Application for Works Approval

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

Works Approval Number	W6594/2021/1
Applicant	Mardie Minerals Pty Ltd
ACN	152 574 457
File number	DER2021/000356
Premises	Mardie Project L08/179, L08/194, G08/93, G08/94, M08/525, M08/526, M08/527 MARDIE WA 6714 As defined by the premises maps attached to the issued works approval
Date of report	16 February 2022
Decision	Works approval granted

Alana Kidd

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ALANA KIDD
MANAGER, RESOURCE 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 W6594/2021/1 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

On 15 June 2021, the applicant submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

The application is to undertake construction works for the development of a salt and sulphate of potash project and associated export facility at the premises. The premises is approximately 80 km south-west of Karratha.

The premises relates to the category and assessed production / design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in works approval W6594/2021/1. The infrastructure and equipment relating to the premises category and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are outlined in works approval W6594/2021/1.

2.2.1 Other approvals

The applicant commenced a trial pond program to construct and operate a nominal 1:10,000 scale system of ponds and crystallisers. This was to confirm the evaporation rates at each stage of the solar evaporation process on the Premises, at the same time recording atmospheric conditions and to prepare raw salt for pilot scale processing off-site. Construction was authorised by works approval W6172/2018/1 (now inactive) and this is currently licensed by licence L9253/2020/1.

There is also a current works approval W6524/2021/1, which is for the Mardie Project Wastewater Treatment Plant (WWTP).

Works approval W6594/2021/1 does not cover the export of products as a Bulk Loading Facility (Category 58a). A separate works approval application will be submitted for this.

2.2.2 Summary of Mardie Project

The Mardi Project is a greenfields high quality salt and sulphate of potash (SOP) project with an associated export facility at Mardie, approximately 80 km south-west of Karratha. The Mardie Project will produce a high purity salt product, SOP and other products that can be derived from sea water.

The following infrastructure is required for the full Mardie Project:

- Primary and Secondary Saltwater Intake;
- Evaporation Ponds;
- Primary and Secondary Crystallisers;

- Tertiary (Kainite-Type-Mixed Salts (KTMS)) Crystallisers;
- Salt Wash Plant;
- SOP Plant;
- Salt and SOP Stockyard;
- Brine outfall diffuser;
- Desalination Plant;
- Causeway;
- Trestle Jetty;
- Small Boat Launching Facility;
- Pipelines;
- Berth Pocket; and
- Transhipment Vessel Channel.

Up to 150 GL/year of seawater will be pumped from a large tidal creek into the first Evaporation Pond (Pond 1) to be used as the feed source for the Mardie Project. Refer to Figure 1 and Figure 2.

The seawater is directed through the Evaporation Ponds to progressively increase the Specific Gravity of the seawater as it moves through the system. The Evaporation Ponds condense the seawater by up to 90% and precipitate out impurities such as calcium carbonate and calcium sulphate (gypsum salts) prior to brine delivery at the Primary Crystalliser Ponds. The brine is saturated, free of suspended matter, has a low viscosity and is clean and pure as it is transferred into the Primary Crystalliser Ponds.

The Primary Crystalliser Ponds are used to crystallise sodium chloride contained within the brine feed from the Evaporation Ponds. The Primary Crystalliser Ponds aim to produce salt of a quality that can be upgraded through the Salt Wash Plant to be suitable for use as a chemical feedstock in the chlor-alkali industry. The final chemical purity of the sodium chloride after washing is targeted to be greater than 99.5%. The Primary Crystalliser Ponds will extract approximately 75% of the sodium chloride contained in the feed brine and the other 25% will be discharged to the Secondary Crystalliser Ponds.

The Secondary Crystalliser Ponds will extract approximately 80% of the sodium chloride from the feed coming into them as a lower purity mixture. The final bitterns discharged from the Secondary Crystalliser Ponds is transferred to the KTMS Crystallisers to precipitate kainite-type-mixed-salts for harvesting and refining in the SOP Plant to a granular SOP product.

