# Decision Report

## Application for a works approval

**Division 3, Part V *Environmental Protection Act 1986***

| | |
|---|---|
| **Works approval number** | W6567/2021/1 |
| **Applicant** | Lynas Kalgoorlie Pty Ltd |
| **ACN** | 053 160 302 |
| **File number** | DER2021/000366 |
| **Premises** | Lynas Kalgoorlie Rare Earths Processing Facility<br>70 Johns Rd<br>YILKARI WA 6430<br><br>Legal description –<br>General Purpose Lease G26/169 |
| **Date of report** | 8 February 2022 |
| **Status of report** | Final |

# 1. Purpose and scope of assessment

Lynas Kalgoorlie Pty Ltd (the applicant / Lynas) proposes to construct and operate a new rare earths processing facility (REPF). An application for works approval was submitted under Division 3 Part V of the *Environmental Protection Act 1986* (EP Act) on 23 June 2021.

This report sets out the delegated officer's assessment of potential risk events arising from emissions and discharges during construction and operation of infrastructure relating to the prescribed activity.

In completing the assessment documented in this report, the department has considered and given due regard to its regulatory framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

# 2. Application details

## 2.1 Overview

The Lynas Kalgoorlie REPF is a rare earths processing facility proposed to be developed by Lynas on the outskirts of Kalgoorlie. The REPF will separate and process rare earth (RE) concentrate from Lynas' Mt Weld rare earths mine near Laverton, to produce an RE carbonate product for export to Lynas' advanced materials plant in Malaysia.

The project has been awarded 'major project' status by the Commonwealth government and 'lead agency' status by the Western Australian government, with its approvals processes being overseen by the Department of Jobs, Tourism, Science and Innovation (JTSI). The project is time critical due to Lynas' commitment to the Malaysian government to relocate its existing RE processing operations in Kuantan, Malaysia, to Kalgoorlie by July 2023.

The Environmental Protection Authority (EPA) determined to assess the proposal at the level of Referral Information with updated referral document and additional information required (4-week public review) and published its report on 20 October 2021 (EPA Report 1712). Ministerial Statement 1181 (MS 1181) was subsequently issued on 1 February 2022.

Table 1 describes the prescribed premises category that the application is subject, as defined in Schedule 1 of the Environmental Protection Regulations 1987.

**Table 1: Prescribed premises category**

| Classification of premises | Assessed throughput (as per application) |
|---|---|
| Category 44: Metal smelting or refining: premises on which metal ore, metal ore concentrate or metal waste is smelted, fused, roasted, refined or processed. | 162,000 tonnes (of RE concentrate, dry tonnes) per annual period, to produce 68,000 tonnes (of RE carbonate, dry tonnes) per annual period |

## 2.2 Proposal details

The REPF is a heavy industrial facility that will receive and treat RE concentrate from the Mt Weld mine to produce a solid RE carbonate product via a cracking and leaching process.

RE concentrate will be reacted with sulfuric acid and heated in a rotary kiln to convert the RE phosphate to a RE sulfate, which will then be leached in water and neutralised with magnesium oxide to precipitate impurities such as iron and phosphorus. The RE solution will then be filtered and either precipitated as an RE carbonate or sent to the next stage for solvent extraction in Malaysia. A process overview is provided below as Figure 1.

Process by-products, namely iron phosphate (IP) and gypsum will be temporarily stored on the premises and periodically returned to the Mt Weld mine site for long-term disposal. Brine discharge from treatment of process water will also be contained on the premises in evaporation ponds.

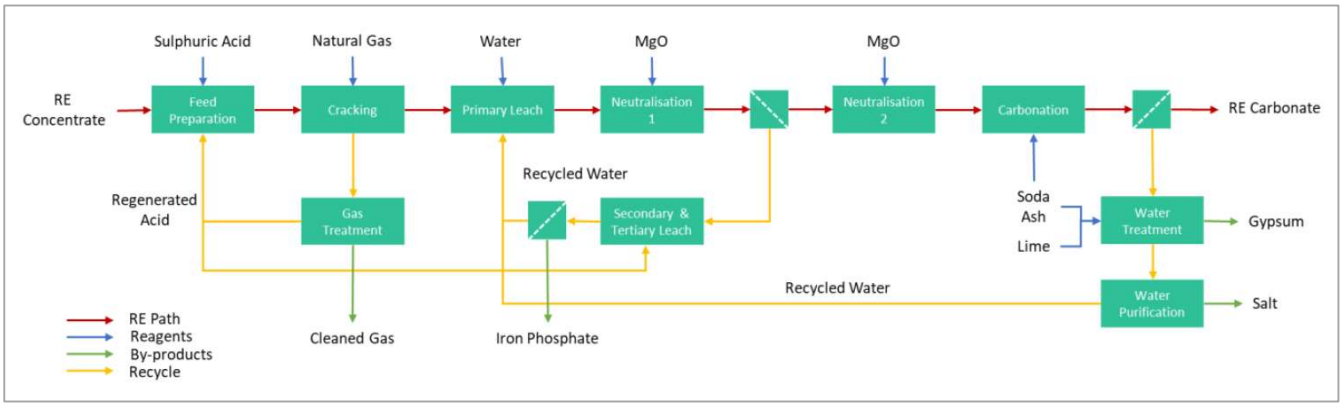


***Figure 1: REPF process flow***

### 2.2.1 Cracking and leaching plant

Raw materials handling, delivery and storage

RE concentrate will be transported from the Mt Weld mine to the premises in closed containers, with handling at the premises undertaken by a tippler which is hooded and drafted through a bag filter to eliminate dust.

RE concentrate will remain in sealed containers and be stored on an engineered hardstand in a container yard located adjacent to the feed hopper and feed conveyor, to minimise handling and dust generation.

RE carbonate product from the REPF will be packaged in closed containers and transported by rail to the Port of Fremantle for export.

Cracking and leaching process

Stored RE concentrate will be gravity fed into a feed hopper via tippler unit and conveyed into an acid mixing tank located above the kiln, where it will be mixed with concentrated sulfuric acid. This mixture will then be fed into a rotary kiln and heated to about 600°C as part of the cracking process, forming a soluble RE sulfate.

Cracked material will be discharged from the kiln into a primary leach circuit where the RE sulfate will be dissolved in water, leaving insoluble material in suspension. The slurry from the primary leach will then be neutralised with magnesium oxide (magnesia, MgO) to a pH of about 3.5 which precipitates iron, phosphate and some aluminium, leaving the REs in solution.

The resulting slurry will be filtered producing a filter cake that 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 dried in an on-site storage facility (see section 2.2.2). The filtrate will be recycled back to the primary water leach circuit to recover REs.

An RE carbonate precipitate will be produced from the neutralised RE sulfate solution, that will be filtered and bagged for shipping.

Flue gas treatment

Gases from the kiln 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 that will be recycled to secondary leach and used to recover unreacted RE minerals.

An emergency gas scrubbing system comprising a packed tower and caustic scrubbing will also be installed as a backup, in the event of any failure of the primary gas treatment system.

Secondary containment

Secondary containment will be constructed for all tanks and storage areas containing

hazardous materials, including hydrocarbons, chemicals and reagents, and will comprise several different forms including prefabricated concrete bunds, concrete bunds constructed on-site, built-in metal containment bunds (i.e., within a self-contained skid) and double-skinned tanks. All containment will meet the design principals of AS 1940.

Site drainage

The site has been designed and will be operated to achieve zero water discharge from the premises, with potentially contaminated runoff from the plant area segregated from clean stormwater and directed to a stormwater retention pond with 1:100 year, 72-hour AEP design capabilities. All other dams, ponds and storage facilities will be contained within bunds designed for 1:100 year, 72-hour storm events and do not require drainage.

Uncontaminated stormwater will be diverted from operational areas at the site and directed to natural downstream drainage in a manner that prevents increased rates of sedimentation and erosion.

Hazardous materials storage

Several hazardous chemicals and reagents are required to support on-site activities, with the largest being a 30,000 L self-bunded diesel storage tank. Other hazardous chemicals and reagents, such as caustic soda and sulfuric acid, will be stored within carbon steel tanks and silos, in bunded areas in accordance with the storage requirements contained in AS 1940.

### 2.2.2 By-products management

Iron phosphate (IP)

IP by-product is the solid material produced after filtering of the primary leach solution that will comprise of iron, aluminium, phosphorus and residual RE from the concentrate. It will also contain naturally occurring radioactive materials (NORM) in the form of thorium and uranium, at similar radiation levels to that of the Mt Weld concentrate, ore and tailings (specific activity ~6.5 Bq/g). Under the National Directory for Radiation Protection (RPS C-6) (ARPANSA 2018), a material is deemed to be radioactive if the concentration of the Th-232, U-238 and U-235 decay chains exceeds 1.0 Bq/g. The IP by-product is therefore classified as radioactive with respect to this definition. For context however, the IP by-product remains below specified activity levels for transporting NORMs (10 Bq/g), making it an exempt product for placarding during transport (DMP, 2010).

