Application for Works Approval

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

Works Approval Number	W6952/2024/1
Applicant	Australian Gold Reagents Pty Ltd
ACN	009 140 121
File number	DER2024/000361
Premises	Australian Gold Reagents Pty Ltd Part of Lot 20 on Diagram 78086 KWINANA BEACH WA 6167
Date of report	1 April 2025
Decision	Works approval granted

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MANAGER, PROCESS INDUSTRIES
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the premises. As a result of this assessment, works approval W6952/2024/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

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

2.2 Application summary and overview of premises

Australian Gold Reagents Pty Ltd (AGR; the applicant) holds licence L6110/1990/13 for the Kwinana Sodium Cyanide Manufacturing Facility (SCMF) located at Part of Lot 20 on Diagram 78086 (the premises) in Kwinana Beach.

On 3 July 2024, the applicant submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act) for its debottlenecking project and associated increase in sodium cyanide (NaCN) production capacity.

The premises is located within the CSBP Kwinana Industrial Complex (KIC) in the Kwinana Industrial Area (KIA) and consists of two NaCN plants (SCP1 and SCP2) that produce a ~40% weight/weight (w/w) liquid NaCN which is then diluted prior to dispatch, or fed to the sodium cyanide solids (SCS) plant for the manufacture of NaCN briquettes. Under current licence L6110/1990/13, SCP1 and SCP2 are authorised to produce a combined output of 91,000 tonnes per annum (tpa) of pure (100%) NaCN, and the SCS plant is authorised to produce 45,000 tpa of NaCN briquettes (>97% NaCN). The total assessed production capacity of the licence is currently 136,000 tpa under category 31: Chemical manufacturing.

The Stage 1 expansion project (this application) requests authorisation to undertake works relating to the modification of existing infrastructure and the construction and installation of new infrastructure to debottleneck the manufacturing process at SCP1 and the SCS, thus increasing NaCN production up to a combined total of 170,000 tpa. SCP2 debottlenecking works will form part of the Stage 2 expansion which will be subject to a separate application and assessment. These proposed modifications (Stage 1 and Stage 2) were approved by the Minister for Environment subject to the conditions of MS 1196 (published on 23 August 2022).

Details of the components of this application are summarised in Table 1.

Table 1: Components of works approval application.

	Proposed works	Scope of proposed works relevant to Part V of the EP Act	Intended outcome of proposed works
1.	2 x Air blower installation	The existing air boost fans on SCP1 will be replaced with two new pressurised blowers operating in tandem. The air intake will be ~12 m above ground level. They will sit to the west of the existing boost fan location (to be removed). Oxygen (as air) is required to so that combustion may achieve the required reaction temperature. A higher air supply pressure is required to convert the reactors to pressurised operation.	Each blower will have a capacity when operating in tandem of 20,961 kg/hr each (combined flow of 41,922 kg/hr). This will result in the plant running at 30-50 kPa positive pressure measured at the reactor.

2.	Natural gas and ammonia filter upgrades	As part of the pressurisation modification, gas filters will operate on each individual feed line for air, natural gas and ammonia – and no longer as a mixed feed. The air-stream will first be filtered by a 3-stage HEPA air filter at the inlet to the air blowers. Ammonia and natural gas will continue to be filtered by the existing in-stream filters. The existing mixed gas stream filter will be removed as it is not suitable for pressurised operation and will add to the pressure loss in the mixed gas stream.	The natural gas filter will have a maximum flow rate of 6,500Nm^3/hr. The ammonia filter will have a maximum flow rate of 6,500Nm^3/hr.
3.	Steam drum elevation	The existing SCP1 steam drum will be elevated by 6 m on a new pre-assembled platform to be established on top of the existing steam drum platform. The raised steam drum will provide additional circulating driving force within the boiler system to remove the additional heat generated by the increased HCN production. This will also require the raising of the waste gas stack by a similar amount to ensure personnel safety in the immediate area and compliance with the relevant API 521 standard (relieving of pressure vessels).	Prevent decomposition of HCN (formed at high temperatures in the reaction system) and the associated yield losses. Improve gas dispersion from the waste gas stack.
4.	Reactor modification	The existing SCP1 reactors will be modified for positive pressure. Flanged connections will be minimised so far as practicable by replacing flanges with welded sections. Pipework downstream of the reactor-boiler and prior to the absorber will also be redesigned to reduce the number of existing flanges. A new reactor ignition system will be designed to ignite the reaction under pressurised conditions. HCN gas detection will be stationed in the vicinity of the reactors in order to detect and warn of any possible leaks.	Minimise the risk of process leaks downstream of the HCN reaction gauzes.
5.	Absorber tower modifications	For the absorber to operate efficiently new higher capacity packing is required, and greater packing bed height required to provide the same efficiency at the higher production rates. Absorber internals will be modified to accommodate a greater bed height.	Increase capacity for conversion of additional HCN into NaCN product.
7.	Reverse osmosis (RO) (i) RO expansion (ii) New RO polishing train	(i) The existing wastewater treatment system (WWTS) will be expanded with the inclusion of an additional process RO plant operating in parallel to the existing RO plant. This will treat the process condensate downstream of the ammonia stripper, with the cleaned permeate then treated in the cyanide destruction unit and fed to the new RO polishing package (see Figure 1). (ii) The proposed increase in sodium cyanide production will generate additional demand for makeup water at the cooling tower due to increased evaporation/drift losses. The objective of the new RO polishing train is to treat wastewater produced by the cyanide destruction process in order to remove residual ammonia, free cyanide, peroxide, cyanate, ammonia and copper (chemicals used in the cyanide destruction process). This will enable the wastewater permeate to be recycled to the site cooling towers. The polishing RO reject water will be sent to the CSBP ponds.	Wastewater permeate to be recycled to the site cooling towers rather than discharging to the CSBP wastewater treatment ponds. The volume of blowdown water discharged to the CSBP wastewater system will reduce, despite increased water evaporation due to increased production.