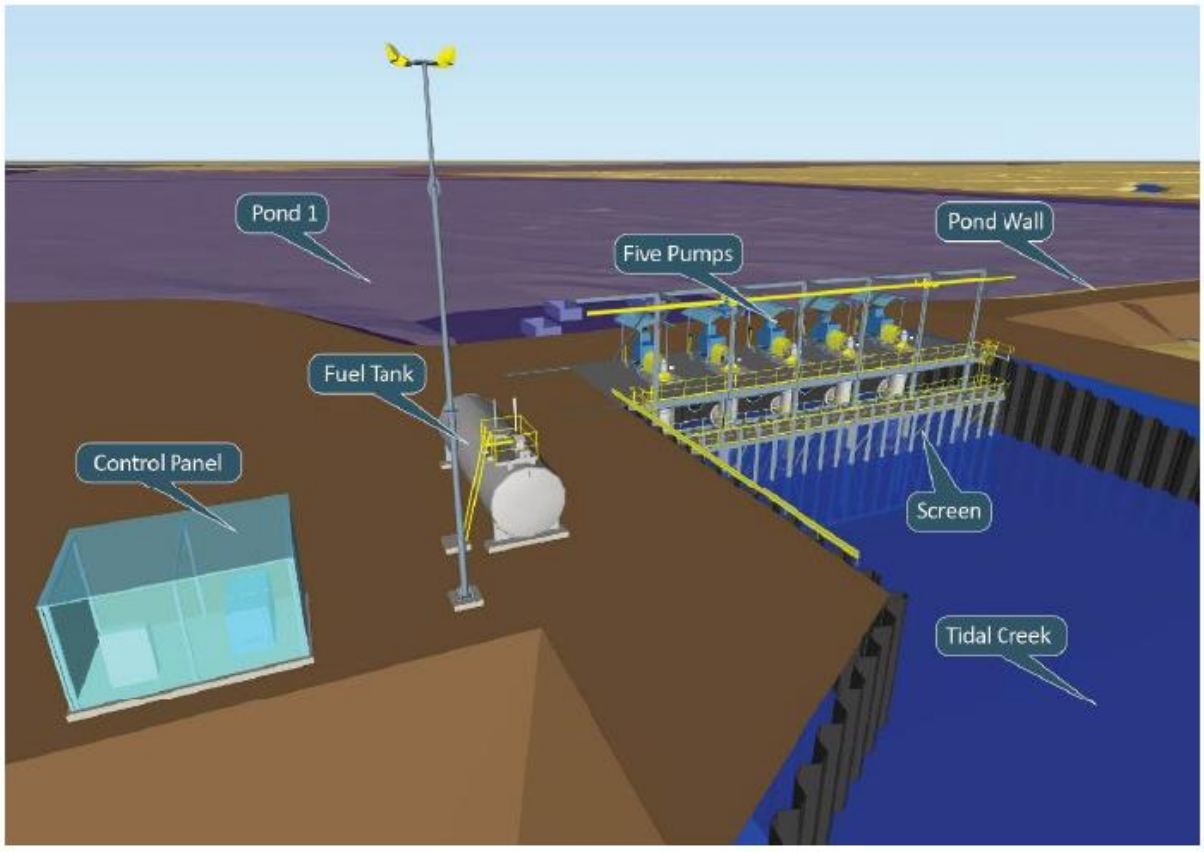

Figure 1: Indicative design of the Primary Seawater Intake Station

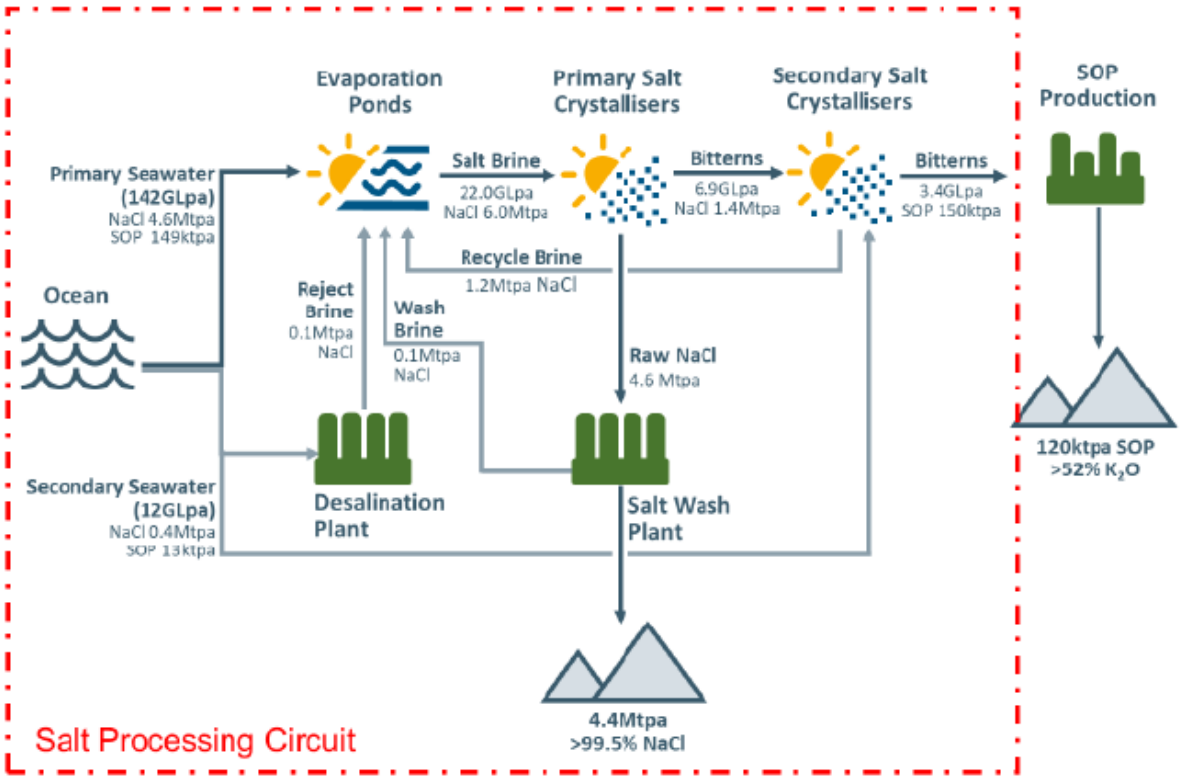

Figure 2: Salt processing circuit general flow diagram

The Salt Wash Plant will comprise of the following infrastructure:

- Raw Salt Receival (Conveyor and Screen, Oversized Salt Bunker etc.);