IP will be produced as a wet solid cake discharge from a pressure filter, that will initially be stored on the premises within an engineered conditioning and storage facility, prior to being returned to the Mt Weld mine site for long-term disposal.

Key elements of the IP storage design criteria:

- dry stacking facility with internal process liquor storage pond (sump);
- dual liner design with leak detection between the liners;
  - 2.0 mm thick HDPE geomembrane as primary upper liner;
  - 5.5 mm thick geosynthetic clay liner (GCL) as secondary lower liner;
  - under-liner leak detection system, consisting of a geonet between the two liners, draining at a minimum grade of 1% towards a central leak detection/extraction sump;
- 500 mm operational freeboard, allowing for 1:100 year, 72-hour AEP storm (211 mm);
- storage capacity – 230,000 $m^3$;
- maximum IP storage height – 20 m (assumed saturated density of 20 $kN/m^3$);
- process liquor storage – 15,000 $m^3$;
- process liquor storage, design pond depth – 8.4 m.

Any liquor coming from the IP stockpile, either as leachate from the stored material or runoff during a rain event, will be collected in the process liquor storage pond and reclaimed for re-use within the process for water leach. The applicant expects the storage pond will normally be dry, given IP will essentially be dry stacked and the applicant's intention to maximise water

recycle.

The applicant expects the annual amount of IP stockpiled on the premises to be in the vicinity of 60,000 dry tonnes after year 1, increasing to 88,000 dry tonnes each in years 2 and 3, after which it will become market dependent. There is sufficient on-site capacity for dry stacking of IP by-product for the first 5 years of operation, before off-site removal is required.

Gypsum storage

Wastewater from gas treatment and RE carbonate production will be neutralised with calcium oxide (quicklime) to form gypsum. The resulting slurry will be pumped to engineered storage ponds on the premises, where gypsum will settle out and the supernatant water recovered for treatment and re-use in the process.

Key elements of gypsum storage design criteria:

- slurry deposition system with settling and water recovery;
- single primary liner, comprising 2.0 mm thick HDPE geomembrane;
- above liner underdrainage will be installed on top of the HDPE geomembrane, with collectors draining to an underdrainage collection sump at the lowest point;
- 300 mm operational freeboard, allowing for 1:100 year, 72-hour storm event (211 mm);
- 2 x ponds, with 1,600,000 $m^3$ (pond 1) and 1,620,000 $m^3$ (pond 2) storage capacity;
- pond wall height – 10 m.

Water treatment

Supernatant water recovered from the gypsum storage ponds will be softened with sodium carbonate (soda ash) and treated through a reverse osmosis plant to allow full water recovery and recycling back into the process. The raffinate (brine) discharge from this process, which will contain sodium and magnesium sulfate salts, will be pumped to lined evaporation ponds on the premises.

Key elements of evaporation pond design criteria:

- used for evaporation of the brine discharge from water treatment – expected volume 0.83 GL/yr at maximum production capacity of 900 tonnes per month (tpm) neodymium-praseodymium (NdPr);
- single primary liner, comprising 2.0 mm thick HDPE geomembrane;
- 300 mm operational freeboard, allowing for 1:100 year, 72-hour storm event (211 mm);
- 3 x ponds, each with 370,000 $m^3$ storage capacity;
- total pond area – 32.7 ha;
- pond wall height – 1.5 m;
- maximum water depth under normal operation – 0.63 m during (wetter months).

## 2.3 Construction and commissioning

### 2.3.1 Construction schedule

The applicant anticipates most of the construction at the REPF will occur during the first half of 2022, with construction of the second gypsum storage facility (stage 2) to occur around 2028.

The applicant has allowed for a construction phase duration of at least 18 months from the date of issue of the works approval. Compliance documentation will be submitted progressively as construction of key infrastructure is completed.

To reduce on-site construction time, some REPF systems and infrastructure will be transported to site in modular form. Most buildings associated with the REPF are also likely to be prefabricated and pre-fitted before transportation to site, however there will be some systems, infrastructure and buildings that will require on-site assembly.

### 2.3.2 Commissioning

Commissioning is scheduled to commence by mid-2022, with the applicant allowing for a commissioning phase duration of at least 18 months from the completion of construction and submission of commissioning reports. The delegated officer notes the plant must be fully operational by July 2023 for Lynas to meet the deadline specified by the Malaysian government.

REPF commissioning will begin with leach/water circuits downstream of the kiln, in preparation for when the kiln reaches temperature and then feed onto the kiln.

The initial treatment of RE concentrate and the contained NORM will introduce a radiation source above background levels to the site, which will initiate the full application of the Radiological Management Plan (RMP) and proposed radiation monitoring program.

As agreed with the applicant, an environmental commissioning plan was not required to be submitted with the application, however a plan will be required to be submitted at least 3 months prior to the commencement of commissioning, as a condition of the works approval.

## 2.4 Operational aspects

### 2.4.1 Air emissions

The REPF has both point source and fugitive emission sources. This risk assessment focuses on the air emissions that may present a risk to public health, including the following process gases: sulfuric acid ($H_2SO_4$), hydrogen fluoride (HF), hydrogen chloride (HCl), chlorine ($Cl_2$), combustion gases: oxides of nitrogen ($NO_X$), sulfur dioxide ($SO_2$), carbon monoxide (CO), and particulate matter: $PM_{10}$ and $PM_{2.5}$.

Point sources of air emissions will include (Figure 2):

- gas treatment stack – primary point source of air emissions, after treatment of gases from the kiln. Emissions to air will be continuous whilst the plant is operational. Pollution control equipment includes a combination of two venturi scrubbers, spray tower and WESP. Emissions include process gases ($H_2SO_4$, HF, HCl, $Cl_2$), combustion gases ($NO_X$, $SO_2$, CO) and particulate matter ($PM_{10}$ and $PM_{2.5}$);
- concentrate transfer hopper – operates intermittently during loading of RE concentrate into feed hopper. Pollution control equipment includes an extraction system discharging via a baghouse filter to minimise fugitive dust during handling. Emissions include particulate matter ($PM_{10}$ and $PM_{2.5}$);
- quicklime storage silo – operates on a batch basis, once every 2 hours. Pollution control equipment includes a bag filter to minimise fugitive dust during transfer. Emissions include particulate matter ($PM_{10}$ and $PM_{2.5}$);
- magnesia (MgO) neutralisation circuit – operates continuously whilst primary leach is operating. Pollution control equipment includes a bag filter to minimise fugitive dust during loading. Emissions include particulate matter ($PM_{10}$ and $PM_{2.5}$);
- MgO silos (3) – operates on a batch basis, once every 90 minutes. Pollution control equipment includes a bag filter to minimise fugitive dust during transfer. Emissions include particulate matter ($PM_{10}$ and $PM_{2.5}$);
- quicklime scrubber – operates on a batch basis, for 30 minutes every 3 hours. Emissions include HCl and particulate matter ($PM_{10}$ and $PM_{2.5}$);
- soda ash storage silo – operates on a batch basis, for 30 minutes every 2 hours. Pollution control equipment includes a bag filter to minimise fugitive dust during transfer. Emissions include particulate matter ($PM_{10}$ and $PM_{2.5}$);
- emergency diesel generators (3) – power will be supplied by one generator for black start of the facility and possibly during construction/commissioning and maintenance. Outside of these times, it is expected the generators will only be periodically started for maintenance. The generators are each rated at 2,250 kVA, with emissions including combustion gases ($NO_X$, $SO_2$, CO) and particulate matter ($PM_{10}$ and $PM_{2.5}$).

