Government of Western Australia
Department of Water and Environmental Regulation

Amendment Report

Department-initiated Licence Amendment

Part V Division 3 of the *Environmental Protection Act 1986*

Licence number	L4504/1981/17
Licence holder	South32 Worsley Alumina Pty Ltd
ACN	008 905 155
DWER references	DER2017/001998-1 APP-0026513
Premises details	Worsley Alumina Refinery Gastaldo Road ALLANSON WA 6225 Lease No 3116/7574 being Wellington Locations 5314 – 5317 on Plan 220209 Certificates of Title Volume LR3080 Folios 471 - 474
Date of report	08/09/2025
Decision	Revised licence granted

1. Decision summary

Licence L4504/1981/17 (L4504) is held by South32 Worsley Alumina Pty Ltd (Licence Holder) for the Worsley Alumina Refinery (the Premises), located on Gastaldo Road, Allanson. approximately 15 kilometres north-west of Collie

This Amendment Report documents the assessment of potential risks to the environment and public health from the emissions and discharges during ongoing operation of the Premises. As a result of this assessment, Revised Licence L4504 has been granted and includes an extension of 20 years to the licence expiry to 30 September 2045.

The Revised Licence issued as a result of this amendment consolidates and supersedes the existing Licence previously granted in relation to the Premises. The Revised Licence has been granted in a new format with existing conditions being transferred to the new format.

2. Scope of assessment

2.1 Regulatory framework

In completing the licence amendment documented in this report, the Department of Water and Environmental Regulation (DWER, the department) has considered and given due regard to its regulatory framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

3. Premises overview

3.1 Prescribed premises categories

Licence L4504/1981/17 contains the following prescribed premises categories as per Schedule 1 of the Environmental Protection Regulations 1987:

Table 1: Prescribed Premises Categories in the Existing Licence

Prescribed premises category description (Schedule 1, *Environmental Protection Regulations 1987*)	**Assessed production / design capacity**
Category 46: Bauxite refining	4.7 million tonnes per annual period assessed production capacity
Category 52: Electric power generation	260 Mega Watts per annual period design capacity
Category 53: Flyash disposal	110,000 tonnes per annual period assessed production capacity
Category 54: Sewage facility	270 cubic metres per day design capacity
Category 61: Liquid waste facility	100 tonnes per annual period assessed production capacity
Category 63: Class I Inert landfill site	15,000 tonnes per annual period assessed production capacity
Category 89: Putrescible landfill site	500 tonnes per annual period assessed production capacity

3.2 Current Premises operations

South32 Worsley Alumina Pty Ltd (the Licence Holder) operates the Worsley Alumina Refinery (the premises, refinery) which is located approximately 15 kilometres (km) north-west of Collie on the Darling Plateau within the Augustus (minor) and Brunswick (major) river water catchments and the Collie (minor) and Bunbury (major) airsheds. The premises is principally surrounded by State Forest with some broadscale farming properties, including isolated farmhouses. The nearest residence is approximately 7km from the premises boundary, and the nearest urban location is Allanson approximately 11km south of the refinery.

Construction of the refinery commenced in 1980, and the first alumina was produced in April 1984. The key legislative framework over the premises is the *Alumina Refinery (Worsley) Agreement Act 1973* (as amended) (the Agreement Act) and Ministerial Statement 719 (as amended) issued under Part IV of the *Environmental Protection Act 1986* (EP Act).

The refinery turns crushed bauxite into calcined alumina via the Bayer process. The extended Bayer process used at Worsley has the following key elements;

- Grinding – Bauxite is delivered to the refinery via overland conveyor from the Boddington Bauxite operations. It then passes through a crushing/grinding circuit;
- Digestion – Crushed/ground bauxite is mixed with caustic at high temperature and pressure liberating odorous volatile organic compounds;
- Clarification – Washing, settlement and filtration of digested liquor (and diversion of "red mud" to Bauxite Residue Disposal Areas (BRDAs));
- Precipitation/Seed Preparation – The clarified liquor is cooled and seeded with precipitation of hydrated alumina crystals;
- Liquor Burning – Liquor and oxalate streams are passed through a high-temperature furnace to remove dissolved organic material and destroy oxalate;
- Calcination – Dehydration of hydrated alumina in high-temperature furnace to produce calcined alumina (a fine white powder); and
- Bauxite Residue Disposal Area – Residual sand and mud (bauxite residue) from the process is pumped as an alkaline slurry to the residue disposal area where excess caustic and liquor is collected and recycled through the process. Sodium oxalate which cannot be treated by the Liquor Burner is also stored in the bauxite residue disposal areas and Solar Evaporation Ponds (SEPs) that have been converted into temporary oxalate storage dams.

The final calcined alumina product is stored on site before transport via rail to the Port of Bunbury for export.

The alumina refining process produces point source and broad scale gaseous and particulate emissions. Point source air emissions occur from digestion, calcination, liquor burning and power generating activities through 12 key stacks. Emissions of significance from the point sources include carbon monoxide, nitrogen oxides, sulfur dioxide, particulates, Volatile Organic Compounds (VOCs), mercury and greenhouse gases. Pollution control equipment has been installed at the majority of the point sources. Equipment installed includes Electrostatic Precipitators (ESP), Regenerative Thermal Oxidiser (RTO's), wet scrubber, baghouses and low NOx burners. The Licence Holder maintains an air emissions inventory and commissioned a "Health Risk & Toxicological Assessment – Worsley Expansion Emissions" (Toxikos, April 2005) to predict the air emission impact as a result of increasing production to 4.7 million tonnes per year.

Other emissions of significance for the premises include fugitive particulate emissions, contaminated water and slurry. Fugitive particulate sources include bauxite grinding, bauxite and coal handling and stockpiles, hydrate stockpiles, rail loading and BRDAs. The BRDAs are the most significant of these sources as they cover the majority of the cleared area of the premises. The Licence Holder operates two high-volume dust samplers near the premises boundary to monitor particulate emissions in accordance with requirements of Ministerial Statement 719.

Storage of contaminated waste slurry in BRDAs and contaminated surface runoff present a ground and surface water contamination risk. This risk is managed through operating a closed water circuit with all contaminated water directed to a central storage area (Refinery Catchment Lake, RCL) and uncontaminated water directed to a separate temporary storage area (Fresh Water Lake, FWL) away from production areas. The BRDAs have low permeability clay liners with two under drainage systems which separate uncontaminated groundwater beneath the BRDA from potentially contaminated seepage via a network of underflow collection pipes. The under-drainage systems are separated by a clay drainage blanket. Seepage is directed to downstream pipehead dams where it is collected and returned to the process via the RCL. The uncontaminated groundwater is collected, monitored and if contamination is not detected it is directed into the FWL. Regular groundwater monitoring is undertaken across the premises, including below the BRDAs, to detect contamination, seepage and changes in water quality in accordance with a Water Resources Management Plan required by Ministerial Statement 719.