- Elutriator;
- Hydroextractor; and
- Salt Wash Plant Ancillaries.

Refer to Figure 3.

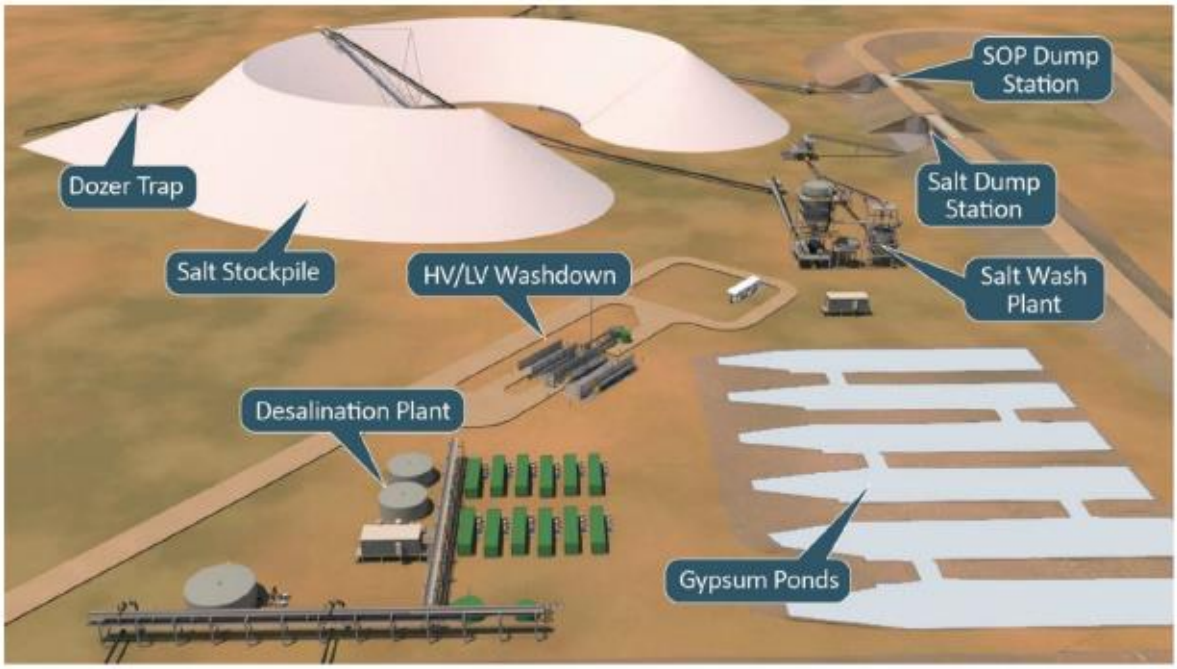

Figure 3: Indicative layout of the Salt Wash Plant and Stockyard

KTMS grown and harvested from the KTMS crystallisers will be processed at the SOP Process Plant as shown in Figure 4.