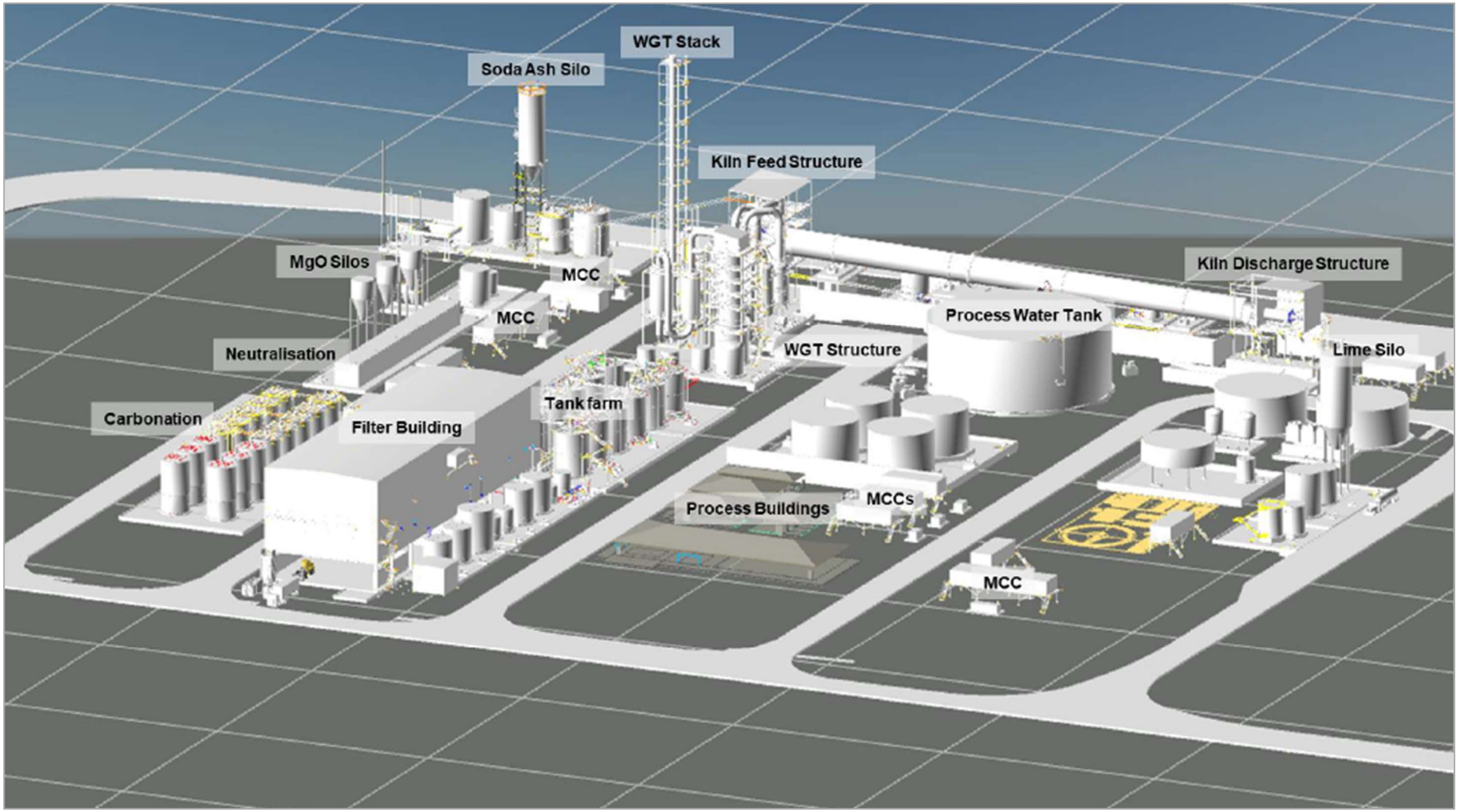


***Figure 2: REPF plant area indicative key infrastructure and emission points***

Expected air emissions

Expected emission rates during operation of the REPF are summarised in Table 2 and have been provided in terms of normal operations and worst-case plant conditions. Normal operations include a conservative representation of the REPF operations at full capacity, and worst-case plant conditions represent the plant in upset conditions preparing to shut down, with the backup generators and emergency wet scrubber both operational.

Emission rates for each component have been derived from several sources, including stack testing results from Lynas' plant in Malaysia and design specifications from the equipment itself.

## 2.5 Exclusions to this assessment

The following matters are out of the scope of this assessment and have not been considered within the technical risk assessment detailed in this report:

- return of IP and gypsum by-products to the Mt Weld mine site (for disposal);
- concrete batching, where batching is done on the premises and for use at the premises;
- preparatory works unrelated to the prescribed activity, such as clearing (refer to Table 3), levelling and construction of access roads, carparks, laydown areas, office buildings, workshops, warehouse/storage, and construction of hardstands for use in construction works;
- on-site wastewater (sewage) and municipal waste disposal;
- vehicle movements on public roads.

The works approval is related to category 44 activities only and does not offer the defence to offence provisions in the EP Act (see s.74, 74A and 74B) relating to emissions or environmental impacts arising from non-prescribed activities, including those listed above.

# 3. Legislation context and other approvals

**Table 3: Relevant approvals**

| Legislation | Approval |
|---|---|
| Part IV of the EP Act | • Full proposal – EPA Report 1712 published 20 October 2021 (Referral Information with updated referral document and additional information). Ministerial Statement 1181 issued 1 February 2022<br>• Consent for 'minor or preliminary works' – March 2021 |
| *Mining Act 1978* (WA) | • General purpose lease granted by DMIRS in October 2020 (G26/169), which allows for the REPF to be applied for and assessed via mining proposal;<br>• Mining proposal for processing plant – under assessment |
| *Mines Safety and Inspection Act 1994*<br>*Radiation Safety Act 1975* | • Radiation Management Plan (LYNAS-WA-000-PM-PP-0014_1) approved by DMIRS in April 2021 |
| Environmental Protection (Clearing of Native Vegetation) Regulations 2004 | • Clearing permit (CPS 8322/1) previously issued in 2019 (expired April 2021);<br>• Clearing for REPF proposal has also been considered by EPA under Part IV assessment |
| *Environment Protection and Biodiversity Conservation Act 1999* (Cth) | • The proposed action is not a controlled action (Ref: 2020/8719) |

**Table 2: Source parameters and emission rates for the proposed REPF during normal operations and worst-case plant conditions**

| Emission source | WGT stack | Concentrate transfer baghouse | Quicklime storage silo baghouse^ | MgO neutralisation circuit baghouse | MgO silo baghouses^ | Quicklime scrubber | Soda ash storage silo^ | Emergency diesel generator |
|---|---|---|---|---|---|---|---|---|
| Installed units | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 3 |
| Operating units | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 |
| Stack height (m) | 60 | 25 | 34.5 | 25 | 23 | 8 | 33 | 10 |
| Stack internal diameter (m) | 1.9 | 0.7 | 0.2 | 0.3 | 0.17 | 0.2 | 0.2 | 0.45 |
| Exit velocity (m/s) [per unit] | 8.1 | 20 | 14.6 | 20 | 20 | 14.6 | 12 | 35.5 |
| Actual flow ($m^3$/hr) | - | - | 1,650 | 5,000 | - | - | 1,400 | - |
| Temperature (°C) | 61 | 32 | 50 | 35 | 45 | 50 | 50 | 350 |
| **Mass emission rate (g/s)** | | | | | | | | |
| TSP | - | 0.38064* | 0.022917 | 0.06944* | 0.0229 | 0.02292* | 0.0194 | - |
| $PM_{10}$ | 1.9 (2.1) | 0.25503* | 0.009167 | 0.02778* | 0.0092 | 0.00917* | 0.0078 | 0.68* |
| $PM_{2.5}$ | - | 0.14464* | 0.002292 | 0.00694* | 0.0023 | 0.00229* | 0.0019 | - |
| $SO_2$ | 3.2 (7.1) | 0.01523* | - | - | - | - | - | - |
| $NO_X$ | 2.9* | - | - | - | - | - | - | 21.47* |
| CO | 5.7* | 0.03806* | - | - | - | - | - | 3.16* |
| $H_2SO_4$ mist | 1.5* | 0.02284* | - | - | - | - | - | - |
| HF | 0.05* | 0.00038* | - | - | - | - | - | - |
| HCl | 0.2* | 0.00076* | 0.000458 | - | - | 0.00046* | - | - |
| $Cl_2$ | 0.2* | - | - | - | - | - | | - |

** No change in emission rates predicted under worst-case plant conditions.*
*^ No emissions under worst-case plant conditions – baghouses would be shut down.*

## 3.1 Part IV of the EP Act

### 3.1.1 Background

The REPF proposal was referred to the EPA in September 2020 under section 38 of the EP Act. In November 2020, the EPA decided to assess the proposal and set the level of assessment at Referral Information with updated referral document and additional information required, with a 4-week public review period.

The EPA advertised the level of assessment for the proposal for public comment in October 2020 and received 27 submissions, with most submissions requesting the proposal be assessed at the level of Public Environmental Review.

The referral information was released for public review from 9 June to 7 July 2021. A total of 17 public submissions and 2 agency comments were received, with the key issues relating to:

- proximity of the facility to residential areas;
- radiation and safety;
- Lynas' performance in Malaysia;
- loss of vegetation;
- visual amenity; and
- lack of community consultation.