9.	Wastewater cyanide destruction system modification	The cyanide destruction process converts sodium cyanide to sodium cyanate in the presence of a strong oxidant (hydrogen peroxide) at elevated temperature and pH. To process the higher wastewater throughput, a previously decommissioned 10 m^3 stainless steel (ASTM A240, type 316L) wastewater buffer tank will be returned to service, including the associated wastewater transfer pump. Additionally, an existing spiral heat exchanger will be replaced with a larger duty plate heat exchanger to ensure the outlet temperature is within parameters to protect the downstream RO polishing membranes.	Modification of the existing wastewater cyanide destruction system will be undertaken to manage the additional load.
10.	SCS demister on evaporators	Ductwork from the exit of the evaporators will be modified to suit the installation of new mist elimination equipment.	Capture cyanide in the evaporation stream before it reaches the SCS condensate.
11.	SCS scrubber upgrade (i) Packed bed scrubber modification (ii) New ammonia scrubber package	(i) The current scrubber package will be upgraded with the addition of a separate ammonia scrubbing column to treat the ammonia rich vapour from the SCS waste gas collection header, before it is combined with the ammonia lean vapour streams for treatment in the packed bed scrubber. (ii) A dedicated ammonia scrubber will be added to treat waste gases before the packed bed scrubber. It will be located adjacent to the existing packed bed scrubber and will include an ammonia scrubber column, recirculation pump, heat exchangers, and chilled water package.	Treat the waste gases associated with increased NaCN production.
12.	Air cooled dump condenser (ACDC) upgrade	Due to increased low pressure steam generation by the reactor boilers, and the additional cyanide evaporation demand increasing the swing between normal and peak steam dump load, the existing ACDC will be upgraded. An additional condenser bay will recondense low pressure steam derived from the reactor boilers. Condensate will be returned to the deaeration unit via the existing plant condensate header. The new bank will be sized for a peak load of 23,500 kg/hr of 6.5 bar low pressure steam in line with the existing condenser banks. It will contain two cooling fans with variable speed drive (VSD) control for adequate turndown in low demand situations. The existing condensate tank will be replaced by a new larger common carbon steel condensate vessel (nominally 6 m^3) suitable for all three condenser banks. The condensate return pumps will be upgraded to return the increased condensate load to the SCP1 and SCP2 deaerators.	Additional capacity to meet expansion capacity requirements.
13.	Cooling tower expansion	The water basin for cooling tower 2 is sized for 8 cells that currently has evaporation fans installed on only 6 cell locations. To remove the additional heat from the process streams by circulating cooling water through the cooling tower, the last two cell locations will have cooling units installed on them. These will be a similar size to those installed fans with increased cooling duty to manage additional heat load from the solids plant (existing fans 3.75 MW heat transfer each, new fans nominally 5MW). For greater operational flexibility and heat distribution of the cooling tower, new pumps will be provided to supply cooling water to the SCS effectively isolating solids from the existing plant cooling water circuit. This will provide additional heat removal capacity at the SCS, and flexibility to supply cooling water to the SCS under various operating scenarios.	Remove the additional heat from the process streams, due to increased production.

14.	Natural gas treatment plant (NGTP) modifications	Improvements will include the upgrading of the natural gas filter to achieve a volumetric flow of ~440 m^3/hr (9,524 Nm^3/hr) for Stage 1 expansion and installing a gas by-pass at the dehydration unit.	Manage the increased flow of natural gas for cyanide production.

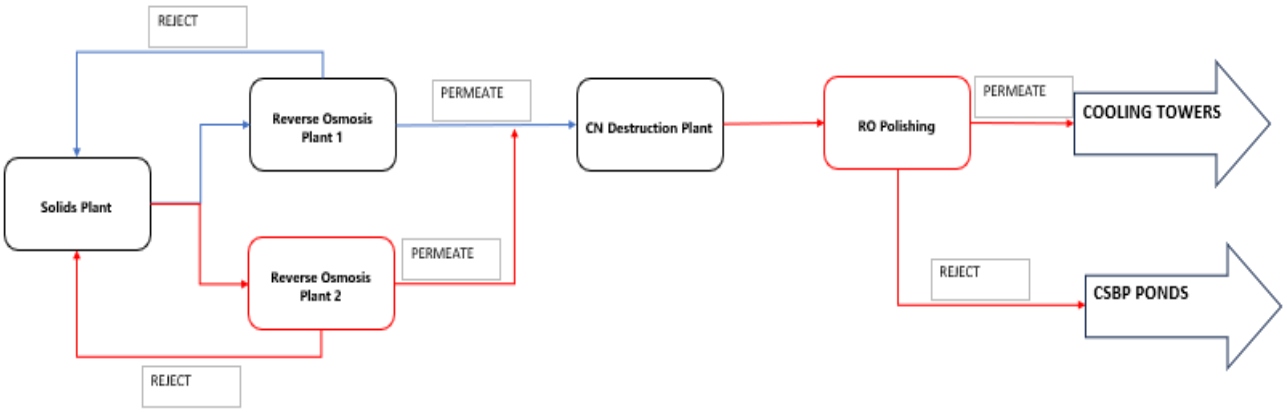

Figure 1: Changes to the Sodium Cyanide Manufacturing Facility wastewater treatment shown in red.