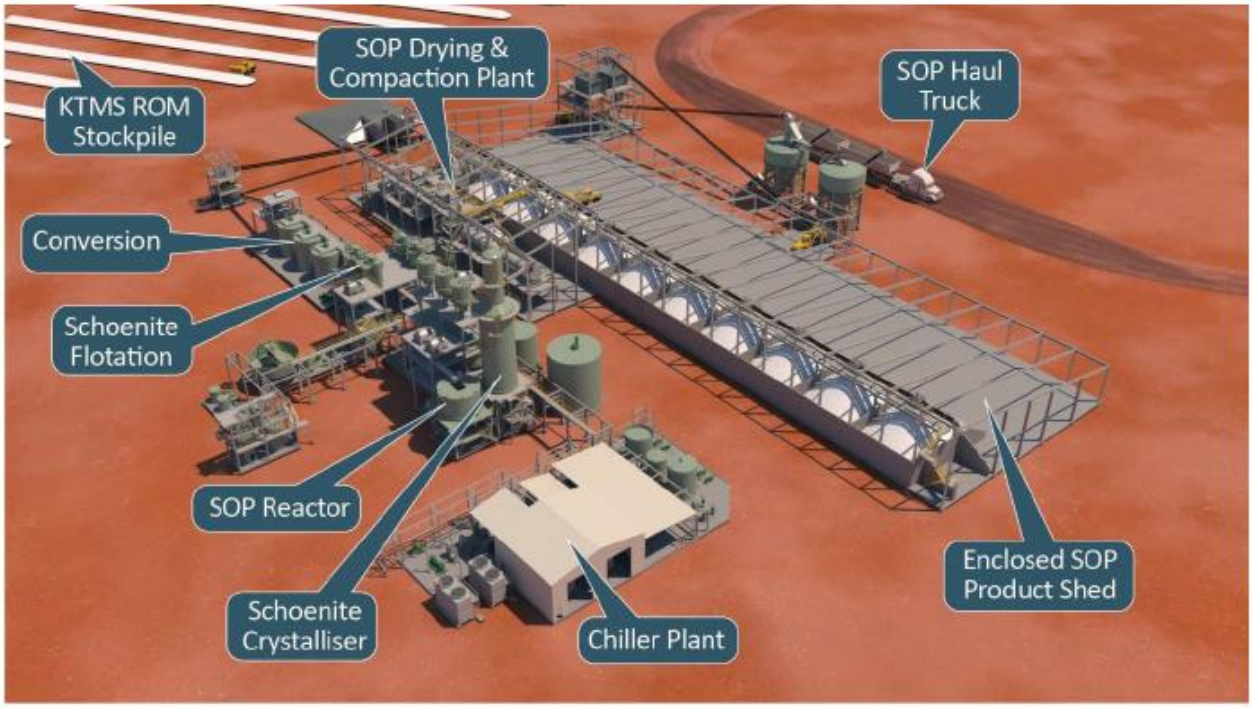

Figure 4: SOP Processing Plant

Flow diagrams of the salt and SOP processing are shown in Figure 2 and Figure 5.