The Bayer alumina refining process generates waste sodium oxalate. Sodium oxalate cake has historically been buried in trench pits within consolidated, trafficable parts of the BRDA. In 2014, the areas suitable for sodium oxalate disposal within the BRDA reached capacity. Subsequently, SEP1, SEP 2A, SEP3 and SEP4 have been converted into temporary sodium oxalate storage facilities. The storage of sodium oxalate in the SEPs is considered as a short to medium term disposal option for the Licence Holder, while a more sustainable disposal option is developed.

Power generation is required as part of the Premises operations. This is performed by burning a combination of different fuels within boilers and power plants. The premises has recently converted the power generated within Boilers 1 and 3 from coal fired to gas fired (identified as A1 and A3 in Figure 2 Schedule 1 of the licence). Boiler 2 is still using coal to generate power. However, based on the approved timeline, the conversion of Boiler 2 from coal fired to gas fired will be completed by December 2029. Multi Fuel Cogeneration Power Plant units 5 and 6 will continue to operate on a mix of biomass and coal. Flyash is generated from coal-fired power generation with captured flyash being disposed within specified areas of the BRDA's.

The site landfill was established on decommissioned BRDA 3, located immediately southwest of BRDA 4. The landfill accepts inert and putrescible wastes generated on the site for disposal. The landfill is equipped with an extensive leachate recovery system. The landfill also has a wet dump area which previously accepted wastewater generated off-site from pressure testing of refurbished tube heaters from the digestion part of the process, however, acceptance of off-site wastewater is no longer undertaken.

Domestic grey water and sewage generated on the premises is directed to a Sequential Batch Reactor (SBR) wastewater treatment plant with treatment via an extended aeration, activated sludge process. Treated water is discharged to the RCL for reuse in the Refinery.

4. Background and Purpose of Amended Licence

4.1 Application history

On 30 April 2024, the Licence Holder submitted an application to the department to renew Licence L4504 and make changes to the Prescribed Premises Categories under the *Environmental Protection Act 1986* (EP Act). The licence was due to expire on 30 September 2024. Due to limited time to assess and process the renewal of licence, the department-initiated an amendment to extend the expiry date of the licence to expire on 30 September 2024 with the intention of reviewing and assessing the changes to the Prescribed Premises Categories after 30 September 2024.

4.2 Department-initiated licence amendment

This department-initiated licence amendment was undertaken to carry out the intended review and assessment of the Licence Holder's proposed changes to the Prescribed Premises Categories and minor amendments as outlined in their application to the department on 30 April 2024. These proposed amendments include:

- the removal of Prescribed Premises Category 61: Liquid Waste Facility. However, it is noted that during the consultation period, the Licence Holder requested that Category 61 remains on the licence.
- the inclusion of Prescribed Premises Category 5: Processing or beneficiation of metallic or non-metallic ore
- the inclusion of Prescribed Premises Category 67: Fuel Burning
- the reduction of assessed production capacity of Prescribed Premises Category 52: Electric Power Generation from 260 Mega Watts per annual period to 232 Mega Watts per annual period
- the reduction of assessed production capacity of Prescribed Premises Category 53: Flyash Disposal from 110,000 tonnes per annual period to 102,000 tonnes per annual period
- an increase of assessed production capacity of Prescribed Premises Category 63: Class I Inert landfill site from 15,000 tonnes per annual period to 72,000 tonnes per annual period
- combining former licence tables 2.2.2 (Point source emission targets to air) and 3.2.1 (Monitoring of point source emissions to air) for ease of reading and reporting.
- Proposed changes to the targets and limits used for the monitoring of point source emission to air

No changes to the aspects of the existing Licence relating to Prescribed Premises Categories 46, 54, and 89 were requested by the Licence Holder.

4.3 Use of BRDAs

Although the BRDAs have been used for many years, the BRDAs were not identified on the licence under a category as described in Schedule 1 of the EP Regulations. Therefore, there is scope for the use of the BRDAs to be recognised under Category 5 in Schedule 1 of the EP Regulations, but specifically as Category 5 (c) as the discharged tailings and residue are not processed.

4.4 Electricity production

Although the power generated on the Premise has been undertaken by burning a combination of different fuel sources over many years, the licence has not identified this activity under a category as described in Schedule 1 of the EP Regulations. Therefore, there is scope for the activity of fuel burning for the purpose of power generation be recognised under Category 67 in Schedule 1 of the EP Regulations.

4.5 Changes to the targets and limits used for the monitoring of point source emission to air

The Licence Holder's proposed amendments in the application dated 30 April 2024 included a proposal to change the monitoring of air emissions targets and limits. The following changes

to targets and limits have been considered during this Department-initiated Licence Amendment:
Targets:

- Introduction of a 95% compliance condition on a monthly basis to account for normal process variability and upsets
- Alignment of targets to original Part V Works Approval documentation or equipment specifications

Limits:

- Introduction of limits to annual stack testing as their analysis indicates that CEMS can over or underestimate emissions with stack testing considered to be the most representative compliance measure
- The proposed limits are founded on historic data
- Alignment of targets to original Part V Works Approval documentation or equipment specifications

5. Premises background and legislative overview

The refinery is located approximately 15 kilometres (km) north-west of Collie on the Darling Plateau within the Augustus (minor) and Brunswick (major) river water catchments and the Collie (minor) and Bunbury (major) airsheds. The surrounding area is principally State Forest with some broadscale farming properties, including isolated farmhouses. The nearest residence is approximately 7 km from the refinery boundary, and the nearest urban location is Allanson, located approximately 11 km south of the refinery.

Mining, processing and associated operations at the Premises are authorised under the *Alumina Refinery (Worsley) Agreement Act 1973* (the Agreement Act) and Ministerial Statement 719 (as amended), issued under Part IV of the EP Act.

5.1 Part IV of the EP Act

The Premises was assessed under Part IV of the EP Act (EPA Reports 984 and 1526) and is subject to conditions documented in Ministerial Statement 719 (MS719). The Licence Holder is required to implement the Water Resource Management Plan for the protection and management of nearby proclaimed water resources and to give effect to a zero discharge to these natural resources, and thereby not diminish their environmental value or use.

MS 719 contains conditions that have been considered in the assessment of emissions and discharges from the premises and the imposition of regulatory controls under Part V of the EP Act. The conditions that relate to the amendment application are summarised below:.

- Condition 14-1 and consolidated management commitment 2 (table) in Ministerial Statement 719 require the Licence Holder to monitor and manage dust emissions from the BRDAs. Dust monitors are located along the Licenced Premises boundary and adjacent to sensitive receptors to comply with the requirements of MS 719. See Figure 1 for the location of Dust monitoring locations used to monitor dust originating from the BRDAs.

- Consolidated management commitment 1 and 7 in MS 719 requires the Licence Holder to implement the Water Resource Management Plan for the protection of surface and groundwater resources. This requirement is considered adequate to mitigate the overland runoff of sediment laden slurry water from the Bauxite Residue Disposal Areas. See Figure 2 for the location of surface water and groundwater monitoring locations.