3. Legislative context

3.1 Part IV of the EP Act

The premises is operated under Ministerial Statement (MS) 700. The approved proposal is for the operation of a liquid and solid sodium cyanide production plant at Kwinana and the transport of sodium cyanide by road and rail from Kwinana.

The proposed increase in production, which is the subject of this works approval assessment, was referred to the Environmental Protection Authority (EPA) by AGR under Part IV of the *Environmental Protection Act 1986* (EP Act). The EPA determined to assess the proposal at a level of Referral Information with additional information required under section 40(2)(a) of the EP Act. EPA Report 1725 was released on 27 June 2022. The proposed modifications were approved by the Minister for Environment subject to the conditions of MS 1196 (published on 23 August 2022).

In its report, the EPA noted that air emissions from the premises are currently regulated under the licence (L6110/1990/13) with conditions specifying atmospheric discharge points, emission limits and targets, monitoring and reporting requirements and emissions controls during start up and shut down events. The EPA determined that regulation of emissions to air can continue to be managed under Part V to meet the EPA's objectives for maintaining air quality, however considered that the licence, and the Start-up and Waste Gas Venting Management Plan, should be updated to include the proposed additional avoidance and management measures relating to start-ups. These additional start-up measures were included in the amended licence granted in August 2022, which included not undertaking start-up operations when the wind conditions originate from 57-80 degrees (towards Wells Park) and allowed waste gas from each production plant to be directed to a combined header before treatment by either of the waste gas incinerators.

It is noted that the EPA has considered greenhouse gas (GHG) emissions from the proposal; determining that GHG emissions could be limited through Condition 1 of the Ministerial Statement. Should the limit be exceeded, the EPA highlighted that the Minister for Environment may elect to initiate a section 46 change to the conditions to require a GHG Management Plan. The Delegated Officer has considered the EPA's assessment of GHG emissions and Guidance Statement: Setting Conditions and determined not to unnecessarily duplicate the requirements of MS 700 or reassess GHG emissions as they have already been considered through EPA assessment and conditions

applied (Report 1725).

3.2 Rights in Water and Irrigation Act 1914 (RIWI Act)

AGR source water from CSBP, which includes a combination of licensed groundwater and treated water from the Kwinana Water Reclamation Plant (KWRP). The proposed works do not result in any material increase in water consumption and as such does not require additional RIWI Act approvals.

3.3 Contaminated Sites Act 2003 (CS Act)

Lot 20 is classified under the Contaminated Sites Act 2003 (CS Act) as '*possibly contaminated – investigation required*'. A detailed site investigation (DSI) completed in 2020 listed the nature of the contamination as nitrogen, arsenic and hydrocarbons present in soil and groundwater, and noted the presence of co-mingled plumes related to both primary and secondary on and off-site sources. Therefore, there are several areas of the premises which require management to mitigate residual risks via a Contaminated Site Management Plan (CSMP). A Contaminated Sites Auditor is engaged for the site and has endorsed the finalised version of the CSMP.

The NaCN facility is outside the plumes delineated in the DSI; with the nearest plume located more than 500 m from the facility. The maximum depth of the proposed excavations is 1 mbgl and earthwork excavations are not anticipated to intersect groundwater.

4. Environmental noise assessment

The applicant engaged SLR Consulting Australia (SLR) to undertake an environmental noise assessment to assess the impact of changed noise emissions associated with the proposed Sodium Cyanide Expansion project. The noise assessment considered Stage 1 (this application) and Stage 2 (future application) upgrades. As a works approval application has only been received by the department for Stage 1 works at this time, the delegated officer has determined to only consider these in this assessment.

The CONCAWE prediction methodology was utilised within SoundPLAN for the acoustic modelling. The assessment has been provided with the application (SLR, 2024), which details the predicted change in noise levels at the residential areas surrounding the Kwinana Industrial Area (KIA) and an assessment of noise impacts against applicable noise limits from the *Environmental Protection (Noise) Regulations 1997* (Noise Regulations).

4.1 Construction

Construction noise has not been considered in the environmental noise assessment. Construction noise will primarily involve the installation of equipment and is unlikely to contribute to the operational noise. Construction activities will occur during live operation and planned shutdowns.

4.2 Operation

Noise measurements were undertaken throughout the premises to refresh the acoustic model of the existing operations and provide a current base model for prediction of noise emissions for the proposed upgrade of the AGR facility.

The existing prominent noise sources from the plant operation are the air-cooled steam condenser fans, cooling towers, suction air blowers, the Maxitherm blower, with lessor sources associated with the operation of the solids plant, turbine alternator, switching gear, and the reverse osmosis (RO) plant.

Identified changes associated with Stage 1 of the proposed upgrade that were considered in the noise assessment are:

- Cooling tower No. 2 – additional two cooling tower cells;

- Two air blowers for SCP1, attenuated;
- Additional steam condensate cooling (air cooled radiator);
- RO plant;
- Additional power transformer;
- Minor upgrade to solids plant;
- Decommissioning the SCP1 air boost blower; and
- Decommissioning the SCP1 vacuum blowers.

The acoustic modelling shows that the proposed plant expansion (Stage 1 and Stage 2) noise emissions are predicted to be compliant with the requirements of the Noise Regulations at all noise sensitive premises for all hours, with the upgrades showing a small reduction in noise emissions. The reductions are generally associated with the replacement of the existing vacuum blowers with attenuated positive pressure blowers (Stage 1 and Stage 2) and decommissioning of the Maxitherm incinerator (Stage 2).

