

Identified information gaps on closure implementation include the following:

- Optimal seed mix to promote sustainable rehabilitation and reinstate native ecosystem function.
- Seed application rates and timing to promote sustainable rehabilitation and reinstate native ecosystem function.

These information gaps will be addressed by carrying out small rehabilitation trials during the operations phase of the project or through information sharing agreements with surrounding land users with similar rehabilitation requirements.

9.1.3.7 Key Tasks for Premature Closure

The following key tasks have been identified to manage premature closure:

- Decontaminate, dismantle, and remove the evaporation pond and supporting infrastructure.
- Identification and remediation/removal of any contaminated soil or infrastructure to appropriate disposal locations.

9.1.4 By-Product Storage Facilities

9.1.4.1 Applicable Land Use Objective

It is expected that the pre-mine land use for the by-product storage facilities can be re-established. Therefore, the land-use objective is to reinstate as far as is practicable the natural ecosystem.

9.1.4.2 Implementation of rehabilitation and closure works

Based on the results of the Landform Evolution Modelling (LEM) the rehabilitation cover design prescriptions still require further study to determine the optimal cover design to ensure the By-Product Storage facility remains safe, stable, and non-polluting in the long term. Preliminary design prescriptions require that rehabilitated batter slope angles do not exceed 10° or 10 m in total height, with 10 m wide berms which are back sloped at an angle of 5° separating the batter slope sections.

As shown in discussed in Section 5.12, the provisional cover system for all By-Product Storage facility rehabilitated surfaces will consist of the following thickness of materials, listed from upper most to bottom:

- 10 cm of Topsoil
- 25 cm of Subsoil
- 50 cm of competent material for rock armouring, sourced from nearby mining operations, preferably granite or basalt.

The above generalised cover sequence may require small modifications but is the basis of the requirement to stabilise the rehabilitation surface and prevent exposure of the underlying dispersive, erodible, and slightly radioactive by-product material.

Given the desirability of covering exposed IP and gypsum material as soon as practicable to prevent dust management issues, the batter slopes of any underlying lift areas which are finalised will be rehabilitated during the construction of the remainder of the facility where possible.

This rehabilitation strategy provides opportunities for Research and Trials (Section 9.1.4.3).

9.1.4.3 Research and Trials

Where possible, areas of the facility which have reached final design capacity and can support final rehabilitation earthworks will be rehabilitated as soon as practicable and trials carried out to gather critical data for the refinement of completion criteria.

9.1.4.4 Performance monitoring and maintenance tasks

Monitoring of the rehabilitation progress will be carried out utilising industry standard quadrat vegetation monitoring plots which will be compared to appropriate analogue sites and data (see Section 10).

9.1.4.5 Availability of Resources

Where available, topsoil / subsoil present within each feature in this closure domain will be stripped and subsequently stored in designated stockpile areas.

A suitable volume of competent material for rock armouring will be sourced from nearby mining operations with abundant volumes of this resource. Ideally this material will not be delivered until required for direct placement on final surfaces however this will be subject to negotiations with relevant stakeholders.

9.1.4.6 Identification and management of information gaps

Identified information gaps on closure implementation include the following:

- Optimal seed mix to promote sustainable rehabilitation and reinstate native ecosystem function.
- Seed application rates and timing to promote sustainable rehabilitation and reinstate native ecosystem function.

These information gaps will be addressed by carrying out small rehabilitation trials during the operations phase of the project or through information sharing agreements with surrounding land users with similar rehabilitation requirements.

9.1.4.7 Key Tasks for Premature Closure

Given the low radioactivity of the IP material the key task in the unlikely event of premature closure is to cover all IP material to prevent transport of the IP material in response to ongoing wind and water erosion.

10 CLOSURE MONITORING AND MAINTENANCE

10.1 Overview

Closure monitoring and maintenance programs aim to meet the project closure obligations to achieve successful closure and meet legal obligations. The methodology and quality control of monitoring programs will be undertaken in accordance with relevant state and national guidelines and standards. The monitoring programs will be reported in Annual Environmental Reports (AER) and updated within the MCP until closure criteria has been accepted.

Mine closure developments and progressive changes will be captured in each iteration of the mine closure plan and closure financial provision. Closure monitoring programs will be periodically updated to capture these changes and ensure that present strategies are the most viable for achievement of identified closure objectives. Due to the early stage of the project and information gaps in some areas, the discussion on monitoring has been deliberately kept broad in nature, focussing more on the monitoring methods which are planned to be utilised rather than detail on the number of monitoring locations and laboratory analysis. Once key information gaps are filled, monitoring programs will be developed with adequate detail. Although fine detail has not been attempted to be developed, it is expected that key monitoring activities for the project will occur at least annually, or as otherwise determined by licence requirements. Future revisions of the mine closure plan may change the frequency of closure monitoring programs.

Closure monitoring programs will seek to assess the following overall outcomes:

- The progress of rehabilitation and compliance with completion criteria.
- Impacts on final land use objectives.
- Requirement for maintenance or remedial works.
- Effectiveness, efficiency, and sustainability of rehabilitation methods used.

10.2 By-Product Storage Facility and Site Safety

All rehabilitation earthworks will be verified by survey control. Rehabilitation specifications will be detailed in rehabilitation procedures specific to the closure domain.

The BSF will be geotechnically inspected for stability during closure monitoring. Inspections are to include, but are not limited to:

- LiDAR survey
- Visual inspection
- Wall and/or slope stability
- Settlement
- Cover system integrity
- Erosion impacts

All inspection conclusions are to be documented periodically until closure completion criteria is achieved and tenements are relinquished.