The EPA published its final report on the assessment (EPA Report 1712) in October 2021. A total of 3 appeals were subsequently lodged in objection to the contents and recommendations of the report, with the key issues relating to the assessment of hazardous chemicals and radioactive material and consultation, and inadequate regulation of these aspects.

The Minister allowed the appeal in part in December 2021, to the extent of ensuring that storage of low level radioactive iron phosphate waste at Lot 500 is temporary, and requiring the EPA to provide further advice about aspects of the proposal that it considered would be regulated by other authorities.

The project was approved by the Minister on 1 February 2022 through the issuing of MS 1181.

### 3.1.2 Minor or preliminary works

In December 2020 the applicant sought the EPA's consent to undertake preparatory works under section 41A(3) of the EP Act, relating to preliminary construction activities at the site (e.g. site access, kiln pad and laydown, borrow area, etc.). The request was related to the applicant's timeframe to have its RE processing operation moved from its existing facility in Malaysia by 2023, and to enable civil and earthworks outside of the dry, windy summer months to reduce the potential impact of dust on nearby receptors.

The EPA consented to the minor or preliminary works in March 2021 after considering the scale of the proposed works, which it deemed unlikely to have a significant effect on the environment.

## 3.2 Part V of the EP Act

### 3.2.1 Clearing of native vegetation

Clearing of native vegetation in Western Australia requires a clearing permit unless exemptions apply. Under Schedule 6 of the EP Act, clearing assessed under section 40 of the EP Act as part of a proposal referred under section 38 does not require a clearing permit, providing the clearing is done in accordance with the implementation agreement or decision.

The delegated officer notes there is an expired clearing permit for Lot 500 (CPS 8322/1). This permit was issued to the City of Kalgoorlie Boulder (City) prior to the Lynas proposal, for clearing of up to 134.9 ha of native vegetation for pending industrial land uses (i.e., former lithium hydroxide proposal, which has since been revoked).

# 4. Consultation

The application was referred to relevant public authorities and advertised for public comment on the department's website during July 2021. No public submissions were received during the specified timeframe.

The Department of Mines, Industry Regulation and Safety (DMIRS) advises the applicant has satisfactorily addressed its requirements in relation to the radiation impact assessment for the project and management of potential radiation exposures arising from the proposed operation, including the proposal for interim storage of IP by-product on the premises. A mining proposal for the REPF is currently under assessment.

The Department of Planning, Lands and Heritage (DPLH) advises Lot 500 was broadly identified for industrial land uses when it was rezoned in 2019 and it therefore supports the proposal. DPLH also advises the two closest residential properties along the northern boundary of the site are zoned for industrial purposes and are now considered non-conforming uses, in which they can continue to be used for residential purposes but cannot be extended or redeveloped. DPLH understands the applicant is seeking to purchase, or may have already purchased, nearby residential properties to provide greater buffer distances from sensitive land uses.

JTSI advises it has been working closely with the applicant throughout the ongoing development of the project, which has recently received additional funding as part of the Australian Government's modern manufacturing initiative to include a RE carbonate refining process that will produce a higher purity RE product for export.

The City advised at the time that Lynas had yet to apply for approval under the health regulations for sewerage produced at the REPF, however approval has since been obtained (August 2021).

# 5. Environmental siting

The premises is located about 8 km west of the Kalgoorlie central business district, within an emerging industrial area. The site is subject to General Purpose Lease G26/169, which is 134.7 ha in total area and comprises all of Lot 500 on Plan 63577, Great Eastern Highway, which was formerly vacant crown land prior to being purchased by Lynas.

The local area is characterised as an extensive plateau of low relief on the granitic rocks and greenstone of the Yilgarn Craton. It is considered to have a semi-desert Mediterranean climate with 9 to 11 dry months; mean annual rainfall is in the 250-300 mm range, with most tending to fall in winter. There are no permanent rivers; intermittent streamflow occurs only after major rainfall and the water runs into large claypans or playa lakes. Groundwater is saline to hypersaline, and occurs in the bedrock, palaeochannels and in overlying alluvial, colluvial and calcrete deposits. There is no fresh groundwater in the region – limited areas of brackish groundwater can occur in the upper reaches of some catchments.

**Table 4: Relevant sensitive land uses and specified ecosystems**

| **Human receptors** | **Distance from site** |
|---|---|
| Single dwellings | The nearest dwellings, which are industrial caretaker residences, are located about 110 m north of the premises boundary;<br>The next nearest dwellings are located about 1.5 km west and 3 km north-east of the premises and comprise a mixture of residential and industrial caretaker residences. |
| Population groups (residential) | The nearest population group is within the Kalgoorlie townsite, about 3 km north-east of the premises. |
| **Environmental receptors** | **Description** |
| Flora and vegetation | All flora and fauna species, vegetation types and habitat are well represented outside of the development envelope. Flora and |

| | |
|---|---|
| | vegetation are in good condition. |
| Surface geology | Soils are red loamy earths; sandy clay near the surface (top 30-50 cm), underlain by clay with weathered bedrock at least 40 mbgl.<br>Surface soils are relatively impermeable due to high composition of laterite and clay derived from weathered bedrock, which will restrict infiltration and lead to high rainfall runoff across the site as shallow overland flow. |
| Groundwater | Depth to groundwater at the site varies between 32 to 36 mbgl. Quality is poor (EC ~84,000 µS/cm).<br>Local groundwater flow is southwest towards the Hannan palaeodrainage and associated playa lakes 6.5 km southwest of the premises. |

# 6. Modelling data

## 6.1 Air emissions assessment

### 6.1.1 Air dispersion model

The applicant engaged consultant Environmental Technologies & Analytics to undertake air dispersion modelling for the project (ETA 2021). Version 7 of the CALPUFF air dispersion model was used to assess the potential air quality impacts of atmospheric emissions from the project, comparing the ground level concentrations (GLCs) predicted at sensitive receptor locations against relevant ambient air quality criteria.

### 6.1.2 Results

The modelling indicates the current (2021) National Environment Protection Measure (NEPM) standard for 1-hour $SO_2$ is likely to be occasionally exceeded in Kalgoorlie as a function of background concentrations and other existing $SO_2$ sources, which reflects the constrained nature of the local airshed. The applicant considers that emissions from the REPF will not contribute to exceedances of $SO_2$.

The modelled results have been presented against various criteria for comparative purposes, including the current NEPM standards for $SO_2$ and $NO_2$. The applicant considers that whilst the background concentrations are the main contributors to modelled exceedances, emissions from the REPF will not contribute to existing exceedances:

- for maximum ground level concentrations across the model domain (refer to Figure 3 for location of sensitive receptors):
  - predicted concentrations from the REPF only (excluding background) are well below the current (2021) NEPM criteria, with the highest being $SO_2$ (24-hour) at 12.9% of the criteria;
  - non-project cumulative emissions dominate the profile, with results generally around 100% for $SO_2$ (1-hour), and less than 50% for $NO_2$ (1-hour) and $SO_2$ (24-hour); and
  - short-term, infrequent worst operating conditions (cumulative) are predicted to be over 100% for $NO_2$ (1-hour) and $SO_2$ (1-hour), and over 50% for $SO_2$ (24-hour);
- for maximum ground level concentrations for identified discrete receptors:
  - predicted concentrations from the REPF only (excluding background) are well below the current (2021) NEPM criteria at all identified sensitive receptor locations, with the highest being $SO_2$ (24-hour) at 11.75% of the criteria at receptor I1;
  - non-project cumulative emissions dominate the profile, with results generally around 100% for all receptors for $SO_2$ (1-hour), and less than 50% for $NO_2$ (1-hour) and $SO_2$ (24-hour) at receptors; and
  - receptors I1 and R2 are predicted to experience the highest ground level concentrations under worst case operating conditions (excluding background), with short-term $NO_2$ (1-

hour) impacts ranging from 41.4% to 67.4% of the criteria. For other receptors, results are mostly below 10% of the criteria for $SO_2$ (1-hour and 24-hour) and $NO_2$ (1-hour) under worst case operating conditions.