5.2 *Alumina Refinery (Worsley) Agreement Act 1973*

The Premises currently operates under the *Alumina Refinery (Worsley) Agreement Act 1973* (Worsley State Agreement). The requirements set out in the Worsley State Agreement do not significantly impact the current licence review.

6. Risk assessment

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

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

6.1 Source-pathways and receptors

6.1.1 Receptors

In accordance with the *Guideline: Risk Assessment* (DWER 2020), the Delegated Officer has excluded the licence holder's employees, visitors, and contractors from its assessment. Protection of these parties often involves different exposure risks and prevention strategies and is provided for under other state legislation.

Table 2 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises *(Guideline: Environmental Siting* (DWER 2020)).

Table 2: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	**Distance from prescribed activity**
Single Rural dwellings	No rural dwellings within 5km of the premises. Single residential dwelling approximately 6 km south of the most southern bauxite residual storage areas.
Town of Allanson	Approximately 11km south of the premises boundary
Environmental receptors	**Distance from prescribed activity**
Priority 1 Public Drinking Water Source Area (PDWSA)	The Priority 1 Harris River Catchment Dam Area
Major watercourses/waterbodies	The refinery Freshwater Lake feeds into the Augustus River
Groundwater	Groundwater beneath BRDA is collected via a specifically designed groundwater underdrainage system that reports to the freshwater lake

Rights in Water and Irrigation Act 1914 (RiWI Act)	Premises lie across the boundary of the following surface water areas: Collie River Irrigation District Brunswick River and tributaries
Waterways Conservation Areas	Leschenault Inlet Management Area adjoins western point of the premises boundary
Threatened/Priority Flora	A number of priority flora species within proximity of the premises boundary, the closest to the being 580m, 660m south and 1.5 and 1.7km South west respectively of the BRDA 5.

6.1.2 Emissions and pathways

The key emissions and associated actual or likely pathway during premises operation which have been considered in this decision report are detailed in Table 3 below. Table 3 also details the control measures for these emissions, where necessary.

6.2 Risk ratings

Table 3 describes the risk events associated with the operation of the additional prescribed premises categories added to the amended licence. This is consistent with the *Guideline: Risk Assessments* (DWER 2020). In accordance with this guideline, the Delegated Officer has excluded the licence holder's employees, visitors, and contractors from its assessment. Protection of these parties often involves different exposure risks and prevention strategies and is provided for under other state legislation.

The mitigation measures/controls proposed by the licence holder in the April 2024 application have been considered by the Delegated Officer when determining the final risk rating. Where the Delegated Officer considers the licence holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

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

Licence L4504/1981/17 that accompanies this decision report authorises emissions associated with the operation of the premises. The conditions in the licence have been determined in accordance with *Guidance Statement: Setting Conditions* (DWER 2015).

Table 3: Risk assessment of potential emissions and discharges from the premises during operation

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence condition(s)	Justification for additional regulatory controls
Source/Activities	**Potential emissions**	**Potential pathways and impact**	**Receptors**	**Licence holder controls**			
Bauxite Residue Disposal Areas (BRDAs)	Dust (Particulate PM10) lift off from Bauxite Residue Disposal Areas (BRDAs)	Air and wind dispersion causing impacts to health and amenity.	Rural dwellings located 6km south of the southern BRDAs	Air Quality and Dust Management Plan: • Use of dust suppressant and surface binding agents • Daily visual monitoring of BRDA surface; • Installation of fixed dust monitoring stations • Mechanical ploughing and ripping of BRDA surfaces; and • Trigger levels and corrective action response and reporting.	**C: slight** **L: unlikely** **Risk: low**	2	The delegated officer considers that licence holders controls and the requirements of Condition 14-1 and consolidated management commitment 2 (table) in Ministerial Statement 719 are adequate to monitor and manage dust emissions from the Bauxite Residue Disposal Areas. No additional controls will be included in addition to those of the former version of the Licence.
Embankment failure of BRDAs	Alkaline (oxalate) bauxite residue laden slurry water	Overland runoff potentially causing ecosystem disturbance or impacting surface water quality.	Freshwater Lake (within the Premises boundary) and Augustus River (crosses the north-west boundary of the Premises and connect the Freshwater Lake to the Brunswick River) Native vegetation in State Forest (Premises is located within State Forest 15)	BRDA Operating Maintenance and Surveillance Manual: • Daily inspections of BRDAs • Delivery mudline fitted with dropper pipe spigots that minimise velocity of deposition; • Spigots paced an average of 72 m apart and managed 4-hourly short pours around perimeter embankments to maintain pond around the decant tower; • Beach length of approximately 500 m with tailings deposition of 55% solids and a 0.6% degree beach slope; • Wet pours of a maximum of 1.1 m at a time; and • Use of Amphirollers on wet pours within 72hours of pour until an undrained shear strength of 28 kPa is achieved for each layer.	**C: Moderate** **L: Rare** **Risk: medium**	2	The delegated officer considers that applicants controls and the requirements of consolidated management commitment 1 (table) in Ministerial Statement 719 are adequate to mitigate the overland runoff of sediment laden slurry water from the Bauxite Residue Disposal Areas. No additional controls will be included in addition to those of the former version of the Licence .