4.3 DWER assessment of noise modelling

The acoustic assessment has considered changes associated with the proposed plant upgrade in its entirety (Stage 1 and Stage 2) and concluded that the acoustic modelling shows that noise emissions will be the same or reduced compared to existing noise emissions at far-field residential receptors, such as Medina.

The delegated officer considers the modelling methodology used may be too simplistic to represent the multitude of noise sources present on site and has the potential to result in large uncertainties in the predicted results. Also, the modelling has incorporated changes that are proposed to occur in the future, as part of Stage 2 of the expansion (particularly the decommissioning of the Maxitherm incinerator). It is therefore difficult to assess the veracity of the proposed noise reductions in relation to Stage 1 of the expansion alone. However, the conclusion that cumulative operational noise emissions will comply with the Noise Regulations appeared reasonable, noting the noise controls proposed by the applicant (see Table 3).

5. Air emissions

5.1 Air emissions profile

Emissions to air from the two liquid sodium cyanide plants and the solid sodium cyanide plant are primarily nitrogen dioxide (NO_2), ammonia gas (NH_3) and hydrogen cyanide gas (HCN).

In the licence, SCP start-ups are only permitted to be attempted under specific meteorological conditions for wind direction and speed. Air pollution controls in the licence specify continuous monitoring of SCP1 and SCP2 incinerator stacks for oxides of nitrogen (NOx). The licence also requires quarterly manual stack testing be undertaken for:

- ammonia, cyanide, hydrogen cyanide and NOx for the SCP incinerators; and
- ammonia and total cyanide testing be completed for the solids plant stack.

With the proposed increase in production of liquid sodium cyanide, a minor increase in NOx is expected from SCP1 (see Table 3).

Table 1: Comparison of existing and predicted emission rates associated with the SCMF expansion.

Plant	Production	Units	NO_2	Total HCN	NH_3
SCP1	47 ktpa (current)	g/s	2.81[1]	0.017[3]	0.004[3]
	63 ktpa (expand)[2]		3.9	0.06	0.008

SCP2	47 ktpa (current)		2.86[1]	0.021[3]	0.116[3]
Solids Plant	45 tpa (current)		n/a	0.062[3]	1.32[3]
	60 tpa (expand)[2]		n/a	0.004	0.72

Note 1: CEMS 2022.
Note 2: Predicted.
Note 3: 2021 and 2022 annual report (averaged).

5.2 Applicant's air emissions assessment

The applicant engaged consultants Ramboll Australia Pty Ltd (Ramboll) to undertake an assessment of the air quality impacts associated with the proposed production increase using DISPMOD and AERMOD models. The assessment considered potential air quality impacts arising from the emissions of NO_2, NH_3 and HCN associated with normal operating conditions, start-up operations, waste gas venting and shutdown or plant trips compared against relevant air quality criteria.

Normal operations

For normal operating conditions, the emissions rates applied in the model were as per the upper emission limits specified in the licence as a worst case scenario. The cumulative impacts of emissions were assessed at receptors where ambient air quality data are available. Ground level concentrations (GLCs) for the atmospheric emissions at the corresponding licence limits (or licence targets in the absence of limits for ammonia) were modelled for normal operations. The maximum hydrogen cyanide, nitrogen dioxide and ammonia GLCs were predicted to remain below the applicable air quality criteria at each sensitive receptor.

Start-up

Findings from the modelling for GLCs predicted that under existing start-up conditions, exceedances of the NO_2, NH_3 and HCN guidelines would occur. However, the results provided in the air quality modelling for start-up operations assume continuous emissions between the hours of 6 pm to 6 am, when in fact the start-up process only takes approximately 1-hour. This conservatism, in combination with the low frequency of start-ups, means the likelihood of an exceedance occurring is rare, according to the assessment.

Emissions during start-up are not impacted by the proposed increase in production and will remain unchanged. There are existing start-up restrictions prescribed by the licence to avoid prevailing meteorological conditions unfavourable for the dispersion of emissions and to limit offsite impacts at sensitive receptors.

Waste gas venting

On occasion, the incinerators are unavailable whilst the plant is running due to planned emergency maintenance or unplanned incinerator failures. When this occurs, the scrubbed gases downstream of the absorber column are vented to atmosphere via the waste gas (shutdown) stack if an incinerator is not available.

Modelling has determined that waste gas venting from one or both liquid plants with the solids plant in operation would result in exceedances of the ammonia air quality guidelines, including at sensitive receptors under conditions where both liquid plants are venting. However, given the infrequent occurrence, particularly of simultaneous venting occurring on both liquid plants, the likelihood of adverse impacts at sensitive receptors is expected to be rare.

Emissions during waste gas venting are not expected to be impacted by the proposed increase in production and will remain unchanged.

Shutdowns

The air quality assessment determined no predicted exceedances of the 1-hour average ammonia or hydrogen cyanide guideline values at any of the nominated receptors for a single or double liquid plant

shutdown. GLCs exceeding the 1-hour average hydrogen cyanide guidance value were determined at the boundary of the premises; however, this outcome is based on conservative assumptions since the shutdown emissions are two to three minutes only.

Furthermore, plant trips and planned shutdowns are infrequent with 35 occurrences recorded in the 48 months from January 2020 to December 2023 for both liquid plants. Therefore, the probability of adverse impacts is extremely low. There is no change to the frequency of plant shutdowns (planned or trips) expected due to the proposed increase in production.