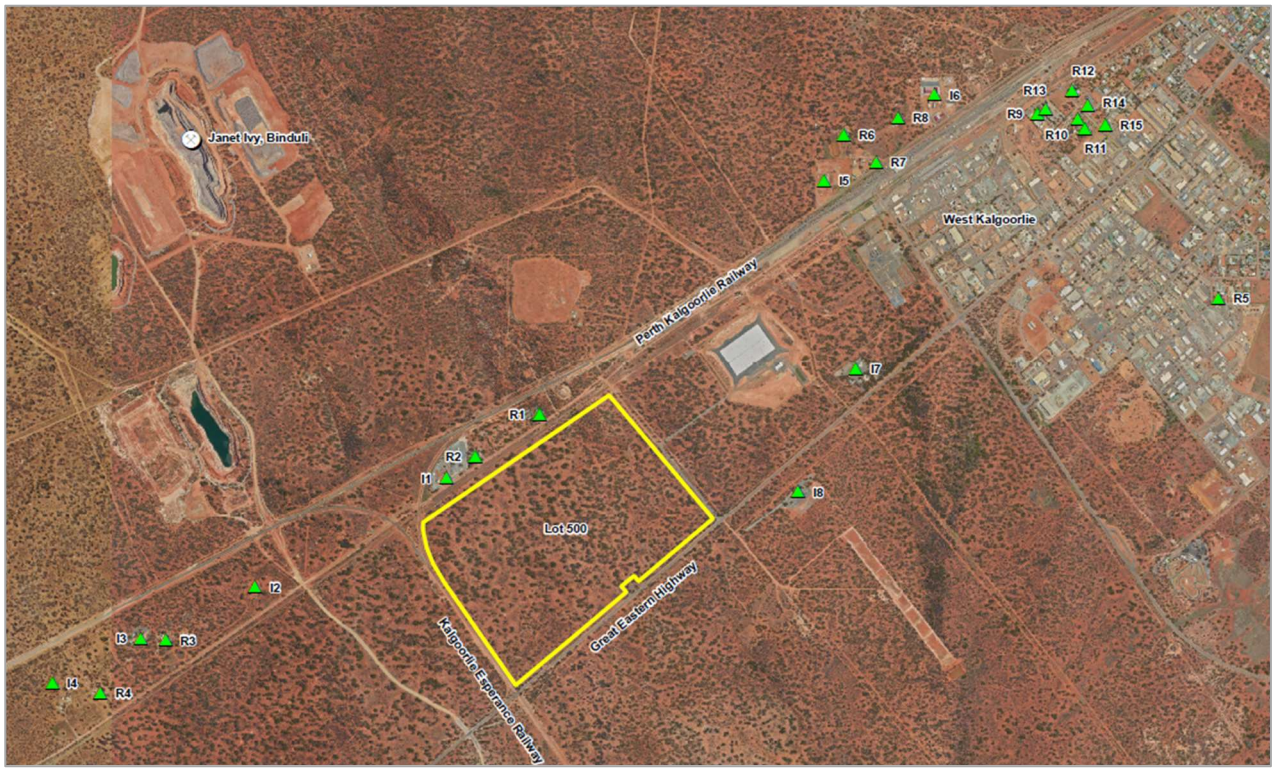


***Figure 3: Discrete sensitive receptor locations referred to in the air dispersion model***

### 6.1.3 DWER technical review

DWER's review of the air dispersion modelling (ETA 2021) identified that:

- the air quality assessment was conducted in accordance with the Air Quality Modelling Guidance Notes (DoE 2006);
- the proposal's contribution is relatively small in terms of cumulative impact, but exceedances of the current NEPM standards (NEPC 2021) $SO_2$ 1-hour average criterion in the airshed are likely. It is noted these exceedances are mainly due to existing large industry sources and the contribution from the REPF to any exceedance is not likely to be significant;
- it is noted the applicant proposes to install a continuous emissions monitoring system (CEMS) on the main stack, for measuring combustion and process gases. It is assumed the use of CEMS for this purpose will comply with DWER's CEMS Code (DER 2016);
- it is recommended that several parameters are added to the stack monitoring program, such as uranium and thorium (thorium is present in the RE concentrate and as a by-product of the cracking process), and sulfuric acid (annual test, to verify the wet scrubbing process is working effectively).
- It is recommended that testing be conducted for hydrogen halides (HF, HCl) and halogen, with the results to be reviewed to determine whether ongoing testing is necessary; and
- the frequency of testing should be based on the results of commissioning tests and risk assessment.

In terms of proposed ambient monitoring of fugitive dust at the premises:

- due to the proximity of sensitive receptors, proposed particulate monitoring at boundary locations should comply with Australian Standards for siting (AS3580.1) as far as practicable, noting the proposed locations will not achieve full compliance with the standard; and
- the ambient particle monitoring method proposed (E-BAM) is a non-standard monitoring method that is generally suitable for dust management purposes. Should dust impacts

become evident, it is recommended the applicant review their dust management practices and implement monitoring equipment that align with Australian Standards such as Beta Attenuation Monitors (BAM) or tapered element oscillating microbalance (TEOM).

## 6.2 Noise assessment

### 6.2.1 Noise model

The applicant engaged consultant Talis to undertake an environmental noise assessment (Talis 2020) and prepare a construction noise management plan (CNMP) (Lynas 2021). The noise modelling software *SoundPLAN 8.0* was used to predict noise levels at nearby receptors from all noise sources operating at the same time under worst case meteorological conditions.

### 6.2.2 Results

Construction noise

The model predicts construction noise will exceed the assigned levels under the Environmental Protection (Noise) Regulations 1997 (Noise Regulations) by up to 5.5 dB at the three nearest noise sensitive receptors during normal daytime hours (7:00 AM to 7:00 PM Monday to Saturday). Outside of these hours, noise levels are predicted to exceed the night time assigned levels by up to 16.8 dB during certain peak construction periods.

The most significant noise impacts are predicted from mobile equipment activities in the northern and north-western areas of the site. A 10 m high noise bund will be constructed along the northern gypsum bund as soon as practicable (target August 2022), which is expected to significantly reduce construction noise impacts.

Under regulation 13 of the Noise Regulations, noise from construction work on construction sites need not comply with the assigned noise levels during normal daytime working hours (7:00 AM to 7:00 PM Monday to Saturday), providing that work is carried out in accordance with AS 2436 and the equipment used is the quietest reasonably available. The applicant has prepared a general construction noise management plan (Lynas 2021), which outlines several noise control and noise management measures during the construction period.

The applicant advises that wherever possible, noisy activities will not be undertaken at night. However, if noise emissions are predicted to exceed the night-time assigned levels, the applicant will submit a separate CNMP to the Department at least 7 days before the work starts, demonstrate how it is reasonably necessary for the work to be done out of normal daytime hours, and advise all nearby receptors that are likely to be impacted at least 24 hours before the work commences.

Operational noise

The model predicts full compliance with the Noise Regulations can be achieved after applying a noise control package consisting of a combination of low noise equipment specifications, engineering changes, layout changes, construction of strategically located bund walls and operational/administrative changes. Talis (2020) indicates that some refinement and optimisation of this package will be undertaken during the detailed design stage of the project.

The model predicts the highest noise levels at the nearest sensitive receptors to range from 39.6 to 43.7 dB(A) from a combination of all noise sources and the highest night-time propagation weather conditions, which comply with the assigned levels for those receptors after applying an influencing factor and other adjustments in accordance with the Noise Regulations.

### 6.2.3 DWER technical review

The department has reviewed the Talis (2020) and Lynas (2021) reports and identified that:

- the assessment methodology and results present reasonable and reliable conclusions on the predicted noise levels under worst case meteorological conditions;
- the influencing factors and $L_{A10}$ assigned noise levels calculated for each of the selected

noise sensitive receivers are correct;
- proposed noise controls and noise management measures during the construction phase comply with the requirements of regulation 13 of the Noise Regulations; and
- noise emissions from the proposed operations can be managed to comply with the Noise Regulations if the proposed noise control package is implemented properly.

# 7. Risk assessment

### 7.1.1 Determination of emission, pathway and receptor

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk Assessments* (DWER 2020).

To establish a risk event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

### 7.1.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account identified potential source-pathway and receptor linkages. Where linkages are incomplete, they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls, these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in the below table.

### 7.1.3 Risk assessment table

The table below describes the risk events associated with the proposal consistent with the *Guideline: Risk Assessments* (DWER 2020). The table identifies whether the risk events are acceptable and tolerated, or unacceptable and not tolerated, and the appropriate treatment and degree of regulatory control, where required.