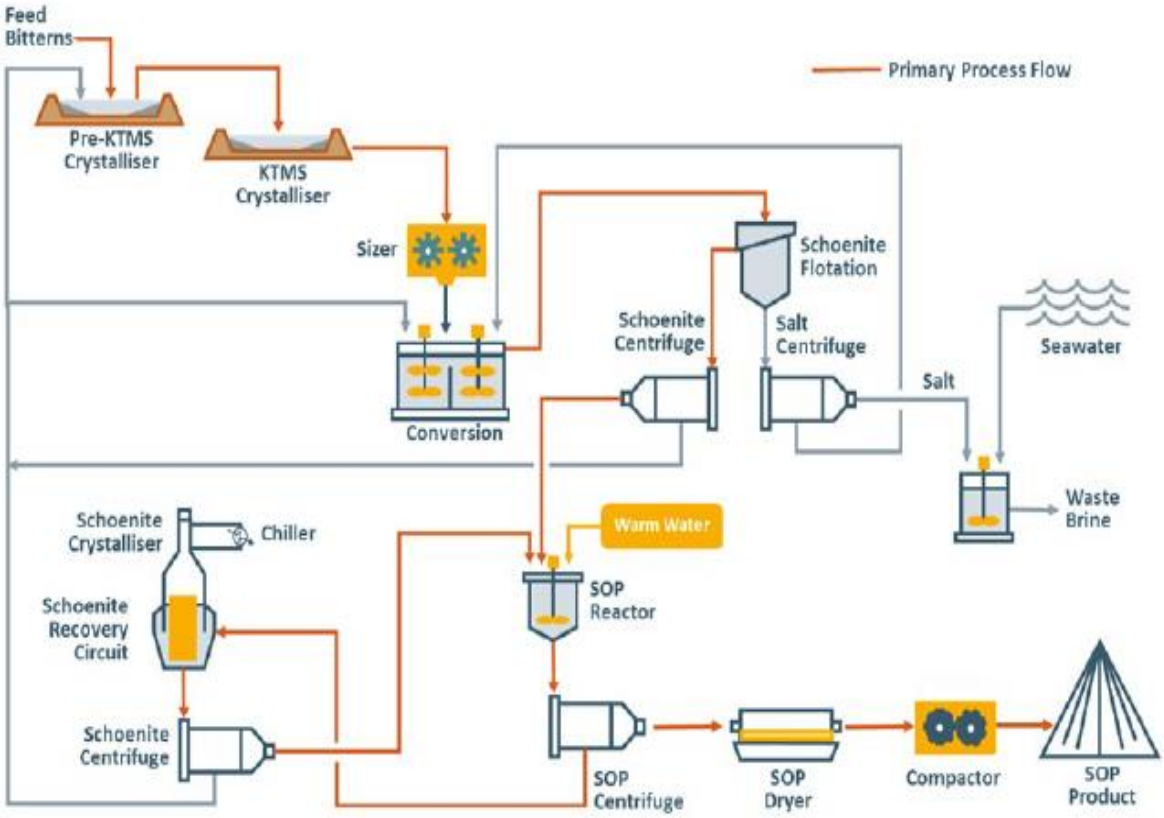

Figure 5: SOP production circuit general flow diagram

Secondary seawater supply will also be drawn from the seawater intake to a Secondary Seawater Transfer Pond and pumped to the following outlets:

- Desalination Plant;
- SOP Process Plant;
- Salt Wash Plant process water;
- Salt Wash Plant and Salt Stockyard firewater;
- Secondary Salt Crystallisers;
- Pre-KTMS Crystallisers;
- Pond 7 Transfer Station;
- Pond 9 Transfer Pump;
- Primary Salt Crystalliser Bitterns Transfer Pump;
- KTMS Bitterns Transfer Pump;
- Waste Bitterns Transfer Pump;
- Waste Bitterns Discharge Pond; and
- Stockpile Heavy and Light Vehicle (HV/LV) washdown.

The production process will produce a high-salinity waste bitterns that is unable to be recycled within the operations. The bitterns will be diluted and discharged through a diffuser at the end of the trestle jetty of the Mardie Port Facility. This outfall will use six dispersion nozzles installed at the end of the discharge pipe to mix the waste brine with surrounding seawater.

Desalination Plant

The Desalination Plant will service the Mardie Project with all treated water requirements. Approximately 3.7 GL/annum of seawater will be processed, with 2.2 GL/annum of reject brine discharged to Evaporation Pond 8 for recovery of the salt.

Power Generation

A temporary power supply of approximately 8 MW will initially be utilised, comprising of diesel generators. Estimated amount of Diesel Fuel to be stored for Temporary Power will be 120 kL. Estimated amount of Diesel Fuel to be stored for Mobile Equipment will be 400 kL.

Estimated duration for the use of Temporary Power Generators is two years whilst the ponds and permanent power station are constructed. Estimated overlap period is 6 months for the transition from temporary power generators to permanent power station.

A single, permanent gas-fired Power Station will be constructed prior to the commissioning of the Salt Wash Plant and export operations. It will be supplied with natural gas from a lateral pipeline that will interconnect with the Dampier to Bunbury Natural Gas Pipeline, which is located approximately 15 km from the Mardi Project. The Power Station will have an electricity production capacity of 9.5 MW, which does not trigger a prescribed premises threshold (Category 52 Electric power generation, threshold is 20 MW).

2.2.3 Odour screening assessment

The Applicant engaged GHD to conduct a screening odour assessment to estimate odour impacts on local receptors (particularly Mardie Station Homestead).

Odour sampling was conducted of the kainite-type mixed salts bitterns at the Bassendean trial site with laboratory analysis for odour detection and characterisation.

There was no distinct odour in the warehouse, there was a very faint musky smell when first entering the warehouse. There was no discernible odour inside the warehouse or any smell when standing above the tanks. Average odour concentration of 83 odour units per unit of volume, which is considered low (GHD, 2021).

2.2.4 Noise modelling

Noise modelling was conducted under worst case meteorological conditions by GHD assuming seven out of nine gas engines in the Power Station were operating continuously.