Human Health Risk Assessment

The applicant engaged Matisons Toxicology Solutions (Matisons) to undertake a Human Health Risk Assessment (HHRA) to determine whether emissions would adversely impact human health during start-up, waste gas venting and planned shutdown or plant trip events. The assessment concluded that a production increase associated with this application will not produce adverse health effects in neighbouring receptors of concern, and that the EPA's environmental objective is expected to be met.

5.3 DWER and Department of Health assessment of air modelling

The department reviewed the modelling techniques and air quality impact assessment provided by the applicant are considers that they are consistent with the DWER *Air Quality Modelling Guidance Notes (2006)*. In relation to the model results, the delegated officer notes that:

- The model estimated concentrations are well in excess of 1–hour and 3–minute model assessment criteria for NH_3, NO_2 and HCN for plant start-up conditions at some sensitive receptor locations; and
- The Hazard Quotient (HQ) is used by risk assessors to make decisions about the risk of adverse health effects. The estimated HQs for HCN and ammonia at the site boundary and the nearest sensitive receptor (Wells Park) appear to be elevated.

Advice was sought from Department of Health (DoH) with regard to the HQ results. In its response to DWER on 12 September 2024, DoH acknowledged that they had been consulted by the EPA over the 2021-2022 period when AGR made a submission to them for the premises expansion. The DoH was satisfied with the health risk assessment provided that the AGR upheld its commitment to incorporate specific avoidance and minimisation measures in its DWER licence, as outlined in the EPA Report 1725 of June 2022 and summarised here:

Avoidance measures	• Not undertaking start-up operations when the wind conditions originate from 57 to 80 degrees (towards Wells Park).
Minimisation measures	• Reduction in the number of start-ups per year. • Start up to only occur between sunset and sunrise. • Continuous monitoring of wind conditions during start up. • Plant start-up will be halted if wind conditions change and are not consistent with the Part V licence. • Introduction of downwind real time monitoring for every plant start-up. • A reduction in waste gas emissions from reduced venting time through interconnection of waste gas lines from both liquid plants. • A reduction in the number of shutdowns per year, due to operational improvements in processing.

DoH notes that this was only partly done when the licence was amended on 25 August 2022 and the current works approval proposal (this application) does not mention the missing measures. Therefore, DoH recommends that the licence be amended to reflect the missing commitments.

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 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered in this decision report are detailed in Table 2 below. Table 2 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 2: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Excavations for foundations of air filters, air blowers, dump condenser, RO infrastructure including tanks, SCS switch room and condensate pump works	Air / windborne pathway	The upgrade activities are not considered dusty and will not require significant earthworks.
Noise			Construction noise will primarily involve installation of equipment and is unlikely to contribute to the operational noise. Construction activities will occur during live operation and planned shutdowns.
Operation			
NH_3, NOx, HCN, PM emissions to air	Increase NaCN production from 136,000 to 170,000 tpa	Air / windborne pathway	The existing licence contains limits and targets for NOx and HCN emissions, and targets for NH_3. NOx and total cyanide emissions have been well within the licence limits for the past two reporting periods and the applicant claims that they will remain these existing limits despite the proposed production increase. Therefore, no further controls are proposed for NOx and HCN emissions. NH_3 emissions have been above the licence targets occasionally over the last two reporting periods. Therefore, the following upgrades and controls have been proposed: • Install demister spray bars to ensure evaporators operate at an optimum pressure and therefore avoid generation of excess ammonia; • unblock and clean chiller cooling water strainers – the higher resulting temperatures led to poor ammonia removal; • install new random packing in scrubbers to optimise gas / liquid contact and ammonia removal efficiency; • install a new ammonia scrubber unit as part of the air emission scrubbing system; • increase cooling water supply to evaporator condensers to improve solubility of ammonia in evaporator condensate; and • replace liquor scrubber pipework to achieve better circulating liquor flows.

Emission	Sources	Potential pathways	Proposed controls
CO_2 and N_2O emissions to air	Venting of CO_2 stripped from natural gas (methane) in the natural gas purification plant, and through combustion of waste gases and fuel (natural gas) in the incinerators.		Installation of a gas bypass (Natural gas treatment plant (NGTP) upgrades). Use of the incinerator interconnection to minimise unabated air emissions while also monitoring the selective catalytic reduction (SCR) system performance of SCP2, and changing out the catalyst prior to performance deterioration.
Noise	Increased production		Replacement of vacuum blowers with attenuated positive pressure blowers (air blower upgrade).
	New Air-Cooled Dump Condenser (ACDC) bay with two cooling fans		Variable speed drive (VSD) control on the fans for adequate turndown in low demand situations.
	Cooling tower expansion with two new cooling units installed		Use of acoustic attenuation on specific equipment as required; and Management of noise to ensure requirements of the Noise Regulations are met.
Wastewater from cooling towers (blowdown) with high concentration of dissolved salts		Overland runoff or seepage, potentially causing ecosystem disturbance or impacting surface water quality	Process effluent will increase due to the proposed expansion, from 54 ML to 74 ML per year. However, as part of the proposed works, a RO polishing plant will be installed with the capacity to recycle up to 65% of process effluent into the cooling tower, thus reducing the demand for bore water. The polished water will be a cleaner alternative to bore water and will increase the time taken for water contaminants to cycle up, reducing the blowdown volume from the cooling towers. With the installation of the polishing plant, the total amount of wastewater generated at the premises is expected to remain below 197 ML (reduced to ~160 ML; this saved capacity will be required in future upgrades).
Stormwater potentially contaminated with ammonia, cyanide, cyanate and copper	New RO plant and RO Polishing plant infrastructure		The new RO Plant and RO polishing plant will be on a sealed hardstand with approximate dimensions 19 x 21m and 0.3m high external bund wall; Have a dedicated sump (2.5m x 1.5m x 1.5m) and pump for spills and rainwater; Have an allowance in design capacity for 2 m3/hr of sump collection water; and Be designed to AS 4452 -1997 (The storage and Handling of Toxic Substances).
RO reject water with high salt concentration			The brine / concentrate from the new RO plant (process) will be managed the same as the existing RO plant, via venturi scrubber to recover CN dust from SCS waste stream. The polishing RO brine will be discharged as process effluent to the adjacent CSBP wastewater management system in line with existing approvals, but at a reduced volume.

Emission	Sources	Potential pathways	Proposed controls
Fugitive SO_2 (from destruction of hydrogen peroxide at the new RO polishing unit)			SO_2 is highly soluble in water (about 70 g/L). The applicant states that a concentration of 0.62 g/L may be produced, which is well below the 70 g/L solubility limit, and has concluded that the new RO polishing unit will result in insignificant fugitive venting of sulphur dioxide. Therefore, no further controls have been proposed.

6.1.2 Receptors

In accordance with the *Guideline: Risk Assessment* (DWER 2020), the Delegated Officer has excluded the applicant'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 3 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 3: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Wells Park	1.2 km SW
Kwinana Golf Course	2.0 km E
Nearest residence	2.1 km E
Motorplex	3 km NE
Wombat Wallow Childcare Centre	2.9 km E
Calista Primary School	3.3 km E
Environmental receptors	**Distance from prescribed activity**
Unidentified Threatened Ecological Community (TEC) intersecting southern part of premises	0 km S
TEC: tuart trees / woodlands within premises boundary	~ 550 m north of proposed activity
Threatened and/or priority fauna: Isoodon fusciventer (Southern Brown Bandicoot/ Quenda) Zanda latirostris (Carnaby's Cockatoo habitat trees)	within premises boundary of Lot 20
Groundwater	~ 1.5 m AHD; about 2.5 – 3 bgl
Resource Enhancement Wetland	1.2 km E
Cockburn Sound	1 km W

6.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account potential source-pathway and receptor linkages as identified in Section 6.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 6.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 4.

Works approval W6952/2024/1 that accompanies this decision report authorises construction and time-limited operations. The conditions in the issued works approval, as outlined in Table 4 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence amendment is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the premises i.e. increased NaCN production. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 4: Risk assessment of potential emissions and discharges from the premises during construction and operation

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Construction								
Excavations for foundations of air filters, air blowers, dump condenser, RO infrastructure including tanks, SCS switch room and condensate pump works	Dust	Air / windborne pathway causing impacts to health and amenity	Residences from 2.1 km E	Refer to Section 6.1.1	C = Minor L = Rare **Low Risk**	Y	N/A	The delegated officer notes that the proposed works will largely be undertaken within existing plant areas and do not involve extensive ground disturbing activities. Therefore, dust generation is not expected to be significant, and no additional regulatory controls are required.
	Noise			Refer to Section 6.1.1	C = Minor L = Rare **Low Risk**	Y	N/A	The delegated officer considers that given the separation to off-site receptors, and the works occurring within a large operating industrial premises, noise associated with construction and installation works is unlikely to be distinguishable from that of the larger premises and impact to off-site human receptors is not reasonably foreseen.
Operation (including time-limited-operations operations)								
Increased production of NaCN – upset conditions (Loss of containment from additional tanks, pipes, pumps etc.)	Liquid NaCN	Overland runoff or seepage, potentially causing ecosystem disturbance or impacting surface water quality	Groundwater 2.5 mbgl Resource Enhancement Wetland 1.2 km E TEC 550 m N of activity Cockburn Sound 1 km W	Refer to Section 6.1.1	C = Moderate L = Unlikely **Medium Risk**	Y	*N/A*	The delegated officer notes that the sodium cyanide liquid storage tanks are equipped with overflow protection, which includes level gauges and overflow lines. Larger tanks also have high-level critical alarms. The delegated officer also notes that existing infrastructure at the premises includes stormwater and wastewater circuits, bunding and sump infrastructure for the management of spills, along with wastewater treatment infrastructure and disposal pathways. The delegated officer considers the existing controls on licence will be sufficient to manage this risk.
Increased production of NaCN – normal operation (Increase in NaCN production from 136,000 to 170,000 tpa)	NH_3, NOx, HCN, PM, CO_2 emissions to air	Air / windborne pathway causing impacts to health and amenity	Residences from 2.1 km E Wells Park 1.2 km SW Golf Course 2 km E Wombat Wallow Childcare Centre 2.9 km E Calista PS 3.3 km E	Refer to Section 6.1.1	C = Moderate L = Possible **Medium Risk**	N	Condition 1 **<u>Condition 4</u>**	The delegated officer notes that the existing licence contains limits and targets for NOx and HCN emissions, and targets for NH_3. It is noted that NOx and total cyanide emissions have been well within the licence limits for the past two reporting periods and the applicant considers that they will remain these existing limits despite the proposed production increase. Therefore, no further controls are proposed for NOx and HCN emissions. NH_3 emissions have been above the licence targets occasionally over the last two reporting periods, and a result the following upgrades and controls have been proposed as part of this works approval: • Install demister spray bars to ensure evaporators operate at an optimum pressure and therefore avoid generation of excess ammonia; • unblock and clean chiller cooling water strainers; • install new random packing in scrubbers to optimise gas / liquid contact and ammonia removal efficiency; • install a new ammonia scrubber unit as part of the air emission scrubbing system; • increase cooling water supply to evaporator condensers to improve solubility of ammonia in evaporator condensate; and • replace liquor scrubber pipework to achieve better circulating liquor flows. The delegated officer considers that these proposed upgrades are required to be conditioned on the works approval, in order to manage the ongoing operation and management of NH_3 emissions.
	CO_2 and N_2O emissions to air			Refer to Section 6.1.1	C = Moderate L = Unlikely **Medium Risk**	Y	Condition 1	The delegated officer notes that upgrades to the natural gas treatment plant (NGTP) are intended optimise performance and incineration reliability to achieve lower emissions with lower gas use while continuing to increase production rates. This includes the utilisation of the incinerator interconnection to minimise unabated air emissions while also monitoring the selective catalytic reduction (SCR) system performance of SCP2 and changing out the catalyst prior to performance deterioration.
SCP1 modifications, including to air-cooled dump condenser, blowers and steam drum.	Noise			Refer to Section 6.1.1	C = Moderate L = Possible **Medium Risk**	Y	Condition 1	As described in Section 4.3, the delegated officer considers that due to the complex nature of plant and equipment associated with the existing premises operations, and additional infrastructure proposed as part of this amendment, verification of individual noise sources and proposed attenuation remains challenging. As a minimum, the delegated officer has conditioned the applicant's proposed controls for key upgrades to blowers and pumps, considered to be noisier equipment. The delegated officer notes that further noise validation monitoring may be necessary following the implementation of the new equipment on the premises (under licence) or as part of the assessment for future Stage 2 works.