**Table 5: Risk assessment table**

| Risk Event | | | | Consequence rating[1] | Likelihood rating[1] | Risk[1] | Reasoning | Regulatory controls |
|---|---|---|---|---|---|---|---|---|
| **Source/ Activities** | **Potential emissions** | **Potential receptors, pathway and impact** | **Applicant controls** | | | | | |
| ***Construction works*** | | | | | | | | |
| Civil excavation, earthworks, vehicle movements on unsealed roads<br>Construction of process plant and associated infrastructure, ponds, dams, by-product storage<br>Site preparation and clearing of native vegetation<br>Construction of noise bunds | Noise associated with construction works | Unreasonable interference with the health, welfare, convenience, comfort or amenity of nearby sensitive receptors (10 receptors within 2 km radius – 4 residential dwellings, 6 industrial premises), nearest being 115 m from the premises boundary (caretaker residences) | Construction of noise bunds on the northern and western boundaries<br>Construction equipment and work practices in accordance with AS2436<br>Noisy activities will not be conducted at night<br>Temporary and moveable shielding used for some noisy activities<br>Community notification when noise is predicted to exceed assigned levels<br>Administrative controls, such as undertaking noisiest activities during daytime<br>Noise monitoring undertaken at commencement of works and at 6-monthly intervals<br>Submission of separate CNMPs for works outside of 7am – 7pm Mon-Sat | Mid-level off-site impacts to amenity on local scale<br>**Moderate** | Could occur at some time<br>**Possible** | **Medium**<br>Acceptable, generally subject to regulatory controls | Noise modelling (Lynas 2021) predicts exceedances of the assigned levels at the nearest noise sensitive receptors by up to 16.8 dB during certain peak construction periods.<br>The applicant has prepared a CNMP (Lynas 2021) that outlines proposed noise controls and noise management measures to ensure compliance with the requirements of the exemption provisions under regulation 13 of the Noise Regulations.<br>The delegated officer considers implementation of these controls will ensure that noise impacts from construction works can be minimised as far as is reasonably practicable.<br>Many of the proposed controls are existing requirements for the exemption provisions under regulation 13 and therefore will not be duplicated on the works approval. However, some site-specific controls, such as construction of noise bunds and noise monitoring, will be imposed on the works approval as they are considered critical for maintaining an acceptable level of risk during construction works and from ongoing operations. | <u>Works approval controls:</u><br>- Construction of noise bunds on the northern and western boundaries;<br>- Requirement to monitor noise levels during construction works. |
| | Fugitive emissions (dust) associated with machinery and vehicle movements | | Use of dust suppression (water carts, etc.)<br>Cease construction activities during significant dust events<br>High risk dust generating activities not undertaken during high wind conditions | Low-level off-site impacts to amenity<br>**Moderate** | Could occur at some time<br>**Possible** | **Medium**<br>Acceptable, generally subject to regulatory controls | Due to the proximity of the closest residential dwellings (~115 m) and position with respect to prevailing wind conditions, there is a risk that fugitive dust from construction works during unfavourable weather conditions could impact the amenity of off-site receptors.<br>To minimise dust impacts, the applicant proposes to implement dust management practices, such as the use of water carts and water sprays and reschedule or cease dusty activities in high-risk weather conditions. The delegated officer considers implementation of these controls will ensure the risk of fugitive dust resulting in off-site amenity impacts can be acceptable.<br>As the proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval. | <u>Works approval controls:</u><br>- Must schedule high dust generating activities to avoid periods of high winds;<br>- Must operate water carts/sprays when levels of dust are generated and proactively when there is a risk of off-site impacts;<br>- Must cease an activity causing high dust levels where other management measures have not prevented dust lift-off |
| | Erosion and sedimentation from surface water runoff | Overland runoff from site, causing adverse health impacts to downgradient native vegetation and local ecosystems | Uncontaminated stormwater diverted away from operational areas to natural downstream drainage | Minimal off-site impacts on local scale<br>**Minor** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, generally subject to regulatory controls | Altering the natural and local surface water regime may impact on soil replenishment and downstream (off-site) surface water dependent ecology, particularly during intense heavy rainfall events from decaying tropical cyclones from the northwest that can cause flash flooding (CSIRO 2010).<br>To minimise the potential for impacts, the applicant proposes to install drainage infrastructure on the site to divert uncontaminated surface water runoff away from construction and operational areas, in a manner that prevents increased rates of sedimentation and erosion.<br>The delegated officer considers implementation of these controls will ensure the risk of adverse impacts to downgradient native vegetation and local ecosystems can be acceptable.<br>As the proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval. | <u>Works approval controls:</u><br>- Requirement to install internal and external stormwater diversion drains;<br>- Requirement to construct stormwater retention basin with capacity to contain a 1% AEP flood event;<br>- Requirement to contain surface runoff from the plant footprint within the premises during construction works. |

| Risk Event | | | | Consequence rating[1] | Likelihood rating[1] | Risk[1] | Reasoning | Regulatory controls |
|---|---|---|---|---|---|---|---|---|
| **Source/ Activities** | **Potential emissions** | **Potential receptors, pathway and impact** | **Applicant controls** | | | | | |
| ***Commissioning and time-limited/full operations*** | | | | | | | | |
| Environmental commissioning of process plant and associated infrastructure, and subsequent operation | Dust emissions associated with RE concentrate delivery, transfer and storage | Unreasonable interference with the health, welfare, convenience, comfort or amenity of nearby sensitive receptors (see above) | RE concentrate brought to site in sealed containers<br>RE concentrate delivery via tippler bins into hooded hopper with baghouse filter<br>RE carbonate product stored in sealed environment | Low-level off-site impacts to amenity on local scale<br>**Minor** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, generally subject to regulatory controls | RE concentrate will be delivered to the premises in closed containers, with handling undertaken by a fixed tipper which is hooded and drafted through a bag filter to eliminate dust generation.<br>RE concentrate will remain in sealed containers and stored on an engineered hardstand in a container yard adjacent to the feed hopper and feed conveyor, to minimise handling and dust generation.<br>RE carbonate product will be packaged into containers and transported by rail directly to the Fremantle Port (no on-site storage), to minimise handling and dust generation.<br>The applicant has transported RE concentrate from Mt Weld to Fremantle Port in this manner since 2012 without incident.<br>Both RE concentrate and RE carbonate product are not considered to be radioactive for transport purposes.<br>The delegated officer considers implementation of these controls will ensure the risk of off-site dust impacts during delivery, transfer and storage of RE concentrate can be acceptable.<br>As the proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval. | <u>Works approval controls:</u><br>- Infrastructure design criteria specified (sealed containers), including pollution control infrastructure (baghouse filter) on transfer hopper;<br><u>Licence controls:</u><br>- Infrastructure design and operational requirements specified in infrastructure table; |
| | Stack emissions during commissioning and testing, and subsequent full operations | | Installation of pollution control equipment (venturi scrubbers, spray tower and WESP, and emergency scrubbing system with caustic scrubbing)<br>Installation of sampling port on main gas treatment stack to allow periodic stack sampling | Specific consequence criteria (for public health) are likely to be met<br>**Minor** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, generally subject to regulatory controls | Gases from the kiln will be cleaned using a flue gas treatment system, which includes a combination of two venturi scrubbers, spray tower and wet electrostatic precipitator. An emergency gas scrubbing system will also be installed as a backup in the event of any failure of the primary gas treatment system.<br>Air dispersion modelling (ETA 2020) indicates that with the above controls in place, maximum GLCs for $SO_2$ and $NO_2$ (1-hr) and $SO_2$ (24-hr) are well below the current (2021) NEPM criteria across the model domain when considering 'project only' emissions. However, exceedances of the $SO_2$ (1-hr) criterion in the airshed are likely when considering cumulative emissions – the delegated officer notes the constraints of the existing airshed and the predicted exceedances are primarily due to existing large industry sources, and that the contribution from the REPF to any exceedances is not expected to be significant.<br>Short term (1-hr) impacts from $NO_2$ and $SO_2$ were predicted to be the main pollutants emitted under upset plant conditions, although predicted concentrations were below the 2021 NEPM criterion when excluding background levels.<br>To ensure an acceptable level of risk is maintained during commissioning and time limited operations, controls will be imposed on the works approval to require installation of the proposed pollution control equipment, installation of continuous emissions monitoring (CEMS) on main stack and separate stack sampling port, and submission of an environmental commissioning plan within 3 months of the commencement of commissioning. Any issues identified by the department will be addressed with the applicant, prior to the commencement of commissioning works. The delegated officer expects that validation of emissions will be conducted during commissioning (stack testing) and calibration of the CEMS system in accordance with the CEMS Code (in preparation for continuous emissions monitoring under the licence).<br>Routine stack testing will commence under full operations of the licence and will include monitoring of all parameters relevant to the process gas stream, including Th and U. It was not considered necessary to require this testing under the works approval.<br>An environmental commissioning report must be submitted following the completion of commissioning, in addition to a CEMS calibration report following completion of successful calibration and verification of the installed CEMS system. | <u>Works approval controls:</u><br>- Infrastructure design criteria specified, including pollution control infrastructure for treatment of flue gases (venturi scrubbers, spray tower and WESP, and emergency scrubbing system with caustic scrubbing);<br>- CEMS and separate sampling port to be installed on main stack;<br>- Submission of a commissioning plan;<br>- Implementation of the commissioning plan, including validation of air emissions monitoring;<br>- Submission of a commissioning report;<br>- Submission of a CEMS completion report<br><u>Licence controls:</u><br>- Infrastructure design and operational requirements specified in infrastructure table;<br>- Continuous air emissions monitoring on main stack for process gases (CO, $SO_2$, $NO_X$), routine stack testing for other parameters;<br>- Operational requirements for emergency scrubbing system |