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence condition(s)	Justification for additional regulatory controls
Source/Activities	**Potential emissions**	**Potential pathways and impact**	**Receptors**	**Licence holder controls**			
Seepage through the BRDA liners	Alkaline leachate from oxalate deposition in BRDAs	Seepage through dam liner and soil to causing ecosystem disturbance	Soil and groundwater	• HDPE liner has permeability of less than 1 x 10 -9m/s • Floor level at between RL 289 and 286.5m • 1.5 mm thick HDPE liner • Geosynthetic Clay Liner • Underdrainage system to divert oxalate containing leachate and any rising groundwater beneath the liner to the RCL • Vibrating wire piezometers in the embankments to monitor phreatic surface and monitor effectiveness of underdrainage system.	**C: slight** **L: Rare** **Risk: low**	2	The delegated officer considers that applicants controls are adequate to mitigate potential seepage of alkaline leachate from the Bauxite Residue Disposal Areas No additional controls will be included in addition to those of the former version of the Licence.
		Seepage through dam liner and soil to groundwater that migrates to nearby surface water bodies (Augustus River and FWL) causing ecosystem disturbance or impacting surface water quality.	Surface water and wildlife				
Leaks and spills from pipelines, mudlines, pumps and associated BRDA infrastructure	Sediment laden slurry water	Direct discharge and overland flow to nearby land and surface water bodies causing ecosystem disturbance or impacting surface water quality.	Freshwater Lake and Augustus River	• Daily monitoring of BRDA's including mudlines delivering Bauxite to the BRDA's, decant recovery pipelines and valves. • Scheduled maintenance. • Incident recording and reporting. • Trigger Action Response Plan to identify and respond to issues as they arise. • The site is operated as a closed system, contaminated water and leachate from spills is contained within the premises; and • Groundwater and surface monitoring is undertaken to validate effectiveness of controls (under MS 719).	**C: slight** **L: Rare** **Risk: low**	2 and 26	Groundwater and surface water monitoring is required under the requirements of consolidated management commitment 1 and 7 (table) in Ministerial Statement 719. The delegated officer considers that applicants controls and the requirements of consolidated management commitment 7 (table) in Ministerial Statement 719 are adequate to mitigate the overland flow and direct discharge to nearby surface water bodies of sediment laden slurry water from leaks or spills from the Bauxite Residue Disposal Areas. No additional controls will be included in addition to those posed by the Licence Holder.
Overtopping of BRDAs due to excess loading or heavy rainfall events, or both	Sediment laden slurry water	Direct discharge and overland flow to nearby land and surface water bodies causing ecosystem disturbance or impacting surface water quality.	Freshwater Lake and Augustus River	• Maintenance of operational freeboard of 0.5 m between the tailings at the top of the beach and the embankment crest (inclusive of wave action); • Maximum operating levels are calculated to only be exceeded in a 1:1,000 year annual recurrence interval storm event; • Ability to move contaminated storm water following high rainfall events to other containment infrastructure on site such that a water from an extreme 1: 1000-year annual rainfall incidence 72-hour duration event is completely contained within the premises infrastructure, enabling compliance with the sites "zero discharge" requirements under the	**C: Major** **L: Unlikely** **Risk: medium**	2	Groundwater and surface water monitoring is required under the requirements of consolidated management commitment 1 and 7 (table) in Ministerial Statement 719. The delegated officer considers that applicants controls and the requirements of consolidated management commitment 7 (table) in Ministerial Statement 719 are adequate to mitigate the overland flow and direct discharge to nearby surface water bodies of sediment laden slurry water from overtopping of the Bauxite Residue Disposal Areas. No additional controls will be included in addition

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence condition(s)	Justification for additional regulatory controls
Source/Activities	**Potential emissions**	**Potential pathways and impact**	**Receptors**	**Licence holder controls**			
				Alumina Refinery (Worsley) Agreement Act 1973; and • Trigger Action Response Plan to identify and respond to issues as they arise.			to those of the former version of the Licence .
Storage of Bauxite residue in BRDAs	Sediment laden slurry water	Direct contact causing impacts to health of the animals.	Stock and wildlife	• Premises has a security fence to keep out stock and large wildlife like kangaroos. • Regular inspections are conducted in areas that are high risk to animals.	**C: slight** **L: rare** **Risk: low**	N/A	No additional controls will be included in the revised Licence.
Burning of gas, coal, or biomass for steam and/or power generation	Air emissions of: • Particulates • Nitrogen oxides (NOx) • Sulphur dioxide (SO2) • Volatile organic compounds (VOCs) • Carbon monoxide (CO)	Air/windborne pathway causing impacts to health and amenity	Rural residential dwellings	• Continuous Air Emissions Monitoring as per former Licence (L4504/1981/17) Condition 3.2.1 • Stack monitoring for VOC's and CO • Boiler 2 fitted with electrostatic precipitator, MFC 5 and 6 fitted with baghouses • Boilers will be subject to scheduled maintenance • Daily visual inspection of power generation infrastructure • Rotational use of boilers to allow for periodic shut down • Limestone injection for SO2 control on MFC 5 and 6	**C: slight** **L: unlikely** **Risk: low**	10 and 11	Existing licence condition to regulate emission levels from point sources and initiate management measures. Additional controls have been included in the revised licence to monitor the air emission concentrations of acetaldehyde, formaldehyde and volatile organic compounds from the use of natural gas in the gas fired boilers.

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

7. Decision

Based on the assessment in this decision report, the Delegated Officer has determined that an amended licence and extension of 20 years to the licence expiry will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements. The Delegated Officer's reasoning and grounds for imposing any additional regulatory controls can be found in Table 3, with additional rationale below.

Addition of Category 5 to the revised licence

The Delegated Officer has included Category 5 on the revised licence based on the following:

- Bauxite processing waste is currently, and has historically been, disposed into the premises BRDAs. However, this process has not previously been reflected on the licence. It should be noted that as the processing of bauxite ore is reflected under Category 46 of the licence and the bauxite tailings are not reprocessed, the specific category that reflects the disposal of bauxite residue at the site is Category 5(c) - Processing or beneficiation of metallic or non-metallic ore: premises on which (c) tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam.
- Based on the ongoing disposal of bauxite residue into the BDRAs, the ongoing management of the BRDAs by the licence holder, the environmental controls placed on the licence for this activity, and the requirements for pollution abatement under Ministerial Statement 719 for dust, groundwater contamination and sediment control, the delegated officer does not consider including this category to the revised licence increases the potential risk profile of the premises.
- This previously unspecified activity is officially recognised on the revised licence.

Addition of Category 67 to the revised licence

The Delegated Officer has included Category 67 on the revised licence based on the following:

- Burning of gaseous, liquid or solid burning in a boiler for the supply of steam or in power generation equipment is currently and historically been undertaken at the premises.
- The licence currently includes monitoring of emissions from the activity of burning fuel for the purpose of the supply of steam and power generation.
- This previously unspecified activity is now officially recognised on the revised licence.

Category 63: Increased production capacity of the Class I Inert Landfill:

The Delegated Officer has determined to increase the production capacity of the inert landfill from 15,000 tonnes per annual period to 72,000 tonnes per annual period as it is unlikely to result in a material change to the overall risk profile of the premises. This determination is based on the following:

- the Class I landfill predominately receives inert waste and small volumes of putrescible waste, which reduces the likelihood of generating large volumes of potentially contaminated leachate;
- the Class I landfill is located within the central portion of the premises and bounded by the BRDAs and refinery catchment lake (RCL), which are likely to limit the extent of migration of any leachate produced by the landfill material;
- The current controls undertaken by the licence holder include

- the use of an underground drainage system to collect and divert landfill leachate and any rising groundwater beneath the landfill liner to the RCL,
- waste is covered with clean fill, bauxite residue, sand or other similar material on a minimum weekly basis;

- Groundwater monitoring of the premises is undertaken as regulated under Ministerial Statement 719 (as amended).

Category 52: Reduction of electrical power generation

The Delegated Officer has reduced the assessed generation of power from 260 Mega Watts to 232 Mega Watts per annual period design capacity. The reduction of power generation is likely to reduce the overall risk profile of the premises.

Category 53: Reduction of flyash disposal

The Delegated Officer has reduced the assessed flyash deposition production capacity from 110,000 tonnes per annum to 102,000 tonnes per annual period. The reduction of flyash disposal is likely to reduce the overall risk profile of the premises.

Changes to air quality monitoring

The Delegated Officer has combined the requirements of tables 2.2.2 and 3.2.1, in the previous version of the licence, for ease of reading and reporting.