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Increased production of NaCN – normal operation (Increase in NaCN production from 136,000 to 170,000 tpa)	Wastewater from cooling towers (blowdown) with high concentration of dissolved salts	Overland runoff or seepage, potentially causing ecosystem disturbance or impacting surface water quality	Groundwater 2.5 mbgl Resource Enhancement Wetland 1.2 km E TEC 550 m N of activity Cockburn Sound 1 km W	Refer to Section 6.1.1	C = Moderate L = Unlikely **Medium Risk**	Y	Condition 1	The delegated officer notes that process effluent will increase due to the proposed expansion, from 54 ML to 74 ML per year. As part of the proposed works however, a reverse osmosis polishing plant will be installed with the capacity to recycle up to 65% of process effluent into the cooling tower, thus reducing the demand for bore water. The polished water will be a cleaner alternative to bore water and will increase the time taken for water contaminants to cycle up, reducing the blowdown volume from the cooling towers. The delegated officer also notes that wastewater discharges are managed through the premises licence, including monitoring (licence conditions 12 and 13). The delegated officer considers that the proposed infrastructure controls as part of this works approvals, and the existing operational controls under L6110/1990/13 are sufficient to manage the risk.
New RO plant and RO Polishing plant infrastructure	Stormwater potentially contaminated with ammonia, cyanide, cyanate and copper	Overland runoff or seepage, potentially causing ecosystem disturbance or impacting surface water quality	Groundwater 2.5 mbgl Resource Enhancement Wetland 1.2 km E TEC 550 m N of activity Cockburn Sound 1 km W	Refer to Section 6.1.1	C = Moderate L = Unlikely **Medium Risk**	Y	Condition 1	The delegated officer notes that spills and leaks (whether into secondary containment compound or not) are required to be managed (immediately recovered, collected and disposed of when detected (irrespective of being in or outside a low permeability compound) in accordance with the requirements of operating licence L6110/1990/13. In addition, the delegated officer considers that the infrastructure controls proposed by the applicant to manage and mitigate spills associated with the RO plant and RO polishing plant will be sufficient to mange the risk. These infrastructure controls are conditioned within the works approval.
	RO reject water with high salt concentration			Refer to Section 6.1.1	C = Moderate L = Unlikely **Medium Risk**	Y	N/A	The delegated officer notes that brine/concentrate from the new RO plant will be managed the same as the existing RO plant, via venturi scrubber to recover CN dust from SCS waste stream. The polishing RO brine will be discharged as process effluent to the adjacent CSBP wastewater management system in line with existing approvals, but at a reduced volume.
	Fugitive SO_2	Air/windborne pathway causing impacts to health and amenity	Residences from 2.1 km E Wells Park 1.2 km SW Golf Course 2 km E Wombat Wallow Childcare Centre 2.9 km E Calista PS 3.3 km E	Refer to Section 6.1.1	C = Moderate L = Unlikely **Medium Risk**	Y	N/A	SO_2 will form from the destruction of hydrogen peroxide within sodium metabisulphite (SMBS) in the acidification and neutralisation tank at the new RO polishing plant. SO_2 is highly soluble in water (about 70 g/L). The delegated officer understands that a concentration of 0.62 g/L may be produced, which is well below the 70 g/L solubility limit, and has concluded that the new RO polishing unit will result in insignificant fugitive venting of sulphur dioxide. Therefore, no regulatory controls are required.
	Noise			Refer to Section 6.1.1	C = Moderate L = Possible **Medium Risk**	Y	Condition 1	As described in Section 4.3, the delegated officer considers that due to the complex nature of plant and equipment associated with the existing premises operations, and additional infrastructure proposed as part of this amendment, verification of individual noise sources and proposed attenuation remains challenging. As a minimum, the delegated officer has conditioned the applicant's proposed controls for key upgrades to blowers and pumps, considered to be noisier equipment. The delegated officer notes that further noise validation monitoring may be necessary following the implementation of the new equipment on the premises (under licence) or as part of the assessment for future Stage 2 works.

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

Note 2: Proposed applicant controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

7. Consultation

Table 5 provides a summary of the consultation undertaken by the department.

Table 5: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 20 August 2024	None received	N/A
City of Kwinana advised of proposal on 21 August 2024	None received	N/A
Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) advised of proposal on 21 August 2024	None received	N/A
Kwinana Industries Council (KIC) advised of proposal on 21 August 2024	None received	N/A
Department of Health (DoH) advised of proposal on 21 August 2024	DoH replied on 9 September 2024, noting that EPA consulted with them over the 2021-2022 period when AGR made a submission to EPA for this expansion. DoH was satisfied with the health risk assessment at that time given AGR's commitment to undertake specific actions which would need to be incorporated into the licence (L6110/1990/13) via an amendment application. DoH notes that this was only partly done when the licence was amended in 2022, and that the current works approval proposal does not include the specified measures. Therefore, they recommend the licence be amended accordingly. Also, DoH requests that, for the proposed real time air monitoring, an associated plan be developed and implemented (previously recommended along with contaminant trigger levels and response measures).	The department acknowledges that improvements to the premises operating licence are ongoing, and that the inclusion of the remaining commitments and minimisation measures proposed by the applicant will require further amendments to the premises licence. The department will continue to progress these improvements with the Licence Holder, and update the premises licence in due course, including the recommendations regarding air monitoring.
The applicant was provided a draft works approval on 17 February 2025 and a second draft works approval on 16 March 2025. Comments were provided on 10 March 2025 and 25 March 2025.	Applicant comments included: - Request for a number of minor changes and clarifications to listed infrastructure within Table 1 of the works approval to; and - Comment on a proposed improvement condition regarding air quality monitoring and mitigation measures.	The delegated officer reviewed and accepted the proposed changes to infrastructure specifications within the works approval, noting that the changes were minor in nature, reflected minor alterations to design subsequent to the application submission, and did not alter the risk. The delegated officer further considered the proposed improvement condition, and noting applicant comments on the sequencing and timing

		Stage 1 and Stage 2 expansion works and the conditions within the existing licence, determined that the implementation of remaining mitigation measures (including that within the proposed condition) will be considered within a future licence amendment, or if appropriate, the works approval application for Stage 2 expansion works. Determination of the appropriate pathway can be considered further during scoping for Stage 2 expansion works.

8. Decision

Based on the assessment in this decision report, the delegated officer has determined the proposal does not pose an unacceptable risk of impacts to the environment or public health, and that a works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Applicant proposed controls were generally found to be reasonable and appropriate to manage the assessed risk of emissions and discharges. Infrastructure controls have been conditioned in the works approval. The assessment recognises that infrastructure installed under this works approval will operate in accordance with the existing controls under operating Licence L6110/1990/13 for the premises.

An amendment to existing licence L6107/1967/17 will be required following the completion of the works to include the increase in production capacity for category 31: *Chemical manufacturing*, along with any operational and infrastructure controls to manage the additional infrastructure.

As part of the assessment, the delegated officer considered the comments provided by DoH regarding the previous commitments and air emission mitigation measures as detailed in EPA assessment report 1725.

Noting that operational conditions are specified through the operating licence for the premises, and that activities associated with the proposed Stage 2 expansion works are relevant for consideration, the delegated officer considers that these mitigation measures and their implementation can be assessed and included as necessary within a future licence amendment or works approval application for Stage 2 expansion works.

References

1. AGR 2024, *Sodium Cyanide Manufacturing Facility Expansion – Stage 1 Works approval application supporting information*, Perth, Western Australia.
2. American Society for Testing and Materials (ASTM) A240, *Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.*
3. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
4. DER 2006, *Air Quality Modelling Guidance Notes,* Perth, Western Australia.
5. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.

6. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
7. Environmental Protection Authority (EPA) 2005, *Ministerial Statement 700* (MS 700) Solid Sodium Cyanide Plant Upgrade, Kwinana.
8. Environmental Protection Authority (EPA) 2011, *Ministerial Statement 1196* (MS 1196) Sodium Cyanide Plants (Liquid and Solid) at Kwinana and Transport of Sodium Cyanide by Road and Rail from Kwinana.
9. Herring Storer Acoustics 2022, *Acoustic Assessment: CSBP Kwinana Cyanide Plant Expansion Project,* Perth, Western Australia.
10. Matisons Toxicology Solutions 2020, *Kwinana Sodium Cyanide Manufacturing Facility Proposed Interim Upgrade Human Health Risk Assessment.*
11. Matisons Toxicology Solutions 2020, *Addendum to Kwinana Sodium Cyanide Manufacturing Facility Proposed Interim Upgrade Human Health Risk Assessment: Start-Up Operations.*
12. Ramboll 2020, *Kwinana Sodium Cyanide Manufacturing Facility Interim Upgrade: Air Quality impact Assessment*, Perth, Western Australia.
13. Ramboll 2021, *Kwinana Sodium Cyanide Manufacturing Facility Air Quality impact Assessment: Start-Up Operations*, Perth, Western Australia.
14. SLR Consulting Australia (SLR) 2024, *Sodium Cyanide Expansion Project Noise Impact Assessment: Australian Gold Reagents,* Perth, Western Australia