Noise modelling and assessment against night time L_{A10} noise levels has been completed for four operating scenarios as follows:

Scenario 1. Normal operating procedures, including continuous operation of the SOP plant, Salt Wash Plant and port.

Scenario 2. Scenario 1, with the addition of harvesting of the primary crystallisers.

Scenario 3. Scenario 1, with the addition of harvesting of the secondary crystallisers.

Scenario 4. Scenario 1, with the addition of harvesting of the KTMS crystallisers.

Table 1 shows the predicted night time L_{A10} noise levels generated by four scenarios, with Scenario 1, 2 and 4 complying with the assigned noise level of 35 dBA as per the *Environmental Protection (Noise) Regulations 1997* (Noise Regulations) at the Mardie Station Homestead. Scenario 3, when secondary crystalliser harvesting is occurring, exceeds the assigned noise level of 35 dBA by 3 dBA due to the proximity of the secondary crystallisers to the Mardie Station Homestead.

Table 1: Predicted night time L_{A10} noise levels at the Mardie Station Homestead

Scenario	Worst case meteorology (dBA)
1. Normal operating procedures	32
2. Primary crystalliser harvesting	33
3. Secondary crystalliser harvesting	38
4. KTMS crystalliser harvesting	34

Therefore, the Noise Regulations will be complied with provided that:

- Only seven out of nine gas engines in the Power Station are operational at any time; and
- the secondary crystallisers are only harvested during day time hours (7:00am – 7:00pm) (GHD, 2021).

However, since the Noise modelling was conducted, the Applicant has revised the method of tractor harvesting for the Secondary Crystallisers and these will now be harvested chemically via redissolving the crystallised salt with fresh seawater. The resultant concentrated brine then gravity feeds back to Pond 8 for further evaporation. Therefore, the outcome is that the noise levels for harvesting Secondary Crystallisers is reduced to the same level as Scenario 1 Normal operating procedures.

The Applicant has also committed to only harvesting the KTMS Crystallisers during day time hours (7:00am – 7:00pm) due to the proximity to the Mardie Station Homestead.

2.3 Part IV of the EP Act

The Mardie Project was referred to the EPA on 30 May 2018 for assessment under Part IV of the EP Act.

Ministerial Statement 1175 was published on 24 November 2021 and includes the following:

- Conditions 3-3 to 3-9 require a Groundwater Monitoring and Management Plan for the evaporation and crystallizer ponds, which includes establishing monitoring bores, seepage recovery actions and implementing trigger criteria; and
- Conditions 4-2 to 4-8 specify the management of bitterns discharge and require a Marine Environmental Quality Monitoring and Management Plan, which includes the levels of ecological protection to be met, establishing a monitoring program and implementing trigger criteria.

3. 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.

3.1 Source-pathways and receptors

3.1.1 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	Vehicle movement, excavation and construction machinery in pond construction	Air / windborne pathway	• Minimise clearing of vegetation to prevent dust occurrence; • Water will be applied to any roads or cleared areas that pose a dust risk; • Areas will not be disturbed until they are required to be used, and the area to be disturbed will be minimized where practicable; • Utilise magnesium compounds as dust suppressants where applicable; • Opportunistic inspections for dust emissions will be undertaken during construction of the Project to ensure dust control measures are being implemented and are effective; • If visible dust emissions are noted then an assessment of the source will be made and additional water will be applied to key source areas, or alternative treatments

Emission	Sources	Potential pathways	Proposed controls
			applied; • The potential for high-risk weather conditions for dust emissions (i.e. windy conditions) will be monitored and extra water applied in preparation; and • An incident reporting system will be maintained to assist in managing environmental incidents such as excessive dust emissions.
Noise and vibration	Vehicle movement, excavation and construction machinery SOP drying and compaction plant	Air / windborne pathway	• Most of the works will be conducted in narrow strips on soft mudflats (for the pond walls) and minimal night work will be conducted due to site terrain; • Noise monitoring will be conducted at Mardie Station Homestead if complaints occur, as required by the station owners; and • An incident reporting system will be maintained to assist in managing environmental incidents such as excessive noise emissions.
Chemicals and hydrocarbons	Power Station, Sewage Facility, Landfill, Fuel Storage and refueling areas.	Direct discharges due to spills/leaks.	• Spill kits located at primary construction sites and within service vehicles; • Any spills controlled, contained and cleaned up; • Hydrocarbons and chemicals stored within suitably bunded areas; • Spill kits regularly checked and replenished if required; and • Hydrocarbon and chemical spills recorded. The Bulk Fuel Facility will be: • Equipped with two 110 kL self-bunded above ground diesel storage tanks; • Leak detection system and alarms; • Interconnecting pipework and pumps installed at ground level where possible; • Pipe crossings off roads will be double contained with trafficable lids to facilitate spills and leaks detection; and • Local stop start and emergency stop control stations at each unloading connection point.