The Delegated Officer has considered the Licence Holder's proposed limits and targets for CEMS and Stack testing of emissions from point sources as provided in the licence application dated 30 April 2024.

The criteria for Boilers 1 and 3 (gas fired boilers) within table 2.2.2 of the previous version of L4504 was not specific to the use of natural gas within Boilers 1 and 3 (A1 and A3). The delegated officer has considered the Licence Holders proposed monitoring criteria of carbon monoxide and Nitrogen oxides (NOx) acceptable based on historic monitoring results provided with the Premises most recently submitted Annual Environmental Report for 2023/2024. The monitoring results of carbon monoxide and NOx performed between February 2024 and June 2024 after Boilers 1 and 3 were converted from coal fired to gas fired were relatively consistent and align with the Licence Holders proposed criteria.

However, although the combustion of natural gas is considered a relatively clean burning fuel when compared to coal, the combustion of natural gas is likely to produce volatile organic carbons (VOC) emissions, in particular acetaldehyde and formaldehyde, small amounts of particulate matter. Therefore, the Delegated Officer has included the requirement to monitor of total VOCs, acetaldehyde and formaldehyde, and particulate matter for monitoring purposes without assigned target or limits and has decided to remove the requirement for monitoring metals and fluoride from the monitoring suite.

The licence holders proposed limits, which were not included in the previous version of the licence, are considered by the Delegated Officer to result in early detection and increased management of exceedances of air emissions from the point sources. The proposed changes include changing the stack trigger levels set for carbon monoxide and NOx to be set as limits rather than triggers. The Delegated Officer accepted a majority of the Licence Holders proposed changes as these changes are likely to provided increased protection to receptors.

The licence holder's proposal to remove some parameters from the monitoring of air emissions from point sources was supported by concentration trends that were provided with the original application for licence renewal received by the Department on 30 April 2024. However, a majority of the parameters proposed to be removed from the monitoring regime, were not significantly below the set trigger/limit levels and have the potential to exceed these during day-to-day operations. Therefore, the Delegated Officer has decided not to remove the

monitoring requirements for these parameters at this time.

Annual Environmental Reporting and exceedances

The most recent Annual Environmental Report (AER) provided to the Department addresses the reporting period between 1 July 2023 and 30 June 2024 (23/24 AER), with the next AER due on or before 30 September 2025.

The 23/24 AER did not report any non-compliances of conditions during the reporting period and this was confirmed by a review of the Department's internal Incident and Complaints Management System. However, it was noted that testing of the regenerative thermal oxidizer (RTO) was not undertaken due to the RTO not operational during the reporting period.

A review of the CEMS data of the 2023/2024 reporting period identified very few exceedances of targets for Particulate Matter (PM), carbon monoxide, sulfur dioxide, and nitrogen oxides across the calciners, boilers, and the liquid burner facility. The most significant number of exceedances over the 2023/2024 reporting period were the PM exceedances from Multi Fuel Cogeneration Power Plant 5, with a total of 3.2% of results exceeding the target concentration of 80mg/Nm^3 and most of these exceedances attributed to an issue with the condition of the bag in the baghouse.

8. Consolidation

In reviewing this licence, the delegated officer has:

- applied additional valid prescribed premises categories;
- revised production/design capacities of prescribed premise categories;
- updated the format and appearance of the licence;
- revised condition numbers, and removed any redundant conditions and realigned condition numbers for numerical consistency;
- corrected clerical mistakes and unintentional errors; and
- extend the expiry of the licence by 20 years to 30 September 2045.

The decision report for the previous licence will remain on the DWER website for future reference and will act as a record of DWER's decision making.

9. Consultation

Table 4 provides a summary of the consultation undertaken by the department.

Table 4: Consultation

Consultation method	Comments received	Department response
Licence review advertised on the department's website (20 June 2024)	None received	N/A
Licence holder was provided with draft documents on 6/8/2025	The Licence Holder's comments, and the Department's response are provided in Appendix 1	

10. Conclusion

Based on the assessment in this decision report, the delegated officer considers the amendments to categories and revised production/design capacities does not change the risk profile of the premises Therefore, the Delegated Officer has determined that this revised licence with an extended expiry will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

10.1 Summary of amendments

The below table provides a summary of the proposed changes and will act as a record of implemented changes. All proposed changes have been incorporated into the new licence as part of the replacement process.

Table 5: Summary of licence amendments

Existing condition	Condition summary	Revised licence condition	Conversion notes
N/A	Prescribed Premises Category table	N/A	Revised to current licensing format. Inclusion of Categories 5 and 67, amendment to assessed production/design capacities of Categories 52, 53 and 63.
1.1.1	Interpretation and definitions	N/A Interpretation section, Definitions and Table 14	Redundant condition. Revised to current licensing format.
1.1.2	Interpretation and definitions	Definitions and Table 14	Redundant condition. Revised to current licensing format.
1.1.3	Australian or other standard	N/A Interpretation section	Redundant condition. Revised to current licensing format.
1.1.4	Reference to code of practice	N/A Interpretation section	Redundant condition. Revised to current licensing format.
1.2.1 and 1.2.2	Liquid waste acceptance	Removed	Redundant condition. Deleted from Licence
1.2.3 and Table 1.2.2	Waste processing	1 and Table 1	New numbering, updated wording and inclusion of process limit under Category 5(c)
1.2.4	Containment infrastructure and requirements	2 and Table 2	New numbering and updated wording
1.2.5	Landfilling management	3	New numbering and updated wording
1.2.6	Oxalate storage	4	New numbering and updated wording
1.2.7	Total quantity of alumina produced	5	New numbering and updated wording
1.2.8 and table 1.2.8	Infrastructure construction and installation	6 and table 3	New numbering

Existing condition	Condition summary	Revised licence condition	Conversion notes
			Removed reference to Stages 1 and 2 (the removal and retrofitting of new gas burners of Boilers 3 (A3) and Boiler 1 (A1)), as these have been completed by or ahead of their proposed installation dates.
1.2.9	Audit of compliance and prepare ECR	7	New numbering and updated wording
1.2.10	ECR requirements	8	New numbering and updated wording
2.1.1	Record and investigate exceedances of limits or criteria	9	New numbering and updated wording
2.2.1 and table 2.2.1	Point source emissions to air	10 and table 4	New numbering Revised to current licensing format.
2.2.2 and Table 2.2.2 3.2.1 and Table 3.2.1	Point source emission targets to air and monitoring requirements	11 and Table 5	Combined former licence tables 2.2.2 and 3.2.1 for ease of reading and reporting
2.2.3 and table 2.2.3	Point source exceedance management actions	15 and table 6	New numbering Revised to current licensing format.
2.2.4 and Table 2.2.4	Process controls for emissions to air	16 and table 7	New numbering Revised to current licensing format.
3.1.1	Laboratory requirements	17	New numbering and updated wording
3.1.2	Definition of monitoring period	18	New numbering and updated wording
3.1.3	Monitoring undertaken according to Australian standards	19	New numbering and updated wording
3.1.4	Calibration of monitoring equipment	20	New numbering and updated wording
3.2.1 and Table 3.2.1	See above under existing conditions 2.2.2 and Table 2.2.2 to revised Condition 11 and Table 5		
3.2.2	Sampling undertaken in accordance with AS 4323.1 and/or CEMS	12	New numbering and updated wording
3.2.3	Non-continuous sampling and analysis undertaken by holder of NATA accreditation	13	New numbering and updated wording
3.2.4	Maintenance and calibration of CEMS	14	New numbering and updated wording