10.3 Groundwater Monitoring

Monitoring will be completed to assess the levels and quality of groundwater. The monitoring programs implemented during the project operations will be continued throughout closure using the same sample points and analysis parameters.

Given the nature of geology underlying the sites, the depth to groundwater and its quality, the risk of impact from the project activities on the regional groundwater is considered negligible. Although this is the case, monitoring of the three bores at the REPF Site and three new bores at the BSF Site will be undertaken to confirm that project activities have not adversely impacted on the local groundwater.

It is anticipated that DWER will prescribe, in consultation with Lynas, the necessary water monitoring to be undertaken for this project. Once established, Lynas will ensure that licence conditions relating to this water monitoring are satisfactorily met, with results presented in the AER and updated continuously within the MCP.

10.4 Flora and Vegetation Monitoring

A progressive flora and vegetation rehabilitation monitoring program will be developed prior to closure and in accordance with the timeframes set out in the gap analysis to assess vegetation establishment and progression towards satisfying closure criteria.

Flora and vegetation monitoring will assess weed populations, vegetation establishment and growth and overall rehabilitation success. Monitoring of flora and vegetation is required to compare site performance to closure criteria. Success indicators to be measured include but are not limited to:

- Species diversity
- Plant density
- Vegetation (foliage) cover
- Presence of weeds
- Litter/debris cover
- Erosion status
- Grazing impact

Rehabilitation monitoring will be compared between undisturbed (analogue) and rehabilitated areas of the project. This comparison allows the assessment of whether a rehabilitated area is progressing towards baseline vegetative levels recorded at the analogue site of the project. Proximate and distant analogue sites will either be established by Lynas or the information gathered via an information sharing agreement with surrounding land users to allow comparison.

Monitoring transects will be established throughout the life of the project where progressive rehabilitation allows.

Monitoring will use a series of plant biodiversity parameters such as species richness and diversity, plant density and percentage cover as indicators of ecosystem development and stability, which is endorsed by the EPA (2006). Qualitative assessment of the developing rehabilitation will be undertaken on a regular basis during the first growing season following establishment, and up to 15 months of age. Seed germination, plant establishment and survival, species diversity and weed establishment will be key parameters monitored during this period. Quantitative monitoring of rehabilitation will commence in the second spring (September) following rehabilitation (15 months), and continue on an annual basis until the third assessment at which time the monitoring interval will be extended to a triennial basis (once every three years).

Rehabilitation blocks will be sampled with adequate replication to ensure the data is representative of the revegetation present across the entire area. The monitoring procedure will involve assessment of permanent belt transects of twenty contiguous 1 m square quadrats. A GPS location of the commencement point and orientation of each transect will be recorded and photo monitoring point established. The twenty 1 m^2 quadrats along each transect line will be assessed individually. For each species within a quadrat the number present, percentage ground cover, and maximum plant height will be recorded. Summarised data will provide mean density values (no. of plants per square metre), mean percentage ground cover, and mean maximum plant height.

10.5 Fauna Monitoring

Native fauna monitoring assesses the presence of species of national and state significance at the project sites and immediate surrounding environment. Terrestrial fauna monitoring will be used to mitigate impact monitor potential changes to the fauna at the project sites and to ensure that the post-closure site is conducive to local fauna requirements.

Closure fauna monitoring programs shall be undertaken in accordance with the Environmental Protection Authority Statement of Environmental Principles, Factors and Objectives (EPA 2016a), Environmental Factor Guidelines – Terrestrial Fauna (EPA 2016b), Technical Guide – Terrestrial Fauna Surveys (EPA 2016c) and the Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA & DEC 2010).

Assessment of parameters relating to fauna re-colonisation will be assessed within individual 1 m^2 quadrats along each permanent transect line being monitored; this will be done at the same time as plant biodiversity parameters are being assessed.

A ‘ground layer assessment’ will record cryptogam cover and fine and coarse litter cover. ‘Biological activity’ will be inferred by recording the number of ant and spider holes, the number of lizard burrows, and number of scats (by species) along the length of each belt transect. Summarised data for each rehabilitation block will provide mean % cryptogamic cover, mean % fine and coarse litter cover, density of ant holes, spider holes, and lizard burrows, and density of animal scats (by species).

11 FINANCIAL PROVISIONING FOR CLOSURE

The financial provisioning for closure will be estimated based on the methodology outlined in the Mine Rehabilitation Fund (MRF) Regulations 2013 and the associated MRF Guidance Document (2013). The Rehabilitation Liability Estimate Calculator was used to establish the Rehabilitation Liability Estimate (RLE) for each activity type or category, based on the specified Unit Rates in the Schedule 1 of the MRF Regulations 2013 and the disturbance areas.

Given the early stage of the project, site specific closure costs are still being finalised are subject to ongoing detailed design workstreams currently underway.

This information will be available and incorporated in the next version of the MCP which will support the Mining Proposals for the REPF and BSF.

12 MANAGEMENT OF INFORMATION AND DATA

A closure, environment and community database will be developed by Lynas to capture baseline data, project operational records, logistical and site management procedures within a centralised framework for the effective management of information and data relevant to closure. All information will be stored on a central database.

In addition, a detailed Quality Management System (QMS) in alignment with ISO 9001:2015 will be developed for the project (WAMR 2019). Lynas is further committed to developing an electronic information management system for the project (and closure domains) with consideration to progressive mine closure planning guidelines.

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