Emission	Sources	Potential pathways	Proposed controls
Commissioning and Operations (including time-limited-operations operations)			
Dust	Vehicle movement and excavation Operations of Salt Wash Plant and SOP Plant and stockpiles	Air/windborne pathway causing impacts to health and amenity	• Water will be applied to any roads around the SOP plant or cleared areas that pose a dust risk; • Utilise magnesium compounds as dust suppressants where applicable; • SOP processing is predominantly a wet process, products are dewatered to a moisture content of <7.5% w/w; • SOP products are stockpiled dry <0.5% w/w and are sized between 2mm and 4.5mm and the Applicant has advised they are unlikely to produce excessive dust; • Salt products are stockpiled wet 4 – 5% w/w and the Applicant has advised they are unlikely to produce excessive dust; • The SOP storage shed is equipped with a dust extraction system that reports to a baghouse; • Off-gas from the SOP drying area has a dust extraction cyclone and the SOP compaction plant has a dust baghouse prior to venting to atmosphere, captured dust is reintroduced to the processing circuit; • Opportunistic inspections for dust emissions will be undertaken during commissioning and operation of the Project to ensure dust control measures are being implemented and are effective; • If visible dust emissions are noted then an assessment of the source will be made and additional water will be applied to key source areas, or alternative treatments applied; • The potential for high-risk weather conditions for dust emissions (i.e. windy conditions) will be monitored and extra water applied in preparation; and • An incident reporting system will be maintained to assist in managing environmental incidents such as excessive dust emissions.
Light	Operations of SOP Plant	Emitted from lighting structures	• All external lighting targeted where possible, using shields and directional lighting to minimise light spill beyond the required work area; and

Emission	Sources	Potential pathways	Proposed controls
			• External lighting will use, where possible, red or low-pressure sodium lights. Bright white lights such as mercury vapour, metal halide or florescent will be avoided where possible. Note only light impacts to Mardie Station Homestead are assessed by Part V of the EP Act as **Illumination Plan for marine and terrestrial fauna is required as per the Ministerial Statement 1175.**
Noise	Intake pumping, Evaporation Ponds, Crystalliser Ponds harvesting, SOP Plant, Stockyard, Power Station, vehicles etc.	Air/windborne pathway causing impacts to health and amenity	Refer to Section 2.2.4. • Only seven out of nine gas engines in the Power Station are operational at any time; • The Secondary Crystallisers can only be harvested by chemically redissolving the crystallised salt with fresh seawater, as opposed to tractor harvesting; and • The KTMS Crystallisers are only harvested during day time hours (7:00am – 7:00pm).
Brine	Evaporation salt ponds KTMS stockpiles Salt stockpiles Processing plant – tank overflows Shed spillage/truck washdown Gypsum seepage	Leachate through base and embankments of ponds	Implement the Groundwater Monitoring and Management Plant as per the Ministerial Statement 1175. **Screened out as regulated by Part IV of the EP Act.**
		Unintentional discharge through spills/leaks from overtopping or pipeline ruptures	• All embankment inspected prior to filling with brine to ensure they meet the design specifications and do not contain structural faults; • Stability of embankments inspected on a regular basis during commissioning and operations and following significant weather events; • Interconnecting pipework and pumps installed at ground level where possible; • Pipe crossings of roads double contained with trafficable lids to facilitate spill and leak detection; and • Bitterns piping is designed to be located within the operational footprint of the ponds/processing plant.
Bitterns		Discharge through diffuser at end of trestle jetty of the Mardie Port Facility	Implement the Marine Environmental Quality Monitoring and Management Plan as per the Ministerial Statement 1175. **Screened out as regulated by Part IV of the EP Act.**

Emission	Sources	Potential pathways	Proposed controls
Odour	Bitterns ponds	Air/windborne pathway causing impacts to health and amenity	Refer to Section 2.2.3. **As Mardie Station Homestead is located 4.5 km east of the ponds, odour is not expected to impact and is, therefore, screened out.**
Chemicals and hydrocarbons	Power Station, Sewage Facility, Landfill, Fuel Storage areas.	Direct discharges due to spills/leaks.	• Spill kits located at fuel storage areas and within service vehicles; • Any spills controlled, contained and cleaned up; • Hydrocarbons and chemicals stored within suitably bunded areas; • Spill kits regularly checked and replenished if required; and • Hydrocarbon and chemical spills recorded.
Contaminated stormwater with salt	SOP and salt stockpiles	Stormwater runoff	Implement the Groundwater Monitoring and Management Plant as per the Ministerial Statement 1175. **Screened out as regulated by Part IV of the EP Act.**
Particulates	Power station	Air/windborne pathway causing impacts to health and amenity	• The model and number of gas fired generators is yet to be determined. Mardie Minerals will consult with eligible vendors and opt for the best available technology at the time of construction; • Air quality monitoring will be conducted at the Power Station and Mardie Station Homestead if required by the station owners; and • An incident reporting system will be maintained to assist in managing environmental incidents such as excessive air emissions.

3.1.2 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 and Figure 6 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**
Mardie Station Homestead and woolshed complex is a European Heritage site and is occupied on a continual basis. There is an Access Deed between the Applicant and Pastoral Management Pty Ltd (the leaseholder).	250 m from closest project infrastructure (pond embankment).
Environmental receptors	**Distance from prescribed activity**
Threatened Ecological Communities and Priority Ecological Communities	Phoenix (2018) states the no Threatened Ecological Communities or Priority Ecological Communities listed under the EPBC Act or Wildlife Conservation Act 1950 are present within the Mardie Project area. The Horseshoe Flat PEC is a regionally significant grasslands of the Roebourne Plains. Baseline flora and vegetation surveys has identified that the vegetation inland of the BCH is dominated by Horseshoe Flat PEC like vegetation. As a result, the Mardie Project has been located to maximise the use of the mud/salt flats and minimise potential impacts to potential Horseshoe Flat PEC. The Benthic Communities and Habitats (BCH) both intertidal and subtidal include the mud/salt flats, algal mats, mangroves, tidal creeks and sub tidal flora and fauna. Baseline studies to identify the extent of these communities and their ecological values have been undertaken. As a result, the Mardie Project has been located to maximise the use of the mud/salt flats and avoid the more sensitive algal mats, mangroves, tidal creeks and sub tidal flora and fauna were possible
Threatened/Priority Fauna	Phoenix (2018) reported that the following were not identified in the survey but may exist in the Mardie Project area: • Lakeland Down Mouse (*Leggadina lakedownensis*) - Priority 4; • Fork-tailed Swift (*Apus pacificus*) - Migratory bird; • Grey Falcon (*Falco hypoleucos*) – Vulnerable; and • Peregrine Falcon (*Falco peregrinus*) - Specially Protected Fauna. Baseline flora and fauna studies have been carried out over the project area and surrounding areas. The location of the proposed ponds avoids most of the conservation significant flora and fauna located and several exclusion zones have

	been set up within the Prescribed Premises Boundary were conservation significant flora and fauna can be avoided. Disturbance to conservation significant flora and fauna is assessed under Part IV of the EP Act.
Groundwater	The Applicant reports that the depth to groundwater varies between 0.3 – 0.8 m below ground level (mbgl), with salinity up to three times the level of seawater and ranging from 130,000 – 210,000 microsiemens per centimetre (µS/cm). The nearest bore lies approximately 2 km south-east of the Mardie Project area based on DWER's data. Water is not used for potable or industrial use. Marine water inundation occurs on the Premises.
Major watercourses or waterbodies	The Indian Ocean lies approximately 5 km from the Mardie Project ponds. The inlet from which seawater is to be drawn is 4.5 km north of the Mardie Project ponds. The Mardie Project area lies within the Saline Coastal Flat. Marine and mangrove ecosystems. Mardie Pool is a permanent water hole providing freshwater year-round and important ecologically and as a heritage site. Mardie Pool has been excluded from the Prescribed Premises Boundary and is 180 m from the nearest crystalliser ponds
Heritage sites	The Yaburara Mardudhunera (YM) People and Kuruma Mardudhunera (KM) People are the Traditional Owners associated with the land that underlies the project. Mardie Minerals holds fully executed Land Access Deeds with both the YM People and the KM People. Extensive Heritage Survey work has been conducted and sites identified. Mardie Minerals is working with the Traditional Owners to avoid heritage sites were possible, salvage material where practicable and applying for Section 18 approval to disturb sites where it is not practicable. As mentioned above Mardie Pool is of significance to the Traditional Owners and has been excluded from the Prescribed Premises Boundary.