Existing condition	Condition summary	Revised licence condition	Conversion notes
3.3.1 and Table 3.3.1	Process monitoring	21 and table 8	New numbering Revised to current licensing format.
3.4.1 and Table 3.4.1	Meteorological monitoring	22 and table 9	New numbering Revised to current licensing format.
3.4.2	Maintenance of monitoring equipment	23	New numbering and updated wording
3.5.1 and Table 3.6.1	Monitoring inputs and outputs	24 and Table 10	New numbering Revised to current licensing format
4.1.1	Recording information	27	New numbering and updated wording.
4.1.2	Submission of AACR	28	New numbering Revised to current licensing format
4.1.3	Complaints recording and management	25	New numbering Revised to current licensing format.
-	Maintain accurate and auditable books	26	Standardised new condition
4.2.1 and table 4.2.1	Annual Environmental Report	29 and table 11	New numbering Revised to current licensing format.
4.2.2	Contents of Annual Environmental Report	29	New numbering Revised to current licensing format.
4.2.3 and table 4.2.2	Non-annual reporting requirements	30 and table 12	New numbering Revised to current licensing format.
4.2.4	Availability of CEMS results	31	New numbering and updated wording
4.3.1 and table 4.3.1	Notification requirements	32 and table 13	New numbering Revised to current licensing format

References

1. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia. Accessed from www.dwer.wa.gov.au
2. Department of Water and Environmental Regulation (DWER) 2019, *Guideline: Industry Regulation Guide to Licensing*, Perth, Western Australia. Accessed from www.dwer.wa.gov.au
3. DWER 2020, *Guideline: Environmental Siting*, Perth, Western Australia. Accessed from www.dwer.wa.gov.au

4. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia. Accessed from www.dwer.wa.gov.au
5. Ministerial Statement 719, April 2006
6. Alumina Refinery (Worsley) Agreement Act 1973
7. South32 Worsley Alumina, Annual Environmental Report FY24
8. South32 Worsley Alumina, Appendix 9 CEMS Data FY2024 attachment to the Annual Environmental Report FY24
9. South32 Worsley Alumina 2024, Air Emissions Control Management Plan
10. South32 Worsley Alumina 30 April 2024, Licence Amendment Application Form
11. South32 Worsley Alumina 2024, Supporting Information attachment to the Licence Amendment Application Form

Schedule 1: Maps

Figure 1: Dust Monitoring locations

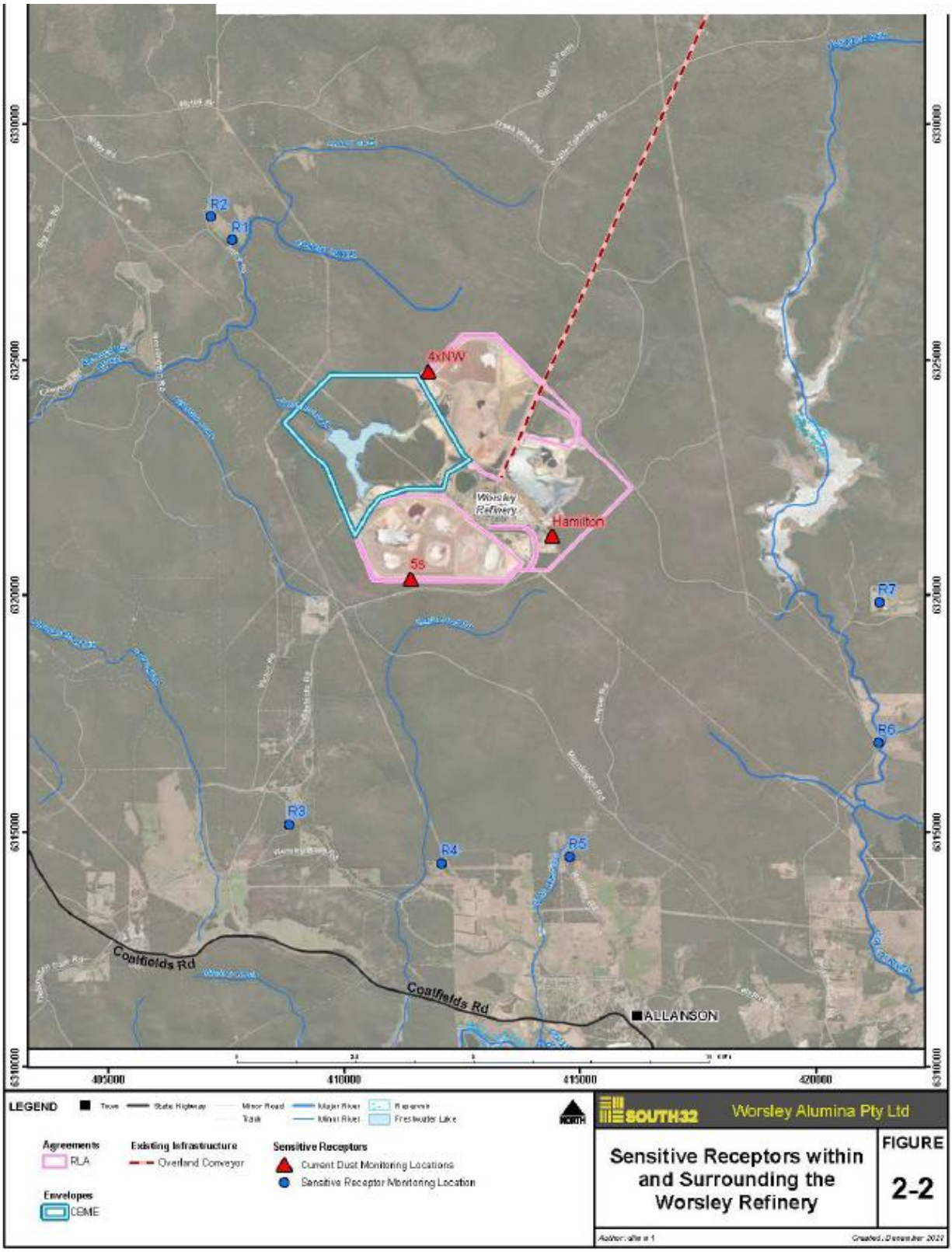
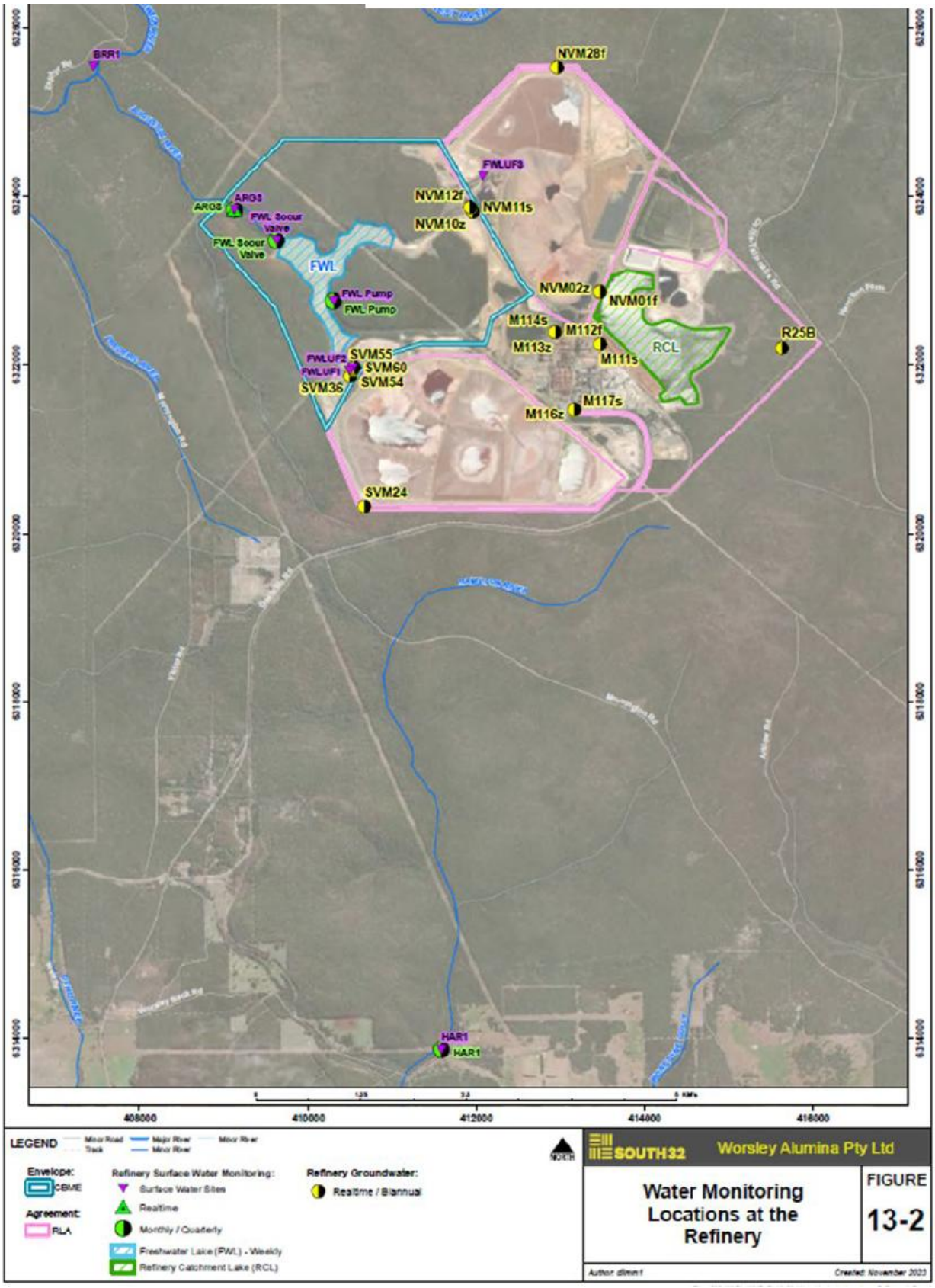


Figure 2: Surface and groundwater monitoring locations



Appendix 1: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of Licence Holder comment	DWER response
Prescribed Premise Category table	The Licence Holder requested that the Prescribed Premise Category table specifies Cat 5 (c) instead of Cat 5. This is to explicitly reflect the metallic or non-metallic ore, as described by Prescribed Premise Category 5, at the Premises is bauxite residue.	The request is not granted as the prescribed premises category needs to reflect the description of the category as listed in Schedule 1 of the EP Regulations.
Prescribed Premise Category table	The Licence Holder requested the reintroduction of Prescribed Premise Category 61	The April 2024 application requested the removal of Prescribed Premise Category 61 as at the time, the licence holder no longer accepted liquid waste at the Premises. Following the consultation period, the licence holder requested Prescribed Premise Category 61 remains on the licence as this activity is likely to be reinstated. The Delegated Officer has reinstated Prescribed Premise Category 61 on the licence.
Prescribed Premise Category table	The Licence Holder requested the assessed production capacity associated with Prescribed Premise Category 63: Class I Inert landfill site is change from 47,000 tonnes per annual period to 72,000 tonnes per annual year.	The draft licence stated an assessed production of 47,000 tonnes per annual period. This was an administrative error as the 2024 licence amendment application referred to 47,000m3 of waste per annual period which was not converted to tonnes per annual period and was overlooked. Based on a conservative density of approximately 1.5 tonnes per cubic metre of waste, which accommodates the density a combination of sanitary waste, for which the Licence Holder used a density of 1.15, and process waste, which has a density of 1.6. The Delegated Officer has accepted this change as it does not significantly impact the risk rating of the

<table>
<tr><th>Condition</th><th>Summary of Licence Holder comment</th><th>DWER response</th></tr>
<tr><td></td><td></td><td>Premises.</td></tr>
<tr><td>Condition 1, Table 1, Item 2</td><td>The Licence Holder requested a change to the wording of the process requirements for oxalate waste. The Licence Holder recommended the wording be amended from ‘submerged in water’ to ‘remain moist or maintained underwater or beneath a full surface cover’ immediately following disposal.</td><td>The Delegated Officer has accepted this request and has changed the wording to ‘…moist or maintained underwater or beneath a full surface cover immediately following disposal’. This wording reflects the requirements of Condition 4.</td></tr>
<tr><td>Condition 2, Table 2, Item 1</td><td>The Licence Holder requested the previous licence’s wording for the containment/operational requirements of BRDAs 1, 2, 4, 4X and 5 are reinstated.</td><td>The Delegated Officer has accepted this request and notes that the Licence Holders voluntary controls have been captured in the Risk Assessment Table (Table 3) in this Amendment Report.</td></tr>
<tr><td>Condition 2, Table 2, Item 5</td><td>The Licence Holder requested an amendment to the initialism of the Northern and Southern Pipehead Dams from NVPHD and SVPHD to NPHD and SPHD</td><td>The Delegated Officer has accepted this change.</td></tr>
<tr><td>Condition 3</td><td>The Licence Holder requested a change to the wording of condition 3(a) as the waste is placed in a defined waste area and covered. In addition to this, decommissioned BRDA 3 is recognised as the Premises landfill area and including the term BRDA 3 may cause confusion in the future.</td><td>The Delegated Officer has accepted this request and changed the wording to waste is placed within the designated area within the landfill.</td></tr>
<tr><td>Condition 10, Table 4, Emission Point A12</td><td>The Licence Holder requested emission point A12 is removed as it is no longer in use and there is no intention of bringing it back online.</td><td>The Delegated Officer has accepted this request. The Licence Holder will need to apply for a licence amendment if this emission point is reintroduced in the future.</td></tr>
<tr><td>Condition 11, Table 5 – sampling frequency and targets</td><td colspan="2">The Licence Holder requested multiple changes to the use or targets, or frequency of sampling for a majority of the emission points listed in Table 5. Below is a summary of the changes and the DWER response:
<table>
<tr><th>Emission Point</th><th>Emission</th><th>Licence Holders Comment</th><th>DWER response</th></tr>
<tr><td>A1 and A3</td><td>CO</td><td>Removal of CEMS monitoring in line with October 2024 DWER approval.</td><td>The Delegated Officer has accepted this request as it was previously approved in October 2024.</td></tr>
</table></td></tr>
</table>

Condition	Summary of Licence Holder comment			DWER response
		NOx	Change stack monitoring to annual as emissions are monitoring continuously via the CEMS.	The Delegated Officer has accepted this request as CEMS monitoring is likely to provide sufficient monitoring of NOx in addition to annual stack testing.
		Acetaldehyde and Formaldehyde	Change stack monitoring to annual as the concentration of acetaldehyde and formaldehyde emissions monitored between November 2024 and May 2025 are low.	The Delegated Officer has accepted this request as sufficient data has been provided to justify annual monitoring.
		PM	Removal of CEMS monitoring in line with October 2024 DWER approval.	The Delegated Officer has accepted this request as it was previously approved in October 2024.
	A3	PM	Return to annual monitoring, as per former version of licence.	The licence holder's 2024 licence amendment application proposed an increased sampling frequency for stack testing of PM from annual sampling to quarterly sampling. However, this was retracted during the draft licence consultation period. The Delegated Officer has changed the stack sampling frequency back to the original requirement of annual sampling.
		Fluoride	Change the title of the emission from fluoride to hydrogen fluoride to align with USEPA Method 26.	The Delegated Officer has accepted this request.
	A5-A8	PM	Remove the target monitoring concentration of 250mg/Nm^3 to avoid confusion.	The Delegated Officer has accepted this request as it causes duplication of reporting. The monitoring frequency has also been changed from quarterly to annual to align with

Condition	Summary of Licence Holder comment			DWER response
				the monitoring of PM from other emission points
		PM10	Change the methodology requirement to include the option of using USEPA Methods 5 and 17.	The Delegated Officer has accepted this request as it aligns with the methodology required for the monitoring of PM.
		Acetaldehyde and Formaldehyde	Change stack monitoring to annual as the monitored concentration of acetaldehyde and formaldehyde emissions are low.	The Delegated Officer has accepted this request as sufficient data has been provided to demonstrate the concentration of acetaldehyde and formaldehyde has not been more than 75% of the target concentration of all monitoring results.
	A9 and A10	PM	Remove the target monitoring concentration of 150mg/Nm^3 to avoid confusion, and return to annual monitoring, as per former version of licence.	The Delegated Officer has accepted this request as it causes duplication of reporting.
		PM10	Change the methodology requirement to include the option of using USEPA Methods 5 and 17.	The Delegated Officer has accepted this request as it aligns with the methodology required for the monitoring of PM.
		Acetaldehyde and Formaldehyde	Change stack monitoring to annual as the monitored concentration of acetaldehyde and formaldehyde emissions are low.	The Delegated Officer has accepted this request as sufficient data has been provided to demonstrate the concentration of acetaldehyde and formaldehyde has not been more than 75% of the target concentration of all monitoring results.
	A11	N/A	Change facility name from liquid	The Delegated Officer has accepted

Condition	Summary of Licence Holder comment			DWER response
			burner to liquor burner	this request
		CO	Remove the target monitoring concentration of 100mg/Nm^3 to avoid confusion	The Delegated Officer has accepted this request as it causes duplication of reporting.
		Acetaldehyde and Formaldehyde	Change stack monitoring to annual as the monitored concentration of acetaldehyde and formaldehyde emissions are low.	The Delegated Officer has accepted this request as sufficient data has been provided to demonstrate the concentration of acetaldehyde and formaldehyde has not been more than 75% of the target concentration of all monitoring results.
	A12	N/A	Remove emission source as it is not operational and there is no intent to restart the equipment.	The Delegated Officer has accepted this request.
	A13 and A14	CO	Remove the target monitoring concentration of 100mg/Nm^3 to avoid confusion	The Delegated Officer has accepted this request as it causes duplication of reporting.
		CO, SO_2, PM and NOx	Change stack monitoring to annual as emissions are monitoring continuously via the CEMS.	The Delegated Officer has accepted this request as CEMS monitoring is likely to provide sufficient monitoring of CO, SO_2, PM and NOx in addition to annual stack testing.
		Fluoride	Change the title of the emission from fluoride to hydrogen fluoride to align with USEPA Method 26.	The Delegated Officer has accepted this request.
	A15 and A16	CO and NOx	Retain limit monitoring concentration, but remove the target monitoring concentration of CO and NOx to avoid confusion.	The Delegated Officer has accepted this request as it causes duplication of reporting.

Condition	Summary of Licence Holder comment	DWER response
Condition 11, Table 5 – Notes	The Licence Holder requested an update to Notes 2, 3 and 5 to avoid confusion of repetition and inconsistencies.	The Delegated Officer has accepted this request.
Condition 24, Table 10 – Coal **And** **Condition 29**	The Licence Holder commented that monitoring of sulfur content in coal was used during the Collie Airshed study which has been completed and no longer serves much value.	The Delegated Officer has accepted this request, as the only infrastructure that uses coal is Burner 2 and this will be converted to gas-fuel soon. The inclusion of determining sulfur content is less valuable especially as SO2 is monitored via CEMS. This requirement has also been removed from Condition 24.
Condition 24, Table 10 – Biomass **And** **Condition 29**	The Licence Holder commented that the monitoring the input of biomass is unnecessary as the burning of biomass has no environmental impact.	The Delegated Officer has not accepted this request as this information is required to support compliance with Condition 10, Table 4 where the condition states that a maximum of 30% of biomass can be used in the MFC Power Plan Coiler Units. This requirement remains in Condition 24.
Condition 32	The Licence Holder requested to change the requirement of submitting a calibration report to the CEO as soon as practicable if calibration of monitoring equipment cannot be practicably met, or a discrepancy exists in the interpretation of the requirements in accordance with Conditon 20. The Licence Holder requested to change the requirement to annual submission with the AER to avoid administrative burden	The Delegated Officer has not accepted this request as it is important for the department to receive these notifications as soon as practicable to get an understanding of issues experienced at the Premises and to be accountable to stakeholders should there be a lengthy delay in addressing any monitoring issues.