Government of Western Australia
Department of Water and Environmental Regulation

Works Approval

Works Approval Number	W6104/2017/1
Works Approval Holder	Alcoa of Australia Limited
ACN	004 879 298
Registered business address	181-205 Davy Street Booragoon WA 6154
File Number	DER2017/001857
Duration	27 March 2018 to 26 March 2022
Date of issue	27 March 2018
Prescribed Premises	Category 46: Bauxite refining
Premises	Wagerup Alumina Refinery Willowdale Road WAGERUP WA 6215 As depicted on the Premises Map in Schedule 1

This Works Approval is granted to the Works Approval Holder, subject to the following conditions, on 27 March 2018, by:

Date signed: 27 March 2018
Jonathan Bailes
A/Senior Manager Industry Regulation (Process Industries)
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

Explanatory notes

These explanatory notes do not form part of this Works Approval.

Defined terms

Definition of terms used in this Works Approval can be found at the start of this Works Approval. Terms which are defined have the first letter of each word capitalised throughout this Works Approval.

Department of Water and Environmental Regulation

The Department of Water and Environmental Regulation (DWER) is established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the *Environmental Protection Act 1986* (WA) (EP Act). The Department also monitors and audits compliance with licences and works approvals, takes enforcement action and develops and implements licensing and industry regulation policy.

Works Approval

Section 52 of the EP Act provides that an occupier of any premises commits an offence if any work is undertaken on, or in relation to, the premises which causes the premises to become, or to become capable of being, Prescribed Premises, except in accordance with a works approval.

Section 56 of the EP Act provides that an occupier of Prescribed Premises commits an offence if Emissions are caused or increased or permitted to be caused or increased, or Waste, noise, odour or electromagnetic radiation is altered or permitted to be altered from Prescribed Premises, except in accordance with a works approval or licence.

Categories of Prescribed Premises are defined in Schedule 1 of the *Environment Protection Regulations 1987* (WA) (EP Regulations).

This Works Approval does not authorise any activity which may be a breach of the requirements of another statutory authority including, but not limited to, the following:

- conditions imposed by the Minister for Environment under Part IV of the EP Act;
- conditions imposed by DWER for the clearing of native vegetation under Part V, Division 2 of the EP Act;
- any requirements under the *Waste Avoidance and Resource Recovery Act 2007;*
- any requirements under the *Environmental Protection (Controlled Waste) Regulations 2004*; and
- any other requirements specified through State legislation.

It is the responsibility of the Works Approval Holder to ensure that any action or activity referred to in this Works Approval is permitted by, and is carried out in compliance with, statutory requirements.

The Works Approval Holder must comply with the Works Approval. Contravening a Works Approval Condition is an offence under s.55 of the EP Act.

Responsibilities of Works Approval Holder

Separate to the requirements of this Works Approval, general obligations of Works Approval Holders are set out in the EP Act and the regulations made under the EP Act. For example, the Works Approval Holder must comply with the following provisions of the EP Act:

- the duties of an occupier under s.61; and
- restrictions on making certain changes to Prescribed Premises unless the changes are in accordance with a Works Approval, Licence, closure notice or environmental protection notice (s.53).

Strict penalties apply for offences under the EP Act.

Reporting of incidents

The Works Approval Holder has a duty to report to the Department all Discharges of Waste that have caused or are likely to cause Pollution, Material Environmental Harm or Serious Environmental Harm, in accordance with s.72 of the EP Act.

Offences and defences

The EP Act and its regulations set out a number of offences including:

- Offence of emitting an Unreasonable Emission from any Premises under s.49.
- Offence of causing Pollution under s.49.
- Offence of dumping Waste under s.49A.
- Offence of discharging Waste in circumstances likely to cause Pollution under s.50.
- Offence of causing Serious Environmental Harm (s.50A) or Material Environmental Harm (s.50B).
- Offence of causing Emissions which do not comply with prescribed standards (s.51).
- Offences relating to Emissions or Discharges under regulations prescribed under the EP Act, including materials discharged under the *Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA).*
- Offences relating to noise under the *Environmental Protection (Noise) Regulations 1997 (WA).*

Section 53 of the EP Act provides that a Works Approval Holder commits an offence if Emissions are caused, or altered, from a Prescribed Premises unless done in accordance with a Works Approval, Licence or the requirements of a closure notice or an environmental protection notice.

Defences to certain offences may be available to a Works Approval Holder and these are set out in the EP Act. Section 74A(b)(iii) provides that it is a defence to an offence for causing Pollution, in respect of an Emission, or for causing Serious Environmental Harm or Material Environmental Harm, or for discharging or abandoning Waste in water to which the public has access, if the Works Approval Holder can prove that an Emission or Discharge occurred in accordance with a Works Approval.

This Works Approval specifies the Emissions and Discharges, and the limits and Conditions which must be satisfied in respect of specified Emissions and Discharges, in order for the defence to offence provision to be available.

Authorised Emissions and Discharges

The specified and general Emissions and Discharges from the Works authorised through this Works Approval are authorised to be conducted in accordance with the Conditions of this Works Approval.

Amendment of Works Approval

The Works Approval Holder can apply to amend the Conditions of this Works Approval under s.59 of the EP Act. An application form for this purpose is available from DWER.

The CEO may also amend the Conditions of this Works Approval at any time on the initiative of the CEO without an application being made.

Duration of Works Approval

The Works Approval will remain in force for the duration set out on the first page of this Works Approval or until it is surrendered, suspended or revoked in accordance with s.59A of the EP Act.

Suspension or revocation

The CEO may suspend or revoke this Works Approval in accordance with s.59A of the EP Act.

Definitions and interpretation

Definitions

In this Works Approval, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
AS 4323.3:2001	Australian Standard 4323.3:2001: *Stationary source emissions, Part 3: Determination of odour concentration by dynamic olfactometry*
Books	has the same meaning given to that term under the EP Act.
CEO	means Chief Executive Officer. CEO for the purposes of notification means: Director General Department Administering the *Environmental Protection Act 1986* Locked Bag 33 Cloisters Square PERTH WA 6850 info-der@dwer.wa.gov.au
Commissioning	means the incremental operational changes after the completion of Works to establish the biological biomass, introduce sodium oxalate feed material, and reach steady-state operation.
Condition	means a condition to which this Works Approval is subject under s.62 of the EP Act.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
Department Request	means a request for Books or other sources of information to be produced, made by an Inspector or the CEO to the Works Approval Holder in writing and sent to the Works Approval's address for notifications, as described at the front of this Works Approval, in relation to: (a) compliance with the EP Act or this Works Approval; (b) the Books or other sources of information maintained in accordance with this Works Approval; or (c) the Books or other sources of information relating to Emissions from the Premises.
Discharge	has the same meaning given to that term under the EP Act.
DWER	Department of Water and Environmental Regulation
Emission	has the same meaning given to that term under the EP Act.
Environmental Harm	has the same meaning given to that term under the EP Act.
EP Act	means the *Environmental Protection Act 1986* (WA).
EP Regulations	means the *Environmental Protection Regulations 1987* (WA).
Implementation Agreement or Decision	has the same meaning given to that term under the EP Act.

Term	Definition
Inspector	means an inspector appointed by the CEO in accordance with s.88 of the EP Act.
Material Environmental Harm	has the same meaning given to that term under the EP Act.
NATA accreditation	means in relation to the analysis of a sample that the laboratory is National Association of Testing Authorities, Australia accredited for the specified analysis a t the time of the analysis
Pollution	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Works Approval applies, as specified at the front of this Works Approval and as shown on the map in Schedule 1 to this Works Approval.
Prescribed Premises	has the same meaning given to that term under the EP Act.
Reportable Event	means an exceedance above the target limit specified in Column 4 of Table 6, in Schedule 3.
Serious Environmental Harm	has the same meaning given to that term under the EP Act.
Steady-state operation	refers to the process operating condition as a continuous 30-day period during which the oxalate bioremoval facility: (a) individual biological oxalate removal reactors have an average operating throughput greater than 12 tonnes per day per reactor; and (b) output provides an average of 90% or greater destruction capability of the input, as measured by oxalate in effluent.
Unreasonable Emission	has the same meaning given to that term under the EP Act.
USEPA	United States Environmental Protection Agency
USEPA CTM-027	USEPA Conditional Test Method 027 – *Procedure for Collection and Analysis of Ammonia in Stationary Sources*
USEPA Method 2	refers to USEPA Method 2 – *Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)*
USEPA Method 5	refers to USEPA Method 5 – *Determination of Particulate Matter Emissions from Stationary Sources*
USEPA Method 6C	refers to USEPA Method 6C – *Determination of Sulphur Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)*
USEPA Method 7E	refers to USEPA Method 7E – *Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)*
USEPA Method 10	refers to USEPA Method 10 – *Determination of Carbon Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)*
USEPA Method 18	refers to USEPA Method 18 – *Measurement of Gaseous Organic Compound Emissions by Gas Chromatography*

Term	Definition
USEPA Method TO-5	refers to USEPA Method TO-5 – *Method for the Determination of Aldehydes and Ketones in Ambient Air Using High Performance Liquid Chromatography (HPLC)*
Waste	has the same meaning given to that term under the EP Act.
Works	refers to the Works described in Schedule 3 to establish an Oxalate bioremoval facility, at the location depicted in Schedule 1 of this Works Approval to be carried out at the Premises, subject to the Conditions.
Works Approval	refers to this document, which evidences the grant of the works approval by the CEO under s.54 of the EP Act, subject to the Conditions.
Works Approval Holder	refers to the occupier of the Premises being the person to whom this Works Approval has been granted, as specified at the front of this Works Approval.

Interpretation

In this Works Approval:

(a) the words 'including', 'includes' and 'include' will be read as if followed by the words 'without limitation';

(b) where any word or phrase is given a defined meaning, any other part of speech or other grammatical form of that word or phrase has a corresponding meaning;

(c) where tables are used in a Condition, each row in a table constitutes a separate Condition;

(d) any reference to an Australian or other standard, guideline or code of practice in this Works Approval means the version of the standard, guideline or code of practice in force at the time of granting of this Works Approval and includes any amendments to the standard, guideline or code of practice which may occur from time to time during the course of the Works Approval; and

(e) unless specified otherwise, any reference to a section of an Act refers to that section of the EP Act.

Conditions

Location of works

1. The Works Approval Holder must locate the Works generally in accordance with the Oxalate Bioremoval Facility Location Map in Schedule 1.

Infrastructure and equipment

2. The Works Approval Holder must install and undertake the Works:

(a) for the infrastructure and equipment;

(b) to the corresponding requirements; and

(c) at the corresponding location

of Table 2.

Table 2: Infrastructure and equipment requirements table

Infrastructure and equipment	Requirements (design and construction)	Location
Oxalate Bioremoval Facility	1. All tanks and vessels must have secondary containment that: (i) is not less than 110 percent of the capacity of the largest tank or vessel within the Oxalate Bioremoval Facility; (ii) directs all runoff and drainage into existing process water systems for reuse; (iii) is constructed of materials that are substantially immune to attack by any corrosive substance it may contain; and (iv) is sufficiently impervious to retain and enable the recovery of any spillage. 2. All tanks and vessels must be of sufficient capacity to allow for surge volume from flow variation without overtopping.	Schedule 1: Maps – Oxalate Bioremoval Facility Layout Plan
Bioreactor tanks and product tank	The tanks must be enclosed and point source emissions to air must be directed to the following discharge points: (i) Oxalate kiln 47K1 vent; or (ii) Oxalate kiln 47K2 RTO vent.	
Bioreactor tanks	The tanks must have: (i) at least one duty and one spare air blower fit for purpose to ensure a continuous supply of air; (ii) a continuous dissolved oxygen monitoring system; and (iii) oxalate feed rate controls	

3. The Works Approval Holder must not depart from Table 2 except:

(a) where such departure does not increase risks to public health, public amenity or the environment; and

(b) all other Conditions in this Works Approval are still satisfied.

4. Subject to Condition 5, within 30 days of the completion of the Works and prior to Commissioning, the Works Approval Holder must provide to the CEO a report from a suitably qualified professional confirming that the Works have been constructed with no material defects and that infrastructure and equipment specified in Table 2 has been constructed to the requirements specified in Table 2.

5. Where a departure from the requirements specified in Table 2 occurs and is of a type allowed by Condition 3, the Works Approval Holder must provide to the CEO a description of, and explanation for, the departure along with the report required by Condition 4.

Emissions

6. The Works Approval Holder must not cause any Emissions from the Works authorised through this Works Approval except for Specified Emissions and General Emissions described in Table 3, subject to the corresponding exclusions, limitations or requirements specified in Table 3.

Table 3: Authorised Emissions table

Emission type	Exclusions/Limitations/Requirements
Specified Emissions	
Point source emissions to air	Subject to compliance with Condition 7, 8 and 9.
General Emissions (excluding Specified Emissions)	
Emissions which arise from undertaking the Works set out in Schedule 2.	Emissions excluded from General Emissions are: • Unreasonable Emissions; or • Emissions that result in, or are likely to result in, Pollution, Material Environmental Harm or Serious Environmental Harm; or • Discharges of Waste in circumstances likely to cause Pollution; or • Emissions that result, or are likely to result in, the Discharge or abandonment of Waste in water to which the public has access; or • Emissions or Discharges which do not comply with an Approved Policy; or • Emissions or Discharges which do not comply with prescribed standard; or • Emissions or Discharges which do not comply with the conditions in an Implementation Agreement or Decision; or • Emissions or Discharges the subject of offences under regulations prescribed under the EP Act, including materials discharged under the Environmental P*rotection (Unauthorised Discharges) Regulations 2004*.