| Risk Event | | | | Consequence rating[1] | Likelihood rating[1] | Risk[1] | Reasoning | Regulatory controls |
|---|---|---|---|---|---|---|---|---|
| **Source/ Activities** | **Potential emissions** | **Potential receptors, pathway and impact** | **Applicant controls** | | | | | |
| | | | | | | | The delegated officer has determined not to impose emission limits on the works approval or subsequent licence at this stage on the grounds the pollution control equipment proposed is appropriate for the risk profile for this type of plant, and predicted emissions (excluding background) are well below the NEPM criterion, with any contribution of the REPF to exceedances of the $SO_2$ (1-hr) criteria not expected to be significant. In addition, process gases from the REPF will be continuously monitored to provide assurance over the effectiveness of pollution control equipment, and this can be reviewed should issues arise during operations.<br>Operational requirements for the emergency scrubbing system to be specified on the licence during operations, including performance requirement to maintain sulfur acid emissions to less than 20 ppm under upset conditions. Continuous emissions monitoring of process gases (CO, $SO_2$, $NO_X$) will be required, in addition to routine stack sampling of other parameters. | |
| | Noise associated with plant operation during commissioning and testing, and subsequent full operations | | Noise mitigation, including construction of 9 m high noise bund on the northern boundary and 3 m high bund on the western boundary – both with 2 m high fence atop<br>Additional low noise specifications on selected equipment (pumps, agitators, etc.), engineering changes (e.g. shielding), layout changes and operational / administrative changes to reduce noise levels as per noise assessment | Low-level off-site impacts to amenity on local scale<br>**Minor** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, generally subject to regulatory controls | Noise modelling (Talis 2020) indicates that without adequate noise controls in place, predicted noise levels would not comply with the night-time assigned levels at 6 neighbouring noise sensitive receivers, particularly the two closest located on the northern boundary, where the exceedance was predicted to be over 10 dB at night.<br>The applicant has identified pumps and fans as being the greatest contributor to overall noise emissions at the premises, and to reduce their noise levels these will be strategically located and/or shielded if they cannot be relocated. Shielding walls will also be installed for some equipment, in addition to ensuring only equipment with low noise specifications are used. A 9 m high noise bund will be constructed along the northern boundary (gypsum bund) in addition to a 3 m high bund along the western boundary (IP bund), both with a 2 m high enclosed fence placed atop.<br>With the above controls in place Talis (2020) predicts full compliance with the assigned levels can be achieved at all nearby noise sensitive premises during worst case meteorological conditions.<br>The delegated officer considers that full compliance with the Noise Regulations can be achieved if the proposed controls are properly designed and implemented.<br>As the proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval as infrastructure design requirements, and on the licence as infrastructure and operational requirements. | <u>Works approval controls:</u><br>- Requirement to construct a 9 m high noise bund along the northern boundary (including 2 m high enclosed fence atop);<br>- Requirement to construct a 3 m high noise bund along the western boundary (including 2 m high enclosed fence atop);<br>- Requirement to locate specified equipment in most suitable location for low noise and/or requirement to install shielding, as proposed by Talis (2020) and specified in the application.<br><u>Licence controls:</u><br>- Infrastructure requirements to include low noise specifications of pumps, fans and agitators;<br>- Shielding walls required for specified equipment, such as top contributing noise sources. |
| Containment of by-products (Iron phosphate, gypsum, RO brine) | Loss of containment of by-products (hazardous materials and hydrocarbons) | Seepage/infiltration causing groundwater contamination | Storage facilities and ponds constructed with suitable geosynthetic clay liner and/or geomembrane liner systems<br>Under liner leak detection system will be installed at the IP storage facility | Mid-level on-site impacts<br>Low-level off-site impacts on local scale<br>**Moderate** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, generally subject to regulatory controls | IP by-product contains naturally occurring radioactive materials at concentrations exceeding the recognised level for radioactive classification (specific activity is about 6.5 Bq/g), and therefore the material is classified as radioactive. However, the IP by-product remains below specified activity levels for transporting NORMs (10 Bq/g; DMP, 2010).<br>The applicant proposes to construct the IP storage facility with a dual liner system (GCL below a HDPE geomembrane) to prevent the loss of contaminants into the underlying soil and groundwater. The gypsum storage facilities and RO brine evaporation ponds will be constructed with a single HDPE geomembrane liner. A seepage assessment (Soilwater 2021) indicates low risk of seepage from proposed facilities with the proposed lining systems in place, which minimises the overall risk of contaminants reaching the deeper water table.<br>As the proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval, and required to be maintained on the licence and minimum infrastructure requirements. Routine liner leak detection tests will also be required on the licence, to provide assurance over the integrity of the ponds. | <u>Works approval controls:</u><br>- Storage facilities must be constructed as per design plan, and HDPE liner specifications must comply with WQPN #26 (DoW 2013) requirements;<br>- Must recover supernatant water and return/recycle back into the process<br><u>Licence controls:</u><br>- Infrastructure design and operational requirements specified in infrastructure table;<br>- Requirement to conduct routine visual integrity and liner leak detection tests |

| Risk Event | | | | Consequence rating[1] | Likelihood rating[1] | Risk[1] | Reasoning | Regulatory controls |
|---|---|---|---|---|---|---|---|---|
| **Source/ Activities** | **Potential emissions** | **Potential receptors, pathway and impact** | **Applicant controls** | | | | | |
| | | Overland runoff from site, causing adverse health impacts to downgradient native vegetation and local ecosystems | Pond designed with sufficient capacity to account for 1:100 year, 72-hour AEP storm event<br>Operational freeboard 500 mm (IP storage), 300 mm (gypsum & evaporation ponds)<br>Daily inspections and integrity checks | Mid-level on-site impacts<br>Low-level off-site impacts on local scale<br>**Moderate** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, generally subject to regulatory controls | The proposed storage facilities have been designed with sufficient capacity to account for a 1% AEP storm event (equivalent to the 1:100 year ARI), and will be operated with suitable freeboard (500 mm IP storage, 300 mm gypsum/evaporation ponds).<br>The delegated officer considers these controls will ensure the risk of impacts from overtopping is acceptable.<br>As the proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval, and required to be maintained on the licence and minimum infrastructure requirements. | Works approval controls:<br>- Storage facilities must be constructed as per design plan (minimum storage capacity specified);<br>- Maintenance of a minimum freeboard specified<br>Licence controls:<br>- Infrastructure design and operational requirements specified in infrastructure table;<br>- Minimum freeboard requirements specified |
| | Dust lift-off from by-products (IP/gypsum) storage facilities/ponds | Unreasonable interference with the health, welfare, convenience, comfort or amenity of nearby sensitive receptors (see above) | Implementation of dust control measures, including application of water sprays and chemical dust suppressant) during dry periods and subject to weather forecasting<br>Installation of on-site meteorological station and continuous PM monitoring | Low-level off-site impacts to amenity on local scale<br>**Minor** | Could occur at some time<br>**Possible** | **Medium**<br>Acceptable, generally subject to regulatory controls | There is an inherent risk of airborne dust, including dust containing NORM, to be generated from IP and gypsum stockpiles during dry and windy conditions, where it can cause adverse impacts to nearby human and environmental receptors.<br>Implementation of dust management controls proposed by the applicant, including the proactive use of chemical dust suppressant subject to weather forecasting, and validated through continuous dust monitoring on the boundary, is expected to minimise the risk of unacceptable impacts.<br>The applicant also proposes to conduct ambient monitoring for $PM_{10}$ at two locations using E-BAM dust samplers (non-standard) on the premises boundary. The delegated officer considers the proposed locations do not comply with AS3580.1.1 due to interference, therefore the applicant needs to propose new locations. The delegated officer also considers that given the site and sensitive receptors are located in an industrial area with isolated residences, the use of non-standard monitors is acceptable. However, should dust impacts become evident, the applicant must review their dust management practices and implement monitoring with methods that comply with Australian Standards such as BAM or TEOM.<br>As the proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval, and required to be maintained on the licence and minimum operational requirements. | Works approval controls:<br>- Must install meteorological station on the premises;<br>- Must establish dust monitoring locations on northern and western boundaries that comply with AS3580.1.1;<br>- Must undertake proactive management measures to minimise dust lift-off from stockpiles<br>Licence controls:<br>- Must undertake proactive management measures to minimise dust lift-off from stockpiles;<br>- Must conduct continuous dust monitoring to provide assurance over the effectiveness of dust management measures |
| Hazardous materials and hydrocarbon storage | Spills and leaks of hazardous materials and hydrocarbons | Overland runoff from site, causing adverse health impacts to downgradient native vegetation and local ecosystems | All reagents stored within bunded areas that comply with AS1940 and have 110% capacity of largest vessel<br>Bunded areas contain sump to recover spilled liquid and rainfall. Recovered liquid to be treated and reused in process | Mid-level on-site impacts, low-level off-site impacts<br>**Moderate** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, generally subject to regulatory controls | All hazardous materials and hydrocarbons will be stored within bunded areas consistent with AS 1940, with spilled liquid and rainfall to be recovered and reused in the process.<br>The delegated officer considers these controls will ensure the risk of impacts from spills and leaks from bulk hazardous and hydrocarbon storage areas is acceptable.<br>As the proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval, and required to be maintained on the licence as minimum infrastructure requirements. | Works approval controls:<br>- Requirement to install internal and external stormwater diversion drains;<br>- Requirement to construct stormwater retention basin with capacity to contain a 1% AEP flood event;<br>- Requirement to contain surface runoff from the plant footprint within the premises during construction works.<br>Licence controls:<br>- Infrastructure design and operational requirements specified in infrastructure table;<br>- Requirement to contain surface runoff from operational areas, for reuse within the plant. |
| | Contaminated surface water runoff from operational areas | | Surface runoff within plant footprint will be contained within stormwater retention basin with capacity to contain 1:100 year, 72 hour storm event (211 mm). | Minimal off-site impacts on local scale<br>**Minor** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, generally subject to regulatory controls | To minimise potential impacts to off-site surface water systems and native vegetation, the applicant has designed the site for zero discharges, with runoff from the plant footprint collected and reused in the process following treatment, and clean stormwater runoff directed to a stormwater retention basin with capacity to contain a 1% AEP flood event (equivalent to the 1:100 year ARI).<br>The delegated officer considers these controls will ensure the risk of impacts from contaminated surface water runoff is acceptable. | Works approval controls:<br>- Requirement to install internal and external stormwater diversion drains;<br>- Requirement to construct stormwater retention basin with capacity to contain a 1% AEP flood event;<br>- Requirement to contain surface runoff from the plant footprint within the premises during construction works. |