Commissioning and steady-state operation

7. During commissioning and steady-state operation, the Works Approval Holder must direct point source emissions to air to:

(a) the 47K2 RTO vent when the oxalate kiln regenerative thermal oxidiser is operating; or

(b) the 47K1 vent when the oxalate kiln regenerative thermal oxidiser is not working.

8. The Works Approval Holder must undertake monitoring of point source emissions to air:

(a) from the emission point;

(b) for the corresponding parameters;

(c) in the corresponding units;

(d) for the corresponding averaging period;

(e) using the corresponding method; and

(f) at the corresponding frequency

of Table 4.

Table 4: Monitoring of point source emissions to air requirements

Emission Point	Parameters	Units	Averaging Period	Method[1]	Frequency
47K1 vent	Volumetric flow rate	m/s	As per method	USEPA Method 2	One sample event for each emission point must be completed within 90 days of reaching steady-state operation.
	Odour	OU	Spot sample	AS/NZS 4323.3:2001	
	Ammonia	mg/m^3 and g/s	30 minutes	USEPA CTM-027	
	Acetaldehyde, acetone, 2-butanone and formaldehyde	mg/m^3 and g/s	15 minutes	USEPA Method TO-5 (modified[3])	
	Benzene	mg/m^3 and g/s	15 minutes	USEPA Method 18 (adsorption tube[2])	
47K2 RTO vent	Volumetric flow rate	m/s	As per method	USEPA Method 2	
	Particulates	mg/m^3 and g/s	60 minutes	USEPA Method 5 or 17	
	Odour	OU	Spot sample	AS/NZS 4323.3:2001	

Emission Point	Parameters	Units	Averaging Period	Method[1]	Frequency
	Ammonia	mg/m^3 and g/s	30 minutes	USEPA CTM-027	
	Carbon monoxide	mg/m^3 and g/s	30 minutes	USEPA Method 10	
	Oxides of nitrogen	mg/m^3 and g/s	30 minutes	USEPA Method 7E	
	Sulphur oxides	mg/m^3 and g/s	30 minutes	USEPA Method 6C	
	Acetaldehyde, acetone, 2-butanone and formaldehyde	mg/m^3 and g/s	15 minutes	USEPA Method TO-5 (modified[3])	
	Benzene	mg/m^3 and g/s	15 minutes	USEPA Method 18 (adsorption tube[2])	

Note 1: Duplicate sample runs are to be conducted consecutively and on the same sampling day.
Note 2: USEPA Method 18 allows for four different sampling options. Sampling of benzene must occur using the methodology described for adsorption tubes.
Note 3: Stack sampling occurs according to a NATA accredited modified version of USEPA Method TO-5 to adapt it from a non-isokinetic ambient sampling method to a non-isokinetic stack sampling method.

9. The Works Approval Holder must ensure that all sampling and analysis for the monitoring of point source emissions to air specified in Table 4 is conducted by companies and laboratories with current NATA accreditation for the methods and analysis specified.

10. The Works Approval Holder must, within 60 days of the monitoring of point source emissions to air monitoring specified in Table 4 being completed, submit to the CEO a report which details the results of monitoring.

11. The Works Approval Holder must retain the services of a person qualified and experienced in the area of environmental noise assessment and who by their qualifications and experience is eligible to hold membership of the Australian Acoustical Society or the Australian Association of Acoustical Consultants to:

(a) investigate the sound power levels of BOD Reactor Tank Agitators during steady-state operations; and

(b) compile and submit to the Works Approval Holder within 90 days of achieving steady-state operations a report in accordance with Condition 12.

12. A report prepared pursuant to Condition 11(b) must include:

(a) a description of the methods used for monitoring;

(b) details and the results of the investigation undertaken pursuant to Condition 11(a); and

(c) a comparison of BOD Reactor Tank Agitator corresponding total sound power levels and 1/1 octave sound power levels against Table 5.

Table 5: Equipment sound power levels

Equipment	Total sound power level [dB(A)]	1/1 octave sound power level [dB(A)]							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
BOD Reactor Tank Agitator 1	91.7	37.7	59.7	76.3	83.8	87.7	83.6	85.4	72.7
BOD Reactor Tank Agitator 2	96.5	39.9	70.1	84.8	89.1	92.7	87.0	89.8	76.7

13. The Works Approval Holder must submit to the CEO the report prepared pursuant to Condition 12 within 14 days of receiving it.

Record-keeping

14. The Works Approval Holder must maintain accurate Books including information, reports and data in relation to the Works, and the Books must:

(a) be legible;

(b) if amended, be amended in such a ways that the original and subsequent amendments remain legible or are capable of retrieval; and

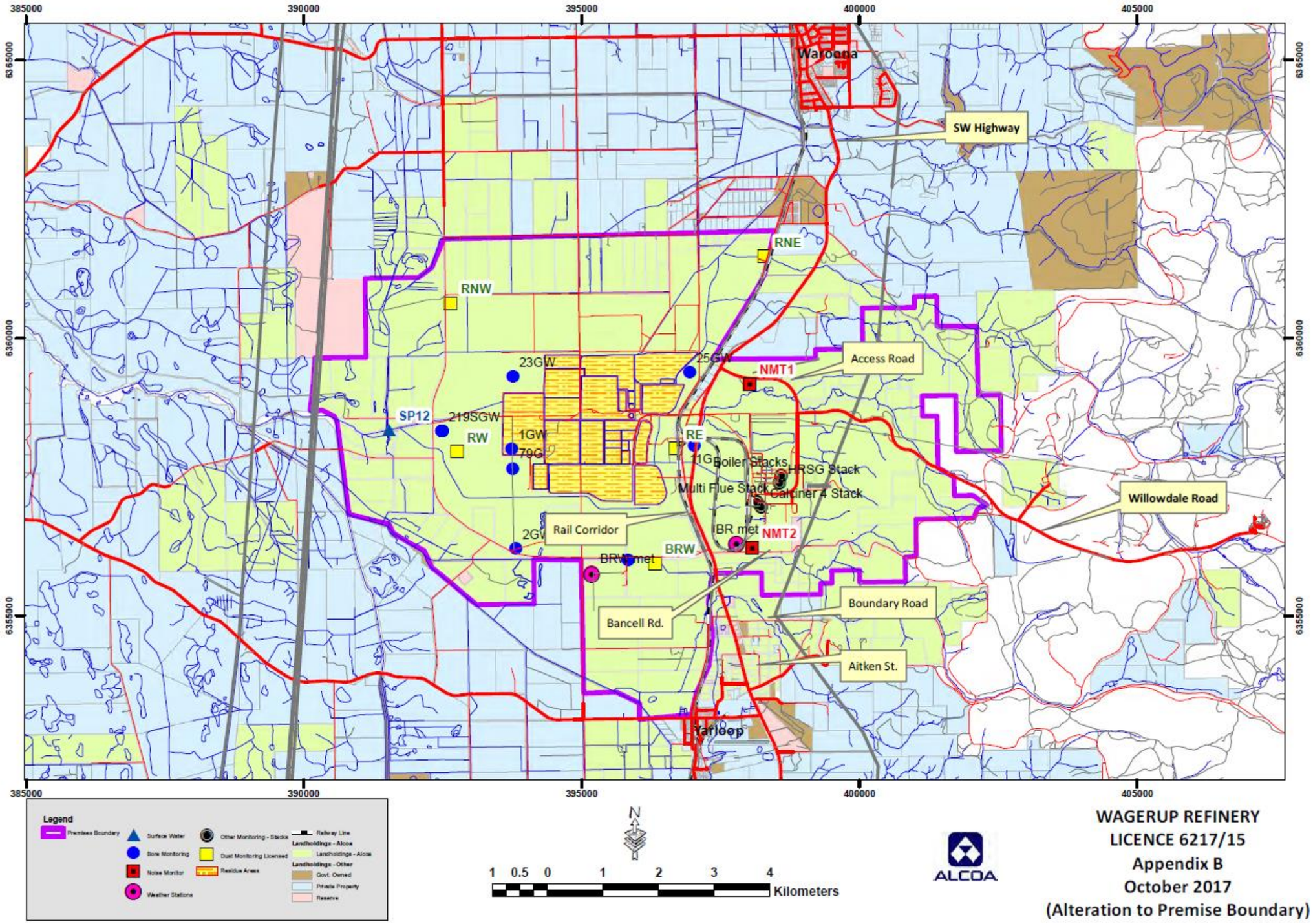
(c) be available to be produced to an Inspector or the CEO.

15. The Works Approval Holder must comply with a Department Request within 14 days from the date of the Department Request or such other period as agreed to by the Inspector or the CEO.

Schedule 1: Maps

Premises map

The Premises are shown in the map below. The pink line depicts the Premises boundary.

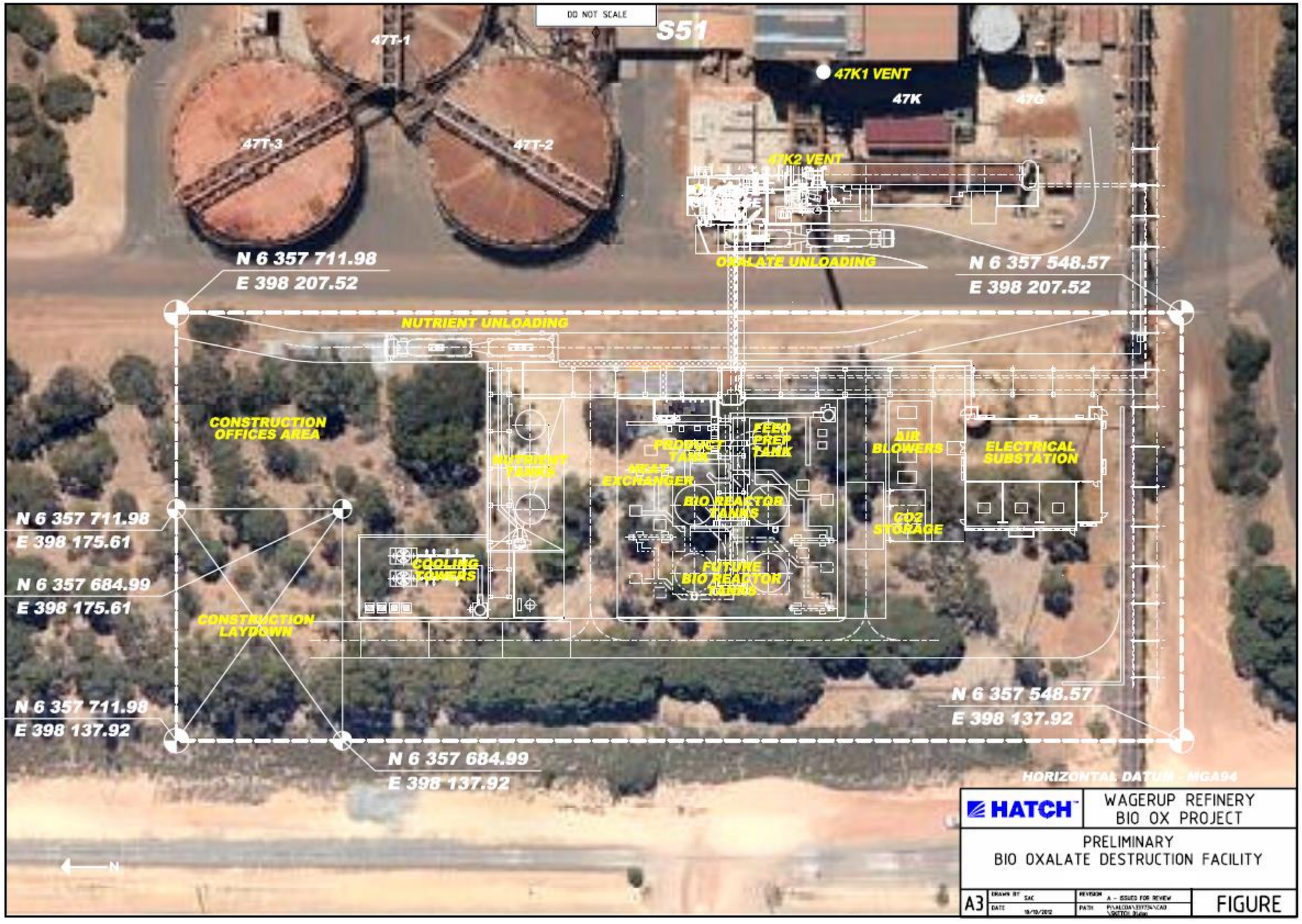


Oxalate Bioremoval Facility Location Map

The green hatched area depicts the location of the Works within the Premises.

Oxalate Bioremoval Facility Layout Plan

The Oxalate Bioremoval Facility is shown in the map below including the location of infrastructure and equipment.



Schedule 2: Works

At the time of assessment, Emissions and Discharges from the Works listed in Table 6 were considered in the determination of the risk and related Conditions for the Works Approval.

Table 6: Authorised Works

Works	Specifications	Schedule 1 reference
Oxalate Bioremoval Facility	• Design capacity of 70 tonnes of sodium oxalate solids per day. • Tanks and vessels (feed preparation, bioreactors, product, nutrient and defoamer). Excludes the tanks marked 'Future bioreactor tanks.' • Secondary containment bunding with associated sumps, sump pumps and connections to existing refinery process water systems. • Pipework and associated pumps for transporting process fluids and oxalate. • Pipework and associated connections to direct air emissions from tanks to the existing oxalate kiln 47K1 vent and 47K2 RTO vent. • Compressed air and carbon dioxide systems. • Two cooling towers and associated heat exchangers.	Oxalate Bioremoval Facility Location Map; and Oxalate Bioremoval Facility Layout Plan

Site layout

The infrastructure and equipment are set out on the Premises in accordance with the Oxalate Bioremoval Facility Location Map and Oxalate Bioremoval Facility Layout Plan as depicted in Schedule 1.

Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	W6104/2017/1
Applicant	Alcoa of Australia Limited
ACN	004 879 298
File Number	DER2017/001857
Premises	Wagerup Alumina Refinery 184 Willowdale Road WAGERUP WA 6215 Lot 700 on Plan 59305 Certificate of Title Volume 2708 Folio 955
Date of Report	27 March 2018
Status of Report	Final

Table of Contents

1. Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
ANZECC Guidelines	Australian and New Zealand guidelines for fresh and marine water quality. Volume 1, The guidelines / Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand
Applicant	Alcoa of Australia Limited
Approved Noise Levels	refers to clause 3 of the Noise Approval
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CS Act	*Contaminated Sites Act 2003* (WA)
Decision Report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation As of 1 July 2017, the Department of Environment Regulation (DER), the Office of the Environmental Protection Authority (OEPA) and the Department of Water (DoW) amalgamated to form the Department of Water and Environmental Regulation (DWER). DWER was established under section 35 of the *Public Sector Management Act 1994* and is responsible for the administration of the *Environmental Protection Act 1986* along with other legislation.
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of, and during this Assessment
LTRMS	refers to the Applicant's Long Term Residue Management Strategy
Minister	the Minister responsible for the EP Act and associated regulations
MS	Ministerial Statement
mtpa	million tonnes per annum
NEPM	National Environmental Protection Measure
NIA	refers to the Applicant's Noise Impact Assessment that forms part of the Application documentation listed in Table 2.
Noise Approval	refers to refers to the *Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Approval 2012* and amendments in the *Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Amendment Approval 2013* granted by

Term	Definition
	the Minister pursuant to r.17 of the Noise Regulations
Noise Approval Locations	refers to locations 1 – 8 as defined in the Noise Approval
Noise Regulations	*Environmental Protection (Noise) Regulations 1997* (WA)
OBF	Oxalate Bioremoval Facility
Occupier	has the same meaning given to that term under the EP Act.
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Primary Activities	as defined in Schedule 2 of the Revised Licence
Regulatory Framework	as published on DWER's website at www.dwer.wa.gov.au
Risk Event	As described in *Guidance Statement: Risk Assessment*
RTO	Regenerative thermal oxidiser

2. Purpose and scope of assessment

Alcoa of Australia Limited (Applicant) lodged an application for works approval on 16 October 2017 (the Application) to construct an Oxalate Bioremoval Facility (OBF) with a design capacity of 70 tonnes of sodium oxalate per day at its Wagerup Alumina Refinery (Premises). This Decision Report documents the Delegated Officer's risk assessment of emissions and discharges and determination of the Application consistent with the Department of Water and Environmental Regulation's (DWER's) *Guidance Statement: Risk Assessment* and *Guidance Statement: Decision Making*.

The scope of the assessment is limited to the risk of actual and potential emissions and discharges arising from the construction and operation of the OBF. The risk of emissions and discharges from the broader Wagerup Refinery are not within the scope of assessment and are subject to the conditions of Licence L6217/1983/15 (Existing Licence).

DWER has commenced a risk-based review of the Wagerup Alumina Refinery to align the Existing Licence with the Department's Regulatory Framework. The review will have regard to the assessment outcomes in this Decision Report.

2.1 Application details

Table 2 lists the documents submitted during the assessment process.

Table 2: Documents and information submitted during the assessment process

Document/information description	Date received
Application form dated 16/10/2017, including Attachments 2, 3A, 4, 6, 8 and Appendix 1	16/10/2017
Supplementary information in response to a request by the Delegated Officer	06/11/2017
Noise Impact Assessment (revision 3) and Site Plan (Figure A3) resubmitted to correct an error	15/11/2017

Table 3 lists the Prescribed Premises categories that have been applied for in the Application

Table 3: Prescribed Premises Categories relevant to the Application

Classification of Premises	Description	Approved Premises production or design capacity	Application design capacity
46	Bauxite refining: premises (other than premises within paragraph (b) of category 5) on which alumina is produced from bauxite refining.	2.85 million tonnes per annum of alumina	70 tonnes of oxalate solids per day

3. Background

The Premises are located approximately 120 km south of Perth and 7.5 km south of the town of Waroona, on the border of the Peel and South West regions of Western Australia. The Premises commenced operations in 1984 and are subject to other approvals including a Ministerial Statement granted under Part IV of the EP Act, a Noise Approval granted under r.17 of the Noise Regulations, and State Agreement Acts.

Bauxite feed material for the Premises is transported from the nearby Willowdale Mine Site via overland conveyor. The Premises are connected to the Applicant's Bunbury Port shipping

terminal by railway for the purposes of exporting alumina product and importing bulk caustic as a process input.

The Applicant holds licences under Part V of the EP Act for the operation of other facilities including:

- Kwinana Alumina Refinery (L5245/1967/14);
- Pinjarra Alumina Refinery (L5271/1983/14);
- Willowdale Mine Site (L6456/1989/10); and
- Huntly Mine Site (L6210/1991/10).

4. Overview of Premises

4.1 Operational aspects

4.1.1 Existing activities

The Premises have two distinct areas dissected by the South West Highway and the Perth-Bunbury railway line - the Refinery that processes and refines bauxite into alumina, and the Residue Storage Area (RSA) for the storage and disposal of residue and other solid and liquid wastes. The Refinery and RSA are joined by internal access roads and pipelines.

Bauxite is received from the nearby Willowdale Mine Site via overland conveyor where it is refined at the Premises into alumina using the Bayer Process. The four main steps in the Bayer Process are digestion, clarification, precipitation and calcination.

Oxalate originates from broken-down organic material (plant and animal matter as humus) in the bauxite. The organic matter forms sodium oxalate within the refining process, which builds up in the recycled caustic liquor circuit. The oxalate impacts on alumina product quality and yield and is therefore removed from the process liquor stream. Although oxalate is a compound commonly found in the environment and itself is not intrinsically harmful, the oxalate extracted from the refining process has a high caustic concentration and therefore requires appropriate handling, storage and treatment.

Oxalate is destroyed (oxidised) in the oxalate kiln or contained either within a tank or tanks at the refinery or within dedicated RSA oxalate ponds.

The Premises operate continuously 24 hours per day and seven days per week.

4.1.2 Application proposed activities

The OBF will be located on the western edge of the refinery as shown in Figure 1 below. The proposed area is adjacent to the existing oxalate kiln (referred to as 47K) as shown on the OBF layout plan in Appendix 2.

Figure 1: Location of the proposed OBF within the refinery (source: the Application)

The Applicant has an oxalate management strategy (Oxalate Strategy) that it reports to DWER annually as part of its annual environmental reporting requirements under the Existing Licence. The Oxalate Strategy involves interim storage of oxalate, destruction of sodium oxalate using a kiln, and destruction of sodium oxalate by alternative technologies. The Applicant has proposed the OBF to complement existing storage and destruction methods of oxalate management. Treatment of oxalate in an OBF provides environmental and cost advantages, and OBFs are already operated by the Applicant at its Kwinana Alumina Refinery and Pinjarra Alumina Refinery.

The treatment of oxalate in the OBF is shown in Figure 2 below. Oxalate cake from the adjacent oxalate kiln circuit is directed to the OBF and mixed with water in the feed tank to form a slurry. The oxalate slurry is then fed to the bioremoval tanks and dosed with an ammonia-based nutrient and defoamer. Continuous aerobic biological processes convert the sodium oxalate to sodium carbonate using naturally occurring microorganisms within the bioremoval tanks with aeration and agitation. The biological oxidation of sodium oxalate under alkaline conditions produces bicarbonate, carbonate and water, which are directed back in to the refinery through the refining circuit.

Air emissions from the OBF will be directed to the adjacent oxalate kiln for destruction or venting to atmosphere via existing vent stacks. Runoff and drainage from secondary containment areas will be collected and directed into the existing process water systems for the Wagerup Refinery.

The Application specifies that the OBF will have a peak design capacity of 70 tonnes of oxalate solids per day and a nominal throughput of 45 tonnes per day.

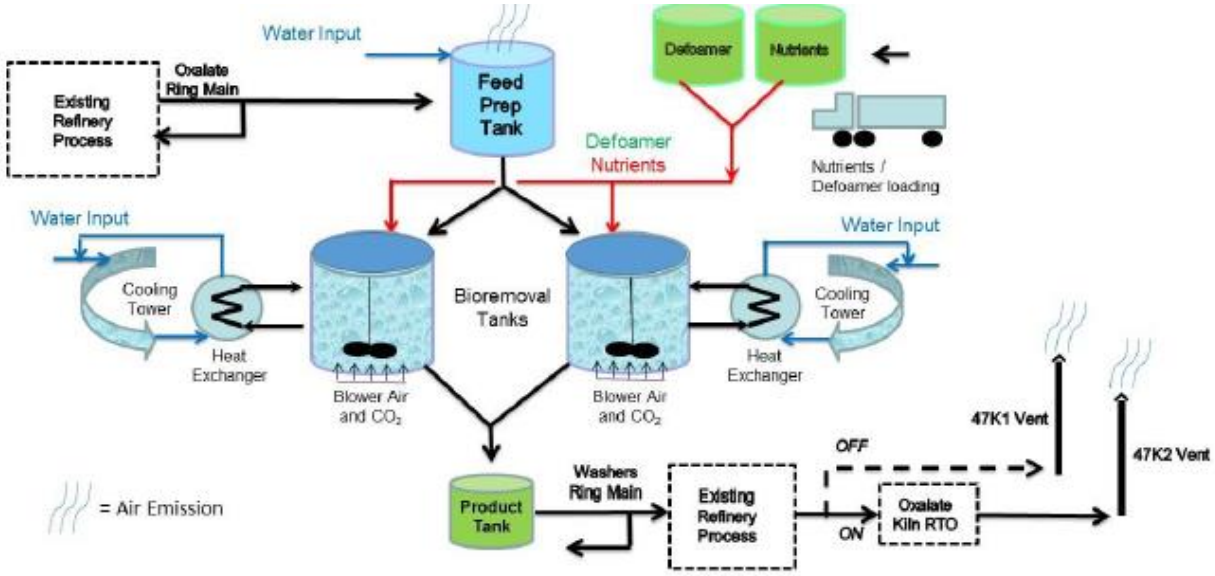


Figure 2: OBF process diagram (source: the Application)

4.2 Infrastructure

The OBF infrastructure, as it relates to Category 46 activities, is detailed in Table 4 and with reference to the layout plan in Appendix 2.

Table 4: Proposed OBF Category 46 infrastructure

Infrastructure		Site Plan Reference
Prescribed Activity Category 46		
Bauxite is refined using the Bayer Process to produce alumina for export. The Bayer Process produces a build-up of sodium oxalate in the liquor stream that is currently destroyed (oxidised) in the oxalate kiln or contained either within a tank or tanks at the refinery or within dedicated RSA oxalate ponds. It is proposed to construct and operate a biological treatment system for oxalate that will complement existing oxalate kiln treatment.		
1	OBF incorporating: • Tanks and vessels (feed preparation, bioreactors, product, nutrient and defoamer). • Secondary containment bunding with associated sumps, sump pumps and connections to existing refinery process water systems. • Pipework and associated pumps for transporting process fluids and oxalate. • Pipework and associated connections from tanks to the existing oxalate kiln 47K1 vent and 47K2 RTO vent. • Compressed air and carbon dioxide systems. • Two cooling towers and associated heat exchangers.	OBF layout plan - Appendix 2

5. Legislative context

Table 5 summarises approvals relevant to the assessment.

Table 5: Relevant approvals and tenure

Legislation	Number	Subsidiary	Approval
Alumina Refinery (Wagerup) Agreement and Acts Amendment Act 1978	N/A	Alcoa of Australia Limited	Establishment and operation of the Premises
Dangerous Goods Safety Act 2004	Dangerous Goods Licence DGS010738		Dangerous Goods storage and handling
Part IV of the EP Act (WA)	MS 728		Operation of the Premises and implementation of the Wagerup Unit 3 expansion proposal
	MS1069		Extension of time limit for implementation of the third production unit
Part V of the EP Act	Licence L6217/1983/15		Licence in respect of emissions and discharges from Prescribed Activities on the Premises.

5.1 Part IV of the EP Act

5.1.1 Background

The Applicant holds Ministerial Statement 728 (MS 728) granted by the Minister for Environment under Part IV of the EP Act for the Wagerup Unit 3 expansion proposal. Bulletin 1215 contains the EPA's advice and recommendations to the Minister on the environmental factors and principles relevant to the expansion proposal. MS 728 has been amended on several occasions to extend the time limit of authorisation for substantial commencement of the expansion proposal. Ministerial Statement 1069 (MS 1069) was granted on 18 December 2017 to extend the time limit of implementation of the third production unit to 27 September 2022.

The EPA identified the following environmental factors in Bulletin 1215:

- Air pollutant emissions;
- Predicted ambient air quality and Health Risk Assessment;
- Potential for health and amenity impacts due to short-term ground level concentrations;
- Land use management in proximity to the refinery;
- Noise; and
- Greenhouse gases.

5.1.2 Ministerial Statement 728

The conditions of MS 728 are divided into three parts as follows:

- Part A – includes Conditions 1 to 7 that apply to the entire revised proposal and are currently active;

- Part B – includes Conditions 8 to 14 and Procedures 1 and 2 that apply to the expansion component of the revised proposal. However, some of these conditions are or have been addressed by the proponent, such as Condition 13-1 that required a revision of the LTRMS. Other conditions are not triggered until implementation of the expansion commences.
- Part C – includes Conditions 15 to 17 and Procedures 3 and 4 that apply to current operations and are active.

Conditions in Part A are primarily administrative in nature relating to the expansion proposal scope of works, fulfilment of commitments, contact details, reporting, performance review, and decommissioning. These conditions are not relevant to this Assessment. As the Applicant is yet to initiate and implement the expansion proposal, conditions in Part B are yet to be triggered. The construction and operation of an OBF do not form part of the expansion proposal.

Conditions 15 to 17 relate to bauxite mining operations and residue closure strategy requirements on social impacts.

5.2 Contaminated sites

The following lots form part of the Premises boundary and were classified under the *Contaminated Sites Act 2003* on 16 June 2008 as *Contaminated – remediation required:*

- Lot 205 on Plan 34250
- Lot 700 on Plan 59305
- Lot 703 on Plan 59305

The published 'Basic Summary of Records' available for the Premises identifies that there are elevated alkalinity and heavy metal concentrations in surface water and groundwater across the Premises. Metals are present in surface water at elevated concentrations towards the south-west and centre of the Premises. A non-metallic halogen is also present in surface water at elevated concentrations towards the south-west of the Premises.

Active remediation of groundwater by abstraction is currently occurring at the Premises.

5.3 Other relevant approvals

5.3.1 Planning approvals

The Applicant is subject to the *Alumina Refinery (Wagerup) Agreement and Acts Amendment Act 1978* (Wagerup Agreement). Therefore, development approval is not required for construction and operation of the proposed OBF.

5.3.2 Department of Jobs, Tourism, Science and Innovation

The Wagerup Agreement is an agreement between the State of Western Australia and the Applicant for the establishment of the Premises. It includes related facilities for production of alumina from bauxite mined within mineral leases granted pursuant to the principal agreement and for shipment of the alumina.

Clause 17 of the Wagerup Agreement specifies that the agreement does not exempt the Applicant from compliance with any requirement in connection with the protection of the environment that may be made by the State.

5.3.3 Department of Mines, Industry Regulation and Safety

The Applicant holds approvals under dangerous goods legislation for the storage and handling of dangerous goods. The Application states that amendments will be sought to the Applicant's Dangerous Goods Licence DGS010738 prior to commissioning of the OBF.

5.4 Part V of the EP Act

5.4.1 Applicable regulations, standards and guidelines

The overarching legislative framework for this assessment is the EP Act and EP Regulations.

The guidance statements which inform this assessment are:

- *Guidance Statement: Regulatory Principles (July 2015)*
- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Decision Making (February 2017)*
- *Guidance Statement: Risk Assessments (February 2017)*
- *Guidance Statement: Environmental Siting (November 2016)*

The Noise Regulations are subsidiary legislation to the EP Act and apply to the Assessment.

5.4.2 Clearing

The Application states that approximately 0.95 ha of intentionally planted vegetation will be cleared for the footprint of the OBF. The Applicant considered that the vegetation does not meet the definition of 'native vegetation' as defined in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. The Applicant concluded that the proposed clearing was exempt from the requirement for a clearing permit and has not applied for one.

The Delegated Officer considered the Applicant's conclusions and reviewed information, including historical imagery, on DWER's records and was satisfied that no clearing permit was required.

5.4.3 Regulation 17 of the Noise Regulations approval

The Applicant holds a Noise Approval granted by the Minister under r.17 of the Noise Regulations. The Noise Approval provides for the Applicant to:

1. vary the allowable level of noise emissions from the Wagerup Refinery at specified locations;
2. implement a noise amelioration plan (NAP) including:
    - an acoustic amelioration program setting out procedures for the provision by Alcoa of noise insulation for buildings;
    - a land management plan for the purchase by Alcoa of noise-affected land;
    - any other matter required by the Department.
3. undertake continuous and point in time noise monitoring programs using specialist and independent noise consultants; and
4. report data and information to the Department and publicly.

DWER is currently assessing an application for a further noise approval from the Applicant. However, the requirements of the existing Noise Approval continue to have effect until the Minister grants or refuses to grant a further noise approval.

The Noise Approval defines eight locations (Noise Approval Locations) for the purposes of measuring compliance with the varied allowable noise levels. Noise emissions from the Premises, including any contribution from the proposed OBF, are subject to the Noise Approval requirements.

6. Consultation

The Delegated Officer referred the application to the Shire of Waroona and the Community Alliance for Positive Solutions Inc. (CAPS) as direct interest stakeholders. The Application was publicly advertised for a period of 21 days, closing on 15 December 2017.

On 13 December 2017, the Department received a request from a third party requesting an extension to the public consultation on account of the time of year (Christmas holiday period) and that two other public consultation processes relating to the Premises were occurring at the same time - the application for further approval under r.17 of the Noise Regulations, and the Department initiated review of Licence L6217/1983/15.

The Delegated Officer agreed to extend the public consultation period from 15 December 2017 to 15 January 2018. In consideration of the request, the Delegated Officer also extended the public consultation periods of the noise application and licence review from 15 December 2017 to 31 January 2018.

A further request was received to extend the Application consultation period to 31 January 2018. However, the Delegated Officer considered that the initial extension had provided sufficient time for consultation and advised that priority should be given to comments on the Application as the consultation periods for the other processes could be extended if required.

A summary of the submissions received and the Delegated Officer's consideration of them is provided in Appendix 3.

7. Location and siting

7.1 Siting context

The Premises are located on the eastern edge of the Swan Coastal Plain adjacent to the Darling Scarp on land zoned as 'Special industry' with rural zoned land adjacent to the west, north, and east. Land zoned for general and intensive farming is located to the immediate south.

7.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 6.

Table 6: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Dwellings	Closest dwelling approx. 1.6 km north west of the proposed OBF Seven dwellings between 1.6 km and 4.0 km from the OBF
Towns	Yarloop – approx. 2.6 km south Hamel – approx. 4.5 km north Waroona – approx. 6.6 km north Note: distances are measured from the OBF to the boundary of the respective town sites as measured on DWER's Geographic Information System

7.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or emissions and discharges from the Premises. The distances to specified ecosystems in respect of the proposed OBF are shown in Table 7.

Table 7: Environmental values

Specified ecosystems	Distance from the proposed OBF within the refinery
Ramsar Sites in Western Australia	Peel-Yalgorup System – approx. 18 km west and 20 km north west
Important wetlands – Western Australia	1. Peel Harvey Estuary – approx. 20 km north west 2. Yalgorup Lakes System – approx. 19 km west
Geomorphic Wetlands Swan Coastal Plain (management)	1. Conservation – approx. 4.8 km north east 2. Resource Enhancement – approx. 2.2 km south west 3. Multiple Use – approx. 420 m north, 1.2 km south and 580 m west
Environmental Protection (Peel Inlet – Harvey Estuary) Policy 1999 (Peel Harvey EPP)	Within the Peel Harvey EPP boundary
Threatened Ecological Communities (TEC) and Priority Ecological Communities (PEC)	1. TEC - Area of Banksia Woodland mapped within the refinery complex, to its north and source, including the location of the proposed OBF. Banksia Woodland areas also extend south of the refinery. 2. PEC – approx. 7.7 km north west correlating with the Buller Nature Reserve. TEC areas of Banksia Woodland are also located in this area.
Waterways Conservation Act 1976 – Peel Inlet Management Area	Approx. 5.7 km west
Public drinking water source areas (PDWSA)	1. Samson Brook Catchment Area - Priority 1 – Waroona and Hamel town water supply system – approx. 6.3 km north east 2. Preston Beach Water Reserve – Priority 1 – Preston Beach town water supply – approx. 15.7 km west
Department of Biodiversity, Conservation and Attractions Tenure	1. Buller Nature Reserve – approx. 7.7 km north west 2. Hamel State Forest – approx. 4.7 km north 3. Yarloop Nature Reserve – approx. 4.2 km south 4. Myalup State Forest – approx. 14.5 km west

7.4 Groundwater and surface water

7.4.1 Groundwater

The OBF will be located within the Premises refinery complex, which is superficially underlain by the Yoganup Formation. This formation is partly saturated near the refinery and forms a widespread unconfined or semi-confined aquifer up to 10 m thick in some areas. The groundwater flow is predominantly westward towards the RSAs with some potential for downward flow towards the underlying Mesozoic Formations, which form a basal aquitard to groundwater in the overlying Yoganup Formation (Rockwater 2017).

7.4.2 Surface water

The natural surface water in the Wagerup area flows to the west from the Darling Scarp across the Swan Coastal Plain.

Surface water drainage in the Wagerup area has been historically heavily modified when the region was originally cleared for agricultural purposes. This includes many shallow drains cut into the land surface to control water-logging and to reduce high groundwater levels during the wetter months. These drains continue to direct water into the Harvey River and ultimately the Peel Harvey Estuary (Rockwater 2017).

The Application relates to the construction and operation of the OBF, which is will be on the western edge of the Premises refinery complex as depicted in Figure 1 above. Table 8 below focuses on distances to groundwater and water sources in the context of the OBF.

Table 8: Groundwater and surface water sources (Rockwater 2017)

Groundwater and water sources	Distance from OBF / refinery	Description / environmental value
Groundwater	The refinery overlies sedimentary units of the Perth Basin and groundwater typically occurs at shallow depths in the area (i.e. less than 5 m).	Groundwater salinities in the Wagerup area range between approx. 500 mg/L and 5,000 mg/L with the most saline groundwater generally occurring within the Guildford Formation, the superficial formation that underlies the RSA. Shallow groundwater at the refinery potentially has beneficial use as irrigation and/or stock water; a small amount of groundwater is produced by the alkali recovery bore field at the refinery and used in the refining circuit. Regionally, it also has potential beneficial use as irrigation and stock water. The refinery land is classified under the CS Act as '*Contaminated – Remediation Required*.' Alkali plumes in the refinery area are present in both the shallow and deeper aquifer intervals. One of the most notable areas is near Building 26 which is immediately north of the proposed OBF where a recovery bore field operates.
Diversion drain(s)	< 1 km west	A drainage line is indicated east of the refinery that links with the Yalup Brook Drain, running parallel to the south RSA perimeter into the Samson South Drain and ultimately discharging to the Harvey River Main Drain / Harvey River west of the RSA.
Harvey River	Approx. 9 km west	The Harvey River discharges into the Harvey Estuary approx. 20 km north west of the RSA. Water is used for industrial and agricultural purposes, with provision for environmental water requirements. The river supports a moderately disturbed ecosystem.

7.5 Meteorology

The Wagerup area experiences a Mediterranean-type climate, with hot, dry summers and cool, wet winters. The majority of rainfall occurs during winter and spring (May to September). The Bureau of Meteorology (BoM) Waroona Station provides an annual average rainfall of 992 mm between 1935 and 2012.

Meteorological conditions strongly influence the dispersion of air emissions. Field studies such as the Department's Winter 2006 Study have found that meteorology of the Wagerup area can vary between simple to complex, i.e. when wind close to the Darling escarpment has different speed and direction compared to wind over the Swan Coastal Plain. Winds at different heights can also have very different speed and direction. This meteorological complexity means that transport of refinery emissions can also be complex.

The Applicant operates a weather monitoring station Bancell Road as a requirement of the Existing Licence.

8. Applicant's noise impact assessment

As outlined in Section 5.4.3, noise emissions from the Premises are subject to the requirements of a Noise Approval. The Applicant provided a Noise Impact Assessment (NIA) which includes updates to the Premises acoustic model to include the OBF. This section of the Decision Report outlines the Applicant's results and findings in the NIA and the Delegated Officer's considerations which inform risk assessment of noise in Section 9.5.

An acoustic model was used by the Applicant to predict noise levels at the eight Noise Approval Locations and at Hamel. Predicted noise levels at the Noise Approval Locations were modelled using worst-case meteorological conditions and compared to the night time Approved Noise Levels.

The NIA listed sources of noise from the OBF and provided sound power levels as measured from a similar OBF currently operating at the Applicant's Pinjarra Refinery. The noise sources and corresponding sound power levels are shown in Table 9.

Table 9: Equipment sound power levels provided in the Application

Source	Sound power level dB(A)
046K-CTF-002 Cooling Tower	100.4
046K-CTF-001 Cooling Tower	100.4
046-BRT-002 OBF Reactor Tank Agitator	96.5
046E-BPP-001 OBF Reactor Product Pump	92.2
046-BRT-001 OBF Reactor Tank Agitator	91.7
046-IDF-001 OBF Reactor Induced Draft Fan	90.0
046-BRB-001 Air Blower Motor Varispeed Unit	88.7
046-BRB-002 Air Blower Motor Varispeed Unit	88.3
046A-BFT-001 Feed Preparation Tank Agitator	85.7
046K-CWP-001 Cooling Tower Discharge Pump	81.0
046-UFP-021 OBF Reactor Underflow Pump	75.4
046-UFP-011 OBF Reactor Underflow Pump	75.4
046A-BFP-001 OBF Reactor Feed Pump	75.2

The predicted noise levels at the assessment locations are provided in Table 10. The results concluded that the OBF would not increase the noise level from the Premises at the Noise Approval Locations.

However, the noise levels were predicted to be above the Approved Noise Levels at some Noise Approval Locations. The Applicant concluded that this is associated with the model accuracy and validation process as detailed in the Wagerup Refinery noise model design and verification report (SVT 2016) and that the predictions do not mean that noise emissions from the Premises will exceed the levels specified in the Noise Approval. The variability between

noise model predictions and the measured noise levels from the Premises were within 2 dB at most Noise Approval locations, and the mean variation across all Noise Approval Locations was +0.5 dB.

Table 10: Predicted noise levels from the Wagerup Refinery and OBF as provided in the Application

Noise Approval Locations and Hamel	Noise Approval or Noise Regulation L_{A10} assigned noise level [dB(A)]	Applicant predicted noise levels [dB(A)]		
		Existing Wagerup Refinery	OBF in isolation	Existing Wagerup Refinery and OBF
1	47	43.6	15.8	43.6
2	46	46	25	46
3	45	42	16.3	42
4	41	40.9	18.6	40.9
5	41	41.4	19.4	41.4
6	37	35.3	12.1	35.3
7	37	37.8	16.9	37.8
8	36	34.3	12.7	34.3
Hamel	35	31.4	11.2	31.4

The Applicant selected Noise Approval Location 1 to determine noise source ranking as it is close to the nearest privately-owned residence to the Premises. The OBF source contribution rankings at Location 1 the NIA are provided in Table 11. When ranked against existing Premises sources, the total OBF contribution of 15.8 dB(A) was ranked the lowest source.

Table 11: Ranking of OBF noise sources at Location 1 of the Noise Approval

OBF source	Source contribution [dB(A)][1]
046-BRT-002 BOD Reactor Tank Agitator	12.0
046-BRT-001 BOD Reactor Tank Agitator	6.4
046E-BPP-001 BOD Reactor Product Pump	4.6
046-BRB-001 Air Blower Motor Varispeed Unit	4.4
046-IDF-001 BOD Reactor Induced Draft Fan	4.4
046K-CTF-001 Cooling Tower	4.0
046K-CTF-002 Cooling Tower	4.0
046-BRB-002 Air Blower Motor Varispeed Unit	3.6
046A-BFT-001 Feed Preparation Tank Agitator	3.2
046A-BFP-001 BOD Reactor Feed Pump	-11.8
046-UFP-021 BOD Reactor Underflow Pump	-12.9

OBF source	Source contribution [dB(A)][1]
046-UFP-011 BOD Reactor Underflow Pump	-13.0
046K-CWP-001 Cooling Tower Discharge Pump	-20.9
Total	**15.8**

Note 1: The Applicant makes note that a negative source contribution level means the sound pressure level is very low, below the threshold of human hearing.

The Applicant concluded that the proposed OBF will have no measurable impact on Premises noise emissions at all the Noise Approval Locations. The predicted contribution of the proposed OBF is more than 20 dB below both the predicted Premises noise levels and the Approved Noise Levels at all Noise Approval Locations.

The Applicant also concluded that there was no increased risk of tonality due to the insignificant contribution of the proposed OBF to the existing Premises noise levels.

In reviewing the NIA, the Delegated Officer found that the model input sound power levels were reasonable and that no issues were identified with the modelling software used or the meteorological inputs.

9. Risk assessment

9.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DWER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

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. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 12 and Table 13.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Table 12 and Table 13 below.

Table 12: Identification of emissions, pathway and receptors during construction

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**		
Construction, mobilisation and positioning of infrastructure	Civil earthworks, wind erosion from soil surfaces, vehicle movements and infrastructure construction	Dust	Closest dwelling approximately 1.6 km north west of the OBF. Seven dwellings between 1.6 km and 4 km.	Air / wind dispersion	Health and amenity impacts	No	The Delegated Officer does not expect dust impacts during the construction phase taking into considering the size, scale and scope of works and the distance to the nearest receptor. The Applicant is subject to existing dust controls including ambient monitoring and ambient limits through its Existing Licence.
	Construction of new buildings, plant and infrastructure	Noise			Noise Approval exceedance Amenity impacts	No	The works will not be carried out on a construction site for the purposes of the Noise Regulations. The Applicant is subject to a Noise Approval for noise emissions from the Wagerup Refinery.

Table 13: Identification of emissions, pathway and receptors during operation

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Oxalate bioremoval facility	Biological treatment of sodium oxalate	Point source air emissions (including odour) via 47K1 or 47K2 vents	Closest dwelling approximately 1.6 km north west of the OBF. Seven dwellings between 1.6 km and 4 km.	Air/wind dispersion	Health and amenity impacts	Yes	Refer to Section 9.4
		Point source emissions of mercury to air			Health impacts	No	The Delegated Officer considered advice in the Application that the concentration of mercury in the oxalate feed is low / negligible. The Delegated Officer had regard to mercury balance work conducted by Alcoa in 2011 for the Pinjarra Refinery OBF, which concluded there would be no measureable effect on the level of mercury emissions to air due to the insignificant amount of mercury returned to the refinery circuit prior to the evaporation stage. The Delegated Officer determined that changes to the risk profile of mercury emissions to air risk were not expected.
		Noise			Amenity impacts	Yes	Refer to Section 9.5
		Fugitive dust			Health and amenity impacts	No	The Delegated Officer does not expect that there will be sources of fugitive dust from the operational OBF taking into consideration that oxalate is fed into the system as a slurry and is treated using a wet process. Minor incidental dust may be generated from surrounding hardstand surfaces; however, this is not expected to result in health or amenity impacts at receptors given the distance to receptors (from the OBF) and the quantity of incidental dust likely to be generated from hardstand surfaces.
		Spills, ruptures and loss of containment resulting in discharges to land	Superficial aquifer	Direct discharge	Impacts on the beneficial use of groundwater	Yes	Refer to Section 9.6
			Surface water (drains and/or Harvey River). Refer to Table 8 for further information		Impacts on surface water beneficial use and ecosystem	No	The Delegated Officer had regard to the size, scale and location of the OBF. Loss of containment events would be expected to be low volume and short-term duration events confined to the immediate area around the OBF. Loss of containment events are not expected to access surface water.

9.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 14 below.

Table 14: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 15 below.

Table 15: Risk criteria table

Likelihood		**Consequence**		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		**The following criteria has been used to determine the consequences of a Risk Event occurring:**		
			Environment	**Public health* and amenity (such as air and water quality, noise, and odour)**
Almost Certain	The risk event is expected to occur in most circumstances	Severe	• **onsite impacts**: catastrophic • **offsite impacts local scale**: high level or above • **offsite impacts wider scale:** mid-level or above • Mid to long-term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • **Adverse health effects:** high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • **Local scale impacts:** permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	• **onsite impacts**: high level • **offsite impacts local scale**: mid-level • **offsite impacts wider scale**: low level • Short-term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• **Adverse health effects:** mid-level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • **Local scale impacts**: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	• **onsite impacts**: mid-level • **offsite impacts local scale**: low level • **offsite impacts wider scale**: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• **Adverse health effects:** low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • **Local scale impacts:** mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	• **onsite impacts**: low level • **offsite impacts local scale**: minimal • **offsite impacts wider scale**: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • **Local scale impacts:** low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	• **onsite impact**: minimal • Specific Consequence Criteria (for environment) met	• **Local scale**: minimal to amenity • Specific Consequence Criteria (for public health) met

^ Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting.*

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines.*

"onsite**"** means within the Prescribed Premises boundary.

9.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment below:

Table 16: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

9.4 Risk Assessment – Point source emissions to air (operation)

9.4.1 Description of risk event

Air emissions from the operating OBF treatment process are released from the existing oxalate kiln 47K1 vent or 47K2 vent causing adverse health and/or amenity impact on a nearby sensitive receptor.

9.4.2 Identification and general characterisation of emission

The OBF includes nutrient and defoamer tanks, a feed preparation tank, bioreactor tanks, and a product tank. All tanks will be enclosed other than the feed preparation tank which will not have a lid. The Application states that the OBF operates at a low temperature (30^{o}C to 35^{o}C) which reduces the potential for the volatilization of contaminants. The biological oxidation of sodium oxalate under alkaline conditions will produce sodium bicarbonate, sodium carbonate and water. The Applicant refers to observations from the Pinjarra and Kwinana Refinery OBFs that odour is predominantly caused by ammonia which originates from the ammonium-based nutrient that is dosed directly into the bioreactor tanks to support biological growth.

The Applicant advised that the defoamer that will be used has low volatility and is not expected to generate VOC emissions at the low operating temperatures of the OBF. The oxalate feed to the OBF process is considered the main potential source of VOC emissions. The target VOCs specified for the existing oxalate kiln RTO vent stack are acetone, acetaldehyde, benzene, 2-butanone and formaldehyde.

Hydrogen sulphide has the potential to be generated in the event that anaerobic conditions occur in one or both of the bioreactor tanks. The Applicant advises that anaerobic conditions would only occur in the event of a loss of air supply to the OBF for greater than 36 hours causing a loss of microbial processes. The treatment process involves constant aeration and agitation to maintain aerobic conditions.

Air emissions from tanks will be directed to one of two existing vent stack emission points within the adjacent oxalate kiln infrastructure. The two normal operating scenarios for air emissions assessed by the Applicant are:

Scenario 1: The oxalate kiln RTO is online – OBF emissions are treated by the RTO and emitted to air through the existing 47K2 RTO vent stack; and

Scenario 2: The oxalate kiln RTO is offline – OBF emissions are emitted directly to atmosphere through the existing 47K1 vent stack without RTO treatment.

In scenario one, emissions from the 47K2 RTO vent stack are the combined emission from the oxalate kiln and the OBF. In scenario 2, air emissions from the 47K1 vent stack are from the OBF only – when the oxalate kiln RTO is offline there are no air emissions from the oxalate kiln through either vent stack.

The Applicant states that the emission scenario is dependent on oxalate kiln availability which is typically available 60% of any year. For periods when the OBF air emissions are directed through the RTO, ammonia will be mostly converted to oxides of nitrogen (NOx), and VOCs will be destroyed in the combustion process.

The Applicant has assessed the oxalate kiln RTO and confirmed that it could treat emissions from the OBF without affecting the current performance.

Average and peak air emission rates for both operating scenarios provided in the Application are set out in Table 17 below. Data for the refinery total (excluding OBF) emission rate as shown in Table 17 has been calculated from the Wagerup Emissions Inventory 2014.

Table 17: Air emission scenario emission rates and percentage of Wagerup Refinery total based on the Wagerup Emissions Inventory 2014

Scenario	Air emission type	OBF Emission rate	Refinery total (excluding OBF)	% of refinery total
47K1 (RTO offline)				
Annual average	Ammonia	0.007 g/s	3.91 g/s	0.19
	Odour	4943 OU/s	1298800 OU/s	0.38
	VOC	4.5E-04 g/s	3.62 g/s	0.01
Peak emission	Ammonia	0.013 g/s	11.71 g/s	0.11
	Odour	14746 OU/s	3309807 OU/s	0.45
	VOC	7.13E-04 g/s	12.81 g/s	0.01
47K2 (RTO treatment)				
Annual average	Ammonia	0.002 g/s	3.91 g/s	0.05
	NOx	0.013 g/s	73 g/s	0.04
	Odour	4136 OU/s	1298800 OU/s	0.32
	VOC	0 g/s	3.62 g/s	0
Peak emission	Ammonia	0.005 g/s	11.71 g/s	0.04
	NOx	0.024 g/s	31 g/s	0.03
	Odour	13245 OU/s	3309807 OU/s	0.4
	VOC	0 g/s	12.81 g/s	0

9.4.3 Description of potential adverse impact from the emission

In general, ammonia is a strongly alkaline and corrosive substance, and ammonia vapours have the potential to cause irritation of the eyes and respiratory tract. Ammonia has a familiar odour from its domestic use in household and window cleaning products.

Individual responses to odour emissions more generally may vary depending on age, health status, sensitivity, and odour exposure patterns. Perceived odour intensity may increase or decrease on exposure. Community response to an odour can include annoyance, potentially leading to stress and loss of amenity. Exposure to repeated odour events can create a nuisance effect. Exposure times and frequency of odour emissions depend on day to day activities and weather conditions.

Emissions of NOx to air from combustion sources are mainly in the form of nitric oxide (NO) and nitrogen dioxide (NO_2). NO_2 can affect humans both directly and indirectly; directly, by irritation that leads to an inflammatory reaction in the lungs, and indirectly by affecting the immune system.

The short-term effects of NO_2 are mainly associated with the respiratory system, generally in combination with other pollutants such as irritant gases and particulates. The effects include wheezing, coughing, and sputum production in asthmatics and people with chronic inflammatory lung disease. At higher concentrations, it can contribute to illness (morbidity) and mortality of especially sensitive groups such as children, asthmatics and people with chronic lung disease such as chronic bronchitis. Oxides of nitrogen can also react with VOCs in the presence of sunlight to form photochemical smog.

The hazards, impacts and toxicities of VOCs are wide-ranging as the generic VOC term encapsulates an aggregate of individual compounds.

9.4.4 Criteria for assessment

There are no set threshold or concentration criteria for odour assessment. The general provisions of the EP Act make it an offence to cause or allow unreasonable emissions which includes emissions of odour that unreasonably interfere with the health, welfare, convenience, comfort or amenity of any person.

The NEPM sets ambient air quality standards for NO_2 for the protection of human health and well-being. Other standards or guides can be referenced for the remaining parameters including DEC NSW 2005, Toxikos 2011 and NEPC 2011. These standards are outlined in Table 18.

Table 18: NEPM ambient air quality standards

Pollutant	Maximum concentration standard	Averaging period	Maximum allowable exceedances
NO_2	0.12 ppm	1-hour[a]	1 day a year
	0.03 ppm	1-year[a]	None
Acetone	22,000 µg/m^3	1-hour[b]	N/A
Ammonia	330 µg/m^3	1-hour[b]	N/A
Acetaldehyde	1830 ppm	24-hours[c]	N/A
	46 ppm	1-year[c]	N/A
Benzene	0.009 ppm	1-hour[b]	N/A

Pollutant	Maximum concentration standard	Averaging period	Maximum allowable exceedances
Benzene	0,003 ppm	1-year[d]	N/A
Formaldehyde	0.018 ppm[b]	1-hour	N/A
2-butanone	N/A	N/A	N/A

[a] NEPM, [b] DEC NSW 2005, [c] Toxikos 2011 and [d] NEPC 2011

9.4.5 Applicant controls

The Applicant's controls for point source emissions from the OBF as outlined in its Application are provided in Table 19.

Table 19: Applicant's proposed point source air emission controls during OBF operation

Infrastructure	Controls
Engineering	• Air emissions from OBF tanks emitted via Oxalate kiln 47K1 or 47K2 vent stacks • Air emissions are treated by combustion in the Oxalate kiln RTO during periods the RTO is operating. • One duty and one spare air blower along with agitation to ensure a continuous supply of air distributed to the bioreactors and reduce the risk of anaerobic conditions • dissolved oxygen monitoring system in the bioreactors • oxalate feed control
Management / procedures	• Defoamer with low volatility • Low-temperature process (30^{o}C to 35^{o}C)

9.4.6 Consequence

The Applicant has a degree of certainty around expected emissions and emission rates from the OBF through experience with the commissioning and operation the Pinjarra and Kwinana Refinery OBFs. Process gases will be emitted via the existing oxalate Kiln 47K1 or 47K2 vent stacks. The OBF emission rates are low when compared to the calculated total refinery ammonia, odour, VOC and NOx emission rates. There is not expected to be any significant change to the profile of the oxalate kiln air emissions as a result of OBF emissions being directed through them. Therefore, the Delegated Officer considers the consequence of OBF point source air emissions to be **Slight**.

9.4.7 Likelihood of Risk Event

The Delegated Officer has determined the likelihood of OBF air emissions impacting receptor health and/or amenity would only occur in exceptional circumstances. Therefore, the likelihood is considered to be **Rare**.

9.4.8 Overall rating of point source emissions to air

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 14) and determined that the overall rating for the risk of OBF point source air emissions is **Low**.

9.5 Risk Assessment – Noise emissions (operation)

9.5.1 Description of risk event

Noise emissions from the operation of the OBF cause or contribute to an exceedance of Approved Noise Levels in the Noise Approval as measured at Approved Noise Locations.

9.5.2 Identification and general characterisation of emission

The OBF will operate 24 hours a day, seven days per week and includes various items of rotating equipment such as pumps and fans as well as product tanks and vessels that generate noise.

Keys aspects of operational noise are discussed in Section 8 of this Decision Report, including equipment sound power levels (Table 9), predicted noise levels compared against assigned levels (Table 10), and the ranking of OBF noise sources (Table 11) from the Applicant's NIA. No significant issues were identified in the Applicant's NIA including the noise model inputs and predicted noise impacts. The predicted OBF noise contribution is 15.8 dB(A) which is more than 20 dB below both the predicted Premises noise levels and the Noise Approval levels at all Noise Approval Locations. The OBF is also the lowest source when measured at Noise Approval Location 1 in the ranking of Premises noise sources.

However, equipment malfunction may result in short-term increased noise emissions.

9.5.3 Description of potential adverse impact from the emission

In general, noise can be annoying, interfere with speech, disturb sleep or interrupt work. Prolonged exposure to loud noise can also result in increased heart rate, anxiety, hearing loss and other health effects. The impacts of noise depend on the noise level, its characteristics and how it is perceived by the person affected.

9.5.4 Criteria for assessment

The Applicant holds a Noise Approval that varies the allowable level of noise from Wagerup Refinery from the Noise Regulations as monitored at eight specified Noise Approval Locations.

The most stringent noise levels from the Noise Approval at each location which apply at night time (7pm to 7am) are summarised in Table 20.

Table 20: Approved noise levels at noise sensitive receptor locations specified in clause 3 of the Noise Approval

Location	Noise Approval levels dB(A)[1]	
	L_{A10}	L_{A1}
1	47	49
2	46	48
3	45	47
4	41	45
5	41	45
6	37	45

Location	Noise Approval levels dB(A)[1]	
	L_{A10}	L_{A1}
7	37	45
8	36	45
Hamel	35[2]	45[2]

Note 1: referenced noise levels are the lowest value specified clause 3 in the Noise Approval that applies to nighttime periods from 7pm to 7am.

Where the Noise Approval levels are exceeded at a specified location, the prescribed standards in the Noise Regulations apply.

9.5.5 Applicant controls

The Applicant specified that noise controls would include procurement of equipment that meets sound power levels specified in the Application and maintenance of infrastructure and equipment. OBF equipment sound power levels are provided in Section 8 (Table 9). The Applicant also stated operational noise will be controlled through ongoing maintenance of equipment.

9.5.6 Consequence

The OBF is not expected to cause or be a major contributor to an exceedance of the Approved Noise Levels if the OBF infrastructure and equipment is constructed and installed to meet the Applicant's stated sound power levels. There is potential that specific consequence criteria (i.e. Approved Noise Levels) will not be met in the event of short-term increased noise due to equipment malfunction. This may cause a short-term impact on amenity at noise sensitive receptors. The Delegated Officer considers the consequence of the risk event to be **Moderate**.

9.5.7 Likelihood of Risk Event

The Delegated Officer does not expect the OBF to cause or be a major contributor to an exceedance of the Approved Noise Levels during normal operating conditions. Exceedances may only be expected due to equipment malfunction. The Delegated Officer considers the likelihood of the risk event to be **Rare**.

9.5.8 Overall rating of noise emissions (operation)

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 14) and determined that the overall rating for the risk of operational noise emissions is **Medium**.

9.6 Risk Assessment – Discharge to land

9.6.1 Description of risk event

A loss of containment during operation of the OBF results in a discharge to land causing impacts on the beneficial use of groundwater.

9.6.2 Identification and general characterisation of emission

There is potential for incidents involving spills and loss of containment that may result in the materials in the OBF process being discharged to the environment. The 2012 LTRMS states that although oxalate is a compound commonly found in the environment and not intrinsically harmful, the oxalate extracted from the refining process has a high caustic concentration. Oxalate will be stored in the feed preparation tank pending mixing and treatment within the bioremoval tanks. Spills could also occur from the nutrient and defoamer tanks.

Loss of containment discharges are short-term events, and in consideration of the size and scale of the OBF, the Delegated Officer expects an incident of this nature to be localised to the immediate vicinity of the OBF.

9.6.3 Description of potential adverse impact from the emission

Loss of containment events have the potential to impact on the beneficial use of groundwater. As noted in Section 7.4, the refinery land is classified under the CS Act as '*Contaminated – Remediation* Required' and alkali plumes are present in the Premises refinery area in both the shallow and deeper aquifer intervals (Rockwater 2017). One of the most notable areas is near Building 26 which is immediately north of the proposed OBF where a recovery bore field operates.

9.6.4 Criteria for assessment

The ANZECC Guidelines are considered appropriate assessment criteria to assess the potential impact on groundwater quality. As outlined in Section 7.4, superficial formations may have a beneficial use for stock and irrigation purposes.

9.6.5 Applicant controls

The Applicant's controls for OBF discharges to land as outlined in its Application are provided in Table 21 below.

Table 21: Applicant's proposed discharge to land controls

Infrastructure	Controls
Engineering	• Tank primary containment will meet the intent of the *Dangerous Goods Safety Act 2004*. • Tank design will allow for adequate surge volume to manage flow variation. • OBF building and tank secondary containment including bunding. • Bunding will meet the intent of the *Dangerous Goods Safety Act 2004*. • Runoff and drainage from secondary containment areas will be collected and recycled into the existing refinery process water systems
Procedures / management	• Existing groundwater monitoring network some of which is monitored specifically to meet requirements of the Existing Licence • Waste and spill management procedures

9.6.6 Consequence

If a loss of containment risk event occurs, the Delegated Officer has determined that the impact on the beneficial use of the superficial and underlying aquifer will be limited to low-level on-site impacts. Therefore, the Delegated Officer considers the consequence of loss of containment impacting on the beneficial use of groundwater to be **Minor**.

9.6.7 Likelihood of Risk Event

The Applicant proposed controls including secondary containment where wastewaters, wash waters and spillages are collected and directed to the refinery process water systems. If secondary containment controls are fit for purpose, the Delegated Officer considers the likelihood of a discharge to land occurring and impacting on the beneficial use of groundwater would only occur in exceptional circumstances. Therefore, the Delegated Officer consider the likelihood of discharges to land impacting on the beneficial use of groundwater to be **Rare** if secondary containment controls are adequate and fit for purpose.

9.6.8 Overall rating of discharges to land or surface waters

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 14) and determined that the overall rating for the risk of discharges to land impacts on the beneficial use of groundwater to be **Low**, subject to secondary containment controls that are adequate and fit for purpose.

9.7 Summary of acceptability and treatment of Risk Events

A summary of the risk assessment and the acceptability or unacceptability of the risk events set out above, with the appropriate treatment and control, are set out in Table 18 below. Controls are described further in Section 10.

Table 22: Risk assessment summary

	Description of Risk Event			**Applicant controls**	**Risk rating**	**Acceptability with controls (conditions on instrument)**
	Emission	**Source**	**Pathway/ Receptor (Impact)**			
1.	Point source air emissions via 47K1 or 47K2 vents	OBF tanks	Air/wind to receptors causing health or amenity impacts	Capture and direction of tank air emissions to 47K1 vent stack or 47K2 RTO vent stack Aerobic biological process	Slight consequence Rare likelihood **Low risk**	Acceptable, subject to Applicant controls conditioned for infrastructure / equipment and regulatory conditions to allow commissioning to validate air emission predictions
2	Noise	OBF	Air/wind causing exceedance of Noise Approval noise levels	Equipment noise sound power level specifications	Moderate consequence Rare likelihood **Medium risk**	Acceptable, subject to specifying Applicant controls for equipment sound power levels
3	Loss of containment discharge to land	OBF	Direct discharge to land infiltrating to groundwater or entering surface water	Primary and secondary containment. Collection and reuse Groundwater monitoring	Minor consequence Rare likelihood **Low risk**	Acceptable, subject to regulatory controls to specify secondary containment requirements

10. Regulatory controls

A summary of regulatory controls determined to be appropriate for the Risk Event is set out in Table 23. The risks are set out in the assessment in Section 9, and the controls are detailed in this section. The Delegated Officer has determined controls having regard to the adequacy of controls proposed by the Applicant. The conditions of the Works Approval are set to give effect to the determined regulatory controls.

Table 23: Summary of controls to be applied

		Controls (references are to sections below, setting out details of controls)	
		10.1 Infrastructure design or construction requirements	**10.2 Commissioning and Steady State operations**
Risk Items (see risk analysis in section 9)	**1. Point sources emissions to air**	•	•
	2. Noise emissions		•
	3. Discharge to land	•	

10.1 Infrastructure design or construction requirements

10.1.1 Point source emissions to air

The OBF must be designed in accordance with the requirements set out in Table 24 for the control of point source emissions to air.

Table 24: Point source emissions to air infrastructure and equipment requirements table

Infrastructure / equipment	**Requirements (design and construction)**
Bioreactor tanks and Product tank	Tanks must be enclosed and air emissions directed to the following discharge points: (i) Oxalate kiln 47K1 vent stack; and (ii) Oxalate kiln 47K2 RTO vent stack.
Bioreactor tanks	The Bioreactor tanks must have: (i) one duty and one spare air blower fit for purpose to ensure a continuous supply of air; (ii) a continuous dissolved oxygen monitoring system; and (iii) oxalate feed rate controls.

10.1.2 Discharges to land

The OBF must be designed in accordance with the requirements set out in Table 25 for the control of discharges to land.

Table 25: Discharges to land infrastructure and equipment requirements table

Infrastructure / equipment	Requirements (design and construction)
Oxalate Bioremoval Facility	1. The Oxalate bioremoval facility and its respective tanks and vessels must have secondary containment that: (i) is not less than 110 percent of the capacity of the largest tank or vessel within the Oxalate bioremoval facility; (ii) directs all runoff and drainage into existing process water systems for reuse; (iii) is constructed of materials that are substantially immune to attack by any corrosive substance it may contain; and (iv) is sufficiently impervious to retain and enable the recovery of any spillage. 2. All tanks and vessels must be of sufficient capacity to allow for estimated surge volume from flow variation without overtopping.

Notes: Secondary bunding and containment infrastructure requirements are adapted from Australian Standard AS 3780: *The storage and handling of corrosive substances* (AS3780) which provides a nationally recognised standard for containing corrosive substances.

Grounds: The Applicant has proposed controls for discharges to land in the form of primary and secondary containment. In the absence of design and specification detail in the Application, the Delegated Officer has specified requirements regarding this infrastructure. The requirements address the uncertainty around the appropriateness of controls for discharges to land and therefore reduce the risk to groundwater.

10.2 Commissioning and steady-state operations

10.2.1 Point source emissions to air

Air emissions from the OBF will be required to be directed to the 47K2 RTO vent stack if the oxalate kiln RTO is operating, or otherwise to the 47K1 vent stack if the oxalate kiln RTO is not operating.

A one-off sampling event of the 47K1 vent stack and 47K2 RTO vent stack will be required once the OBF has reached steady-state operations. The scope of sampling for the 47K2 RTO vent stack will be consistent with requirements on the Existing Licence, with the addition of ammonia. The 47K1 vent stack sampling requirements will exclude particulates and combustion gases.

A report is to be submitted with results of the monitoring of the 47K1 and 47K2 RTO vent stacks.

Notes: The requirement to direct OBF emissions to the 47K2 RTO vent stack while the RTO is operating is derived from the Application and is consistent with the construction design requirements for the control of point source emissions to air. The requirements for the one-off steady state air emissions monitoring program are derived from stack sampling requirements for the Oxalate kiln RTO vent stack in the Existing Licence, with the exception of ammonia sampling.

Grounds: The requirements allow the Applicant to commission the OBF to achieve steady-state operations including establishing the necessary biological biomass and reaching the required parameters for oxalate destruction. The OBF is a biological process that cannot be

readily stopped and started. The requirements, therefore, allow the Applicant to operate the OBF once steady-state is reached and to allow determination of any necessary amendments to the Existing Licence.

The Delegated had regard to the low risk of air emissions where OBF tankage air emissions are directed to the 47K2 RTO vent stack if the RTO is operating, or otherwise the 47K1 vent stack if the RTO is not operating. The Delegated Officer noted that the Existing Licence has adequate conditions relating to the control of air emissions from the 47K2 RTO vent stack that continue to apply during the periods of commissioning and steady-state operations of the OBF under the works approval. Steady-state monitoring is limited to a one-off sampling event for both the 47K1 and 47K2 RTO vent stacks based on the low risk of air emissions. Monitoring under the works approval may be satisfied, in part, through monitoring under the Existing Licence.

10.2.2 Noise validation

Noise emissions from the reactor tank agitators must be validated during steady-state operations against the levels specified by the Applicant in its NIA.

Notes: Requirements are Delegated Officer specifications derived from the Applicant's NIA.

Grounds: The Applicant has a Noise Approval to vary the allowable level of noise emissions from the Wagerup Refinery if it meets the specified noise levels at certain locations. If the Applicant installs equipment that meets the 'as installed' sound power levels used in its NIA, the Delegated Officer does not expect the operation of the OBF will cause, or be a major contributor to, a Noise Approval exceedance.

The Delegated Officer considered the Applicant's comments on the draft determined noise controls in the works approval (refer to Appendix 4) and reviewed the outcomes of the Applicant's NIA. With reference to Table 9 (Section 8) of this Decision Report, the cooling towers are predicted to have the highest sound power levels. However, the ranking of OBF noise sources at Location 1 of the Noise Approval in Table 11 shows that the two BOD Reactor Tank Agitators are the main contributors to noise, with one of the agitators contributing 12 dB(A) to the noise level at Location 1. A review of the noise source list in the NIA identified that this high contribution is probably related to the relatively high elevation of the agitators. The Applicant is therefore required to validate noise emissions from the two agitators against the corresponding total and 1/1 octave sound power levels in Appendix B of the Applicant's NIA to ensure the predicted outcome is achieved.

11. Determination of Works Approval conditions

The conditions in the granted Works Approval in Appendix 5 have been determined in accordance with the *Guidance Statement: Setting Conditions*. The Application included a project summary with an expected timeframe of completing operational handover in late 2019 to early 2020. However, in its comments on the draft works approval (refer to Appendix 4) it requested a works approval duration until Quarter 1 in 2022.

Table 26 provides a summary of the conditions to be applied to this Works Approval.

Table 26: Summary of conditions to be applied to the works approval

Condition Ref	Grounds
Location of Works Condition 1	This condition is valid, risk-based and consistent with the EP Act.
Infrastructure and Equipment Conditions 2, 3, 4 and 5	These conditions are valid, risk-based and contain appropriate controls.

Condition Ref	Grounds
Emissions Condition 6	This condition is valid, risk-based and consistent with the EP Act.
Commissioning and Steady state operations Conditions 7, 8, 9, 10, 11, 12 and 13	These conditions are valid, risk-based and consistent with the EP Act.
Record-keeping Conditions 14 and 15	These conditions are valid and are necessary administration and reporting requirements to ensure compliance.

The Delegated Officer notes DWER may review the appropriateness and adequacy of controls at any time and that, following a review, DWER may initiate amendments to the works approvals under the EP Act.

12. Existing Licence conditions

The granted Works Approval allows the Applicant to construct, commission and operate the OBF once steady state is achieved, subject to the works approval conditions.

Licence conditions are likely to be limited to controls for point source emissions to air including:

- the requirement to direct air emissions to the 47K1 or 47K2 RTO vent stack (consistent with condition 7 on the granted Works Approval); and
- amendments to point source emissions to air stack monitoring requirements on the Existing Licence relating to:
    - addition of 47K1 vent stack monitoring requirements; and
    - ammonia monitoring.

The Delegated Officer will have regard to information submitted by the Applicant under requirements of the granted Works Approval prior to determining any amendments to the Existing Licence.

13. Applicant's comments

The Delegated Officer provided the draft works approval and draft Decision Report to the Applicant for comment on 5 February 2018. The Applicant provided comments to DWER on 27 February 2018. The Delegated Officer provided additional questions on several key points to the Applicant on 7 March 2018 and met with the Applicant on 8 March 2018. The Applicant provided an additional response on 13 March 2018. A summary of the Applicant's comments and the Delegated Officer's considered is provided in Appendix 4.

14. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

Based on this assessment, it has been determined that a Works Approval will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

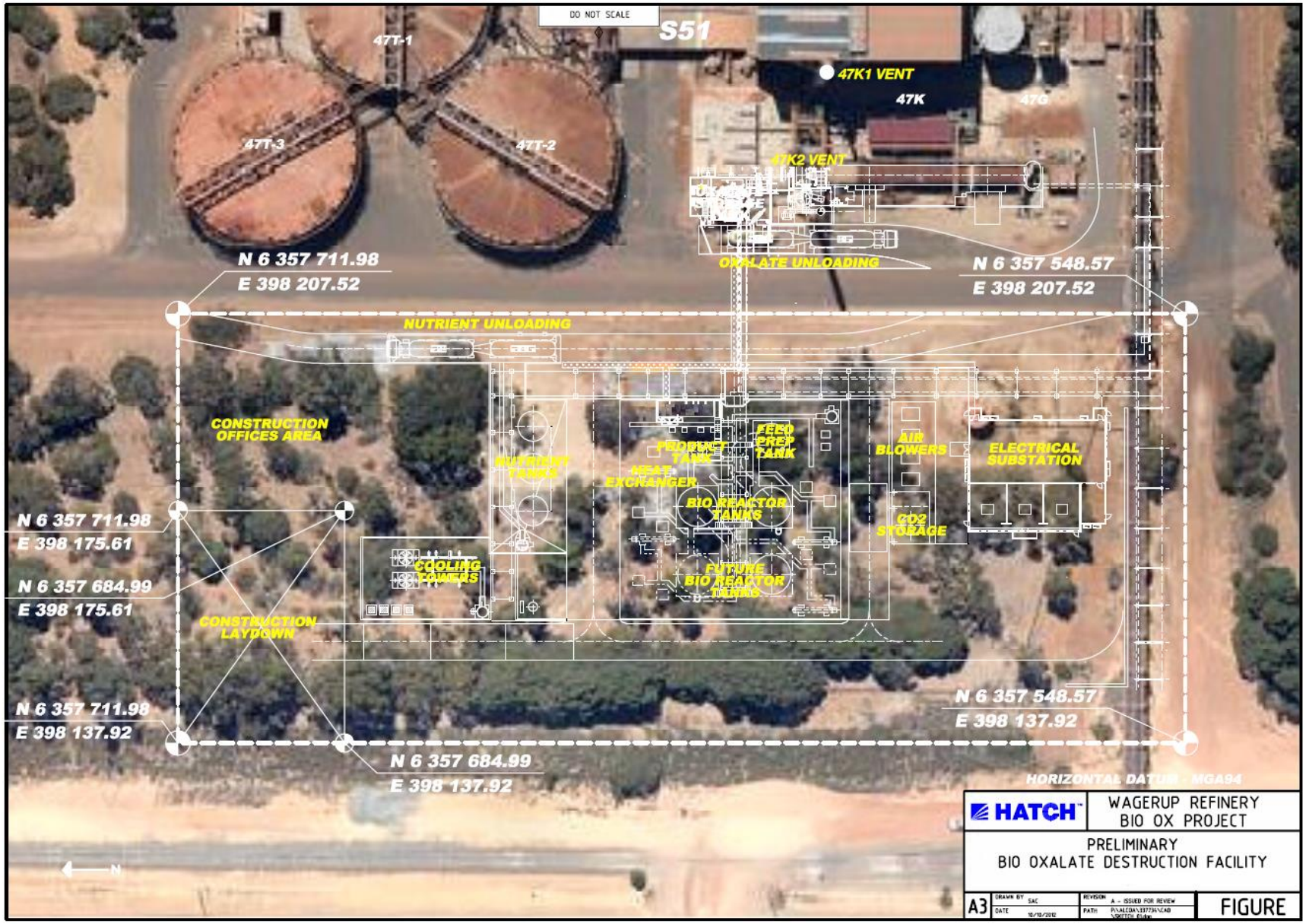
Jonathan Bailes
A/Senior Manager Industry Regulation (Process Industries)
Delegated Officer
under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text ref	Availability
1.	Alcoa, March 2011. Works Approval Application Supporting Information, Pinjarra Alumina Refinery, Oxalate Bioremoval Facility, Alcoa of Australia Limited	Alcoa 2011	DWER records (A382833)
2.	Alcoa, February 2013. *Long Term Residue Management Strategy, Wagerup 2012*, Alcoa of Australia Limited	2012 LTRMS	Accessed at www.alcoa.com.au
3.	Alcoa, December 2015. *Overview of Wagerup Refinery Emission Inventory 2014*, Alcoa of Australia Limited	Wagerup Emissions Inventory 2014	DWER records (A1031370)
4.	ANZECC 2000, *National Water Quality Management Strategy – Paper No. 4: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, The Guidelines.*	ANZECC	Accessed at www.environment.gov.au
5.	Australian Standard 3780: *The storage and handling of corrosive substances*, Standards Australia, 2008	AS 3780	Accessed at: www.saiglobal.com
6.	DEC, October 2006. Winter 2006 Study: Intensive Air Quality Investigations at Wagerup. Department of Environment and Conservation, Perth.	Winter 2006 Study	Accessed at www.dwer.wa.gov.au
7.	DEC NSW, 2005. *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*, Department of Environment and Conservation: Sydney	DEC NSW 2005	Accessed at http://www.epa.nsw.gov.au
8.	DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Water and Environmental Regulation, Perth.	N/A	Accessed at www.dwer.wa.gov.au
9.	DER, November 2016. *Guidance Statement: Environmental Siting*. Department of Water and Environmental Regulation, Perth		
10.	DER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Water and Environmental Regulation, Perth.		
11.	DER, February 2017. *Guidance Statement: Risk Assessments*. Department of Environment Water and Environmental Regulation, Perth.		

	Document title	In text ref	Availability
12.	DER, February 2017. *Guidance Statement: Decision Making*. Department of Environment Water and Environmental Regulation, Perth.		
13.	*DWER, October 2017. Basic Summary of Records for Lot 700 on Plan 59305*, accessed 26 October 2017	DWER 2017	DWER records (A1547808) Also refer to the public contaminated sites database at www.dwer.wa.gov.au
14.	*Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Approval 2012*	Noise Approval	Accessed at www.slp.wa.gov.au
15.	Licence 6217/1983/15 (as amended 20/10/2015)	Existing Licence	Accessed at www.dwer.wa.gov.au
16.	Ministerial Statement 728	MS 728	Accessed at www.epa.wa.gov.au
17.	NEPC, 2011. *National Environment Protection (Air Toxics) Measure*, National Environment Protection Council: Canberra, ACT	NEPC 2011	Accessed at http://www.nepc.gov.au/nepms/air-toxics
18.	Rockwater, 2017. *Wagerup Refinery & Bunbury Caustic Loading Facility, 2016 Annual Review of Groundwater and Surface Water Management*. Rockwater Report No. 308.8/17/01, March 2017	Rockwater 2017	DWER records (A1406329, A1406332 and A1406334)
19.	SVT, October 2016. *Wagerup Refinery Noise Model Design and Verification*, SVT Engineering Consultants	SVT 2016	DWER records (A1381048)
20.	Toxikos, September 2011. *Air guideline values for selected substances*, prepared for the Department of Environment and Conservation, Perth WA	Toxikos 2011	DWER records (A1390680)

Appendix 2: OBF layout plan



Appendix 3: Summary of consultation submissions

No.	Summary submission point	Delegated Officer consideration
Submission: **1. Community Alliance for Positive Solutions Inc. (CAPS) (submission part 1 of 2);** **2. Gun Meskanen Hopkins** **3. TA and SM Cockerham; and** **4. 50 individual proforma letters from third parties in Yarloop, Harvey, Perth, Binningup, Eaton, Millbridge, West Busselton, Hamel, Waroona and Midland submitted to DWER by CAPS**		
1	Including the extension from 15 December 2017 to 15 January 2018 and considering the two other matters for public comment, DWER did not allow reasonable time for submissions. Objection to the application being determined at this time until the separate noise application and licence review have been completed and any appeals determined. It is not appropriate for DWER to assess further major changes to Wagerup until those risk assessments have been completed as further works will only complicate the assessment and make it difficult to comment.	The Department initially advertised the works approval application for public comment for 21 days. On request from a third party, the Delegated Officer agreed to extend the comment period from 15 December 2018 until 15 January 2018. While not related to the works approval application, the Delegated Officer also extended concurrent public consultation periods on a noise application and licence review related to the Wagerup Refinery (from 15 December 2017 to 31 January 2018). The Delegated Officer also suggested that the third party prioritise comments on the works approval application as the consultation periods for the other processes could be extended if required. Therefore, the Delegated Officer advised the public consultation period could not be further extended to 31 January 2018 as requested as this would impact on assessment processes. The Delegated Officer considers that the ongoing assessment of the noise application under r.17 of the Noise Regulations and the DWER initiated review of Licence L6217/1983/15 do not impact on the ability of the Department to assess and determine works approval application for the OBF. The licence review and assessment of the application for further noise approval will have regard to outcomes of the works approval application assessment.

Submission: CAPS (submission part 2 of 2)		
2	Human health concerns as it is not clear what pathogens and bacteria may arise from the biological process and how they are contained. Strict controls required and monitoring to ensure pathogens and bacteria are at same levels. Department of Health should confirm the bioremoval process has an acceptable risk to human health and determine applicable standards.	The process involves the biological treatment of an existing waste stream (oxalate) that is currently either oxidised in the oxalate kiln or stored in dedicated oxalate storage ponds. The OBF process involves the addition of a liquid nutrient and aeration to promote biological activity. The process is largely contained with air emissions directed to existing oxalate kiln vent stacks. The Delegated Officer does not expect there to be any risk to receptor health from exposure to OBF bacteria/pathogens considering the nature of the proposal and distance to receptors. The Delegated Officer determined that Department of Health advice was not required for the purposes of assessing and determining the Application.
3	Noise information is based on noise levels set in the current noise approval which is currently under review. It is not appropriate and pre-emptive for DWER to determine the assessment of the works approval application until the noise approval has been finalised.	The Delegated Officer risk assessed noise emissions from the OBF including technical review of the noise impact assessment and modelling submitted as part of the Application. Refer to Section 9.5 for the assessment of noise emissions.
Submission: John Harris		
4	Alcoa marked 'No' on the application form when asked if the proposal is a major project. The proposal will cover approximately 10,250 m^2 or more than one hectare along with a large investment of some millions of dollars. It is a major project.	Major Project status for applications for works approvals and licence means: • A State Development Project, where the lead agency is the Department of Jobs, Tourism, Science and Innovation (including projects to which a State Agreement applies); or • A Level 2 or 3 Major Resource Project, as defined by the Department of Mines, Industry Regulation and Safety. The Application is not defined as a Major Project. Major Projects are subject to different assessment protocols in accordance with DWER's operational procedures.
5	Alcoa marked 'No' on the application form when asked if the proposal has been referred to the EPA. The project scale and known health impacts of exposure to the substances involved mean it should be referred.	The Application was not referred to the EPA by the Application, DWER or a third-party. Further guidance and information on the referral of applications to the EPA under Part IV of the EP Act are available at: http://www.epa.wa.gov.au/step-step-through-proposal-assessment-process

6	There is no formal industrial buffer and Alcoa's properties near the refinery are leased to families with small children. Alcoa mentioned the technology is operated at their other refineries and doesn't have an impact on the community, but both these refineries have substantial buffers so there is a margin of safety that doesn't exist at Wagerup.	Buffers are a land use planning issue and are not determined by DWER. There are no statutory land use planning buffers surrounding the Wagerup, Pinjarra or Kwinana refineries. The Delegated Officer's assessment had regard to the distance to sensitive receptors in assessing the risk of impacts from OBF emissions, as described in Section 9 of this Decision Report.
7	There is a warning siren at Pinjarra Refinery activated as a signal for staff to move quickly to buildings away from the outside air. It is understood the siren warns of pollution from the oxalate destruction plant entering the surrounding area. Will a warning system be installed at Wagerup? How will families with young children be warned of the immediate danger?	The use of sirens for occupational health and safety matters are not in the scope of this assessment. The use of safety management systems (e.g. sirens) for major incidents is covered under dangerous goods legislation administered by other Government agencies.
8	The Department of Health must be consulted and involved in the evaluation of this project.	Refer to the response to item 2 above.
9	Alcoa has not sought approval to clear the land involved. The 2017 imagery shows considerable regrowth of what is probably native vegetation and it should require a permit.	Refer to Section 5.4.2 of this Decision Report.

Appendix 4: Summary of Applicant comments on drafts

The summary of the Applicant's comments in Table 27 should not be viewed as verbatim unless otherwise indicated by text within inverted commas.

Table 27: Summary of Applicant comments on drafts and Delegated Officer consideration

No.	Summary submission point	Delegated Officer consideration
Draft works approval		
1	Works Approval expiry – duration to early (Q1) 2022 to account for project implementation, construction completion, commissioning and reporting.	Expiry date aligned with Applicant's request.
2	Table 1 – Suggested definition text for 'steady-state operations' provided. Addendum response – Definition should be based on an individual reactor average operating throughput greater than 12 tonnes per day per reactor and an average of 90% or greater destruction capability of the input, as measured by oxalate in effluent.	The Delegated Officer found the Applicant's initial suggested text for defining 'steady-state operations' was too general and requested further information. The Applicant's revised definition wording submitted on 13 March 2018 was accepted and inserted into the definitions section.
3	Table 2 (condition 2) / condition 3 - referenced layout plan is preliminary and may be subject to change during detailed design reviews if improvements are identified. Condition 3 doesn't allow for a departure from the layout plan.	As there is no objection to the layout plan being subject to the departure provisions in the works approval, condition 3 revised to apply to Table 2 in its entirety.

No.	Summary submission point	Delegated Officer consideration
4	Table 2 – OBF Item 1 infers the requirement for a noise compliance report in combination with condition 4. Noise validation would occur post-commissioning. If noise validation is the intent, it should be moved to the '*Commissioning and steady-state operation*' section of the works approval.	The Delegated Officer agreed that any noise validation would need to occur during steady-state operations and took into consideration the Applicant's clarification around noise attenuation (buildings/barriers), comments on the specified sound power levels, and further considered the determined controls for noise specifications. The BOD Reactor Tank Agitators are the equipment sources likely to dominate noise contribution at noise sensitive Location 1 based on the Applicant's NIA ranking of OBF sources. The Delegated Officer, therefore, revised the determined works approval controls to: • delete the Table 2 equipment noise requirement and Table 3 specified sound power levels; and • include requirements to validate post-commissioning sound power levels of the reactor tank agitators against the NIA model input values and submit a report to the CEO.
5	Table 2 – The Applicant identified an application error in specifying two duty and one spare air blower. There will be one duty and one spare. The reference to the individual equipment should be removed in favour of wording reflective of process conditions it is intending to prevent so it can make design efficiency changes to the specific equipment.	Table 2 has been corrected to reference one duty and one spare blower. This change is not expected to alter the risk assessment. The ability to ensure a continuous air supply is a control measure specified by the Applicant and a risk assessment consideration. In this instance, the Delegated Officer did not agree with removing the reference to individual equipment. However, the requirement was revised to '***at least*** *one duty and one spare….*' and is subject to Conditions 3 to 5 regarding any departures.
6	Table 3 – Request the table be removed as it prevents improvements through detailed design, implementation and commissioning. The referenced levels are generally indicative from front-end design. At the individual equipment level some deviations are likely (increase If table is to remain, remove the equipment numbers as these are related to the Pinjarra equipment list.	Refer to Row 4.
7	Condition 3 – As per Row 3, departure condition should also include the layout plan.	Refer to Row 3.

No.	Summary submission point	Delegated Officer consideration
8	Condition 4 – Review the report submission timeframe in consideration to noise validation requirements	Refer to Row 4. Comment considered redundant given revisions to the determined works approval noise controls.
9	Table 4 - There is an error referencing Schedule 3. The general emissions duplicate requirements of the EP Act and EP Regulations. Remove the general emissions section of the table or simply it to address the duplication.	Reference to Schedule 3 corrected. The Authorised Emissions Table is a standard requirement on works approvals granted through DWER's current Regulatory Framework. The general emissions section of the emissions table is intended to capture all emissions from the premises that are not specified emissions. These emissions may have been risk assessed however based on the outcomes of the risk assessment specific regulatory controls have not been imposed. It is important to note that general emissions are authorised emissions; however, only to the extent that they occur within the context of the authorised works (Schedule 2 of the works approval) and do not represent a breach of the EP Act.
10	Condition 8 – There is an error where the referenced columns are not within the table.	Corrected.
11	Table 5 – Applicant requested consistency of the stack sampling methodology referenced in the Existing Licence for the oxalate kiln RTO which have been previously approved by the Department. Within consistency, the Applicant will need time to work with contractors to change the testing regime to meet the works approval requirements. Key issues relate to lack of reference to modified methods for USEPA Methods 6C, 7E, 10 and the CEO approved modified method for USEPA MMTO5.	DWER responded to the Applicant on 7 March 2018 including that it investigates matters around modified methods with its stack monitoring contractor. As a result of further advice from the Applicant on 13 March 2018, there were no material changes required to Table 5. An incorrect reference to USEPA MMTO5 was changed to USEPA Method TO5 (modified).
12	Condition 10 – Applicant requested revised wording to allow submission of the air monitoring report within 30 days of receiving the results rather than within 30 days of completing the monitoring.	The timescales provide certainty over the sequence of events that are required to happen to ensure that the information is provided to the Department in a timely manner. Noting the Applicant's comments, The Delegated Officer increased the timeframe to 60 days from completion of the sampling to allow the Applicant and its contractor additional time to collect the information.

No.	Summary submission point	Delegated Officer consideration
13	Condition 11 / 12 – The condition duplicates requirements for record keeping in the EP Act. The Applicant sought clarification on the necessity of this condition specific to the works. The Applicant also requested clarification on how the condition impacts works approval close-out, as the period of book retention for 3 years extends beyond duration of the works.	The requirement to retain books for at least three years has been removed from the Works Approval.
14	Schedule 1 (OBF layout map) – The map included was superseded by an updated version removing incorrect reference to scrubbers.	Corrected.
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15	Section 3 – Alcoa is no longer the licence holder of L8174 for the Wagerup Co-generation Plant.	Corrected.
16	Section 4.1.1 – Oxalate is contained in tanks at the refinery or within the approved oxalate storage areas in the RDAs.	Updated.
17	Section 4.2 – Update as per comment in Row 16.	Updated.
18	Section 5 – MS728 has been amended by MS109 issued in December 2017.	Section updated.
19	Section 5.2 – Alcoa is not land holder of all lots identified.	Corrected.
20	Section 8 – Response provided to Delegated Officer queries on noise source enclosure and barrier controls. Cooling towers are not enclosed by a building and all other noise sources are not generally surrounded by barriers.	Noted. The information was considered in the context of determined noise controls (refer to Row 4).
21	Table 19 – Correct as per comment in Row 5.	Corrected.
22	Section 9.6.3 – A recovery borefield is also in operation at Building 45.	Noted. The Building 26 recovery borefield was mentioned due to its proximity to the OBF footprint. The Building 45 recovery borefield in the southern part of the refinery has no relevance to the assessment.
23	Table 24 – Correct as per comment in Row 5.	Corrected.