| Risk Event | | | | Consequence rating[1] | Likelihood rating[1] | Risk[1] | Reasoning | Regulatory controls |
|---|---|---|---|---|---|---|---|---|
| **Source/ Activities** | **Potential emissions** | **Potential receptors, pathway and impact** | **Applicant controls** | | | | | |
| | | | | | | | As the proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval, and required to be maintained on the licence and minimum infrastructure requirements. | Licence controls:<br>- Infrastructure design and operational requirements specified in infrastructure table;<br>- Requirement to contain surface runoff from operational areas, for reuse within the plant. |
| Processing facilities including concentrate handling, cracking, leaching, neutralisation and filtration<br>IP storage area | Radiological emissions from NORMs | Unreasonable interference with the health, welfare, convenience, comfort or amenity of nearby sensitive receptors (see above) | Implementation of approved Radiation Management Plan<br>Compliance with Mines Safety and Inspection Regulations regarding radiological risks | Mid-level on-site impacts<br>Low-level off-site impacts on local scale<br>**Moderate** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, generally subject to other regulatory controls | IP by-product will exhibit elevated levels of NORM and will require management via the approved RMP for compliance with the Mines Safety and Inspection Regulations.<br>The RMP outlines guideline exposure levels for employees, internal investigation levels, annual anticipated radiation dose assessments for specific work groups, and methods for minimising exposure. | Works approval controls:<br>Not applicable. Radiological risks are regulated under the *Radiation Safety Act 1975*. |
| | | Seepage/infiltration causing groundwater contamination | Storage facilities and ponds constructed with suitable geosynthetic clay liner and/or geomembrane liner systems<br>Under liner leak detection system will be installed at the IP storage facility | Mid-level on-site impacts<br>Low-level off-site impacts on local scale<br>**Moderate** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, generally subject to regulatory controls | Refer to comments above “Containment of by-products (Iron phosphate, gypsum, RO brine)”. | As above. |

*Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the Guideline: Risk Assessments (DWER 2020).*

# 8. Decision

The delegated officer has determined the proposal to construct and operate a new rare earths processing facility at the premises, with an assessed throughput of 162,000 tonnes per year of RE concentrate, does not pose an unacceptable risk of impacts to public health or the environment. This determination is based on the following:

- the location of the premises being within an emerging industrial area near Kalgoorlie with sufficient separation to sensitive environmental receptors, such as permanent waterways, groundwater, conservation significant flora and vegetation, etc.;
- the proposal having a relatively small contribution in terms of cumulative air impacts, noting that exceedances of the NEPM (2021) $SO_2$ (1-hour) criteria in the airshed are likely, but due mainly to existing large industrial sources; and
- operational noise levels at the nearest sensitive receivers predicted to comply with the Noise Regulations, when considering all noise sources and the highest night-time propagation weather conditions.

To minimise the potential for impacts to human health and the environment, the applicant has proposed the following engineering controls, which will be imposed on the works approval as they are considered critical for maintaining an acceptable level of risk:

- gases from the kiln will be cleaned using a flue gas treatment system that includes a combination of two venturi scrubbers, spray tower and wet electrostatic precipitator;
- an emergency gas scrubbing system will be installed as a backup in the event of any failure of the primary gas treatment system;
- all exhaust emission points will be elevated, and minimum exhaust velocities specified, to facilitate air dispersion;
- air emissions will be continuously monitored during operations, to provide assurance over the effectiveness of pollution control equipment;
- a noise control package will be implemented to ensure compliance with the Noise Regulations, including a combination of low noise equipment specifications, engineering changes, layout changes, construction of strategically located bund walls and operational/administrative changes;
- all by-product containment infrastructure will be installed with appropriate lining systems, and will be designed with sufficient storage capacity to accommodate a 1% AEP flood;
- the site will be designed to achieve zero water discharge, with all process water and stormwater reclaimed and recycled back into the process; and
- all tanks and storage areas containing hazardous materials, including hydrocarbons, chemicals and reagents, will be constructed with appropriate secondary containment in accordance with the requirements of AS 1940.

In addition, the works approval holder proposes to conduct monitoring of the following, to provide assurance over the effectiveness of the above engineering controls:

- noise will be monitored during construction to ensure compliance with the EP Noise Regulations;
- stack testing will be conducted of the process gas stream during commissioning for all relevant parameters; and
- a weather station will be installed on the premises, to provide on-site meteorological information and assist in the scheduling of dusty activities and pre-emptive management actions during time limited operations.

The delegated officer is satisfied the above engineering controls and monitoring lower the overall risk profile of the proposal, and adequately address the potential for unacceptable impacts to public health or the environment.

### 8.1.1 Works approval and licence

Works Approval W6567/2021/1 that accompanies this report authorises construction, commissioning and time-limited operations only. The conditions in the issued works approval, as outlined in the above risk table have been determined in accordance with the *Guideline: Setting Conditions* (DWER 2020b).

A licence is required to authorise emissions associated with ongoing operation of the premises. A risk assessment for full operations has been included in this report, however licence conditions will not be finalised until the department assesses the licence application. Conditions will be imposed to ensure day-to-day operations do not pose an unacceptable risk of impacts to public health and the environment.

### 8.1.2 Applicant comments on draft decision

The applicant was provided with drafts of the works approval and this report on 17 September 2021 and, in addition to providing minor comments and clarifications, requested the following corrections to ensure alignment with its proposed operational controls:

- for the emergency gas scrubbing system, change the proposed performance criteria (minimising sulfur acid emissions to less than 20 ppm) to instead reflect the worst-case emission rate that was modelled (1.5 g/s), which indicated low risk of impacts;
- modify the requirement to install cladding on the processing plant building to extent fully from the roof to ground level to only extend to the level of the suspended concrete slab (level 2), as this is supported by updated noise modelling;
- remove the requirement for a HDPE liner on the stormwater retention pond, as surface runoff entering this pond will be sourced from non-operational areas and will be uncontaminated; and
- remove the requirement to install a sprinkler system on both by-product storage facilities due to the size of each facility and the limited fetch a sprinkler system may provide. Application of a chemical dust suppressant is preferred.

The delegated officer considers the requested changes to be reasonable and has made the necessary changes to conditions, where appropriate.

# 9. Conclusion

Based on this assessment, it has been determined the issued works approval will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Clarrie Green

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***Clarrie Green***
***A/MANAGER, PROCESS INDUSTRIES***
***REGULATORY SERVICES***

*Delegated officer*
*under section 20 of the Environmental Protection Act 1986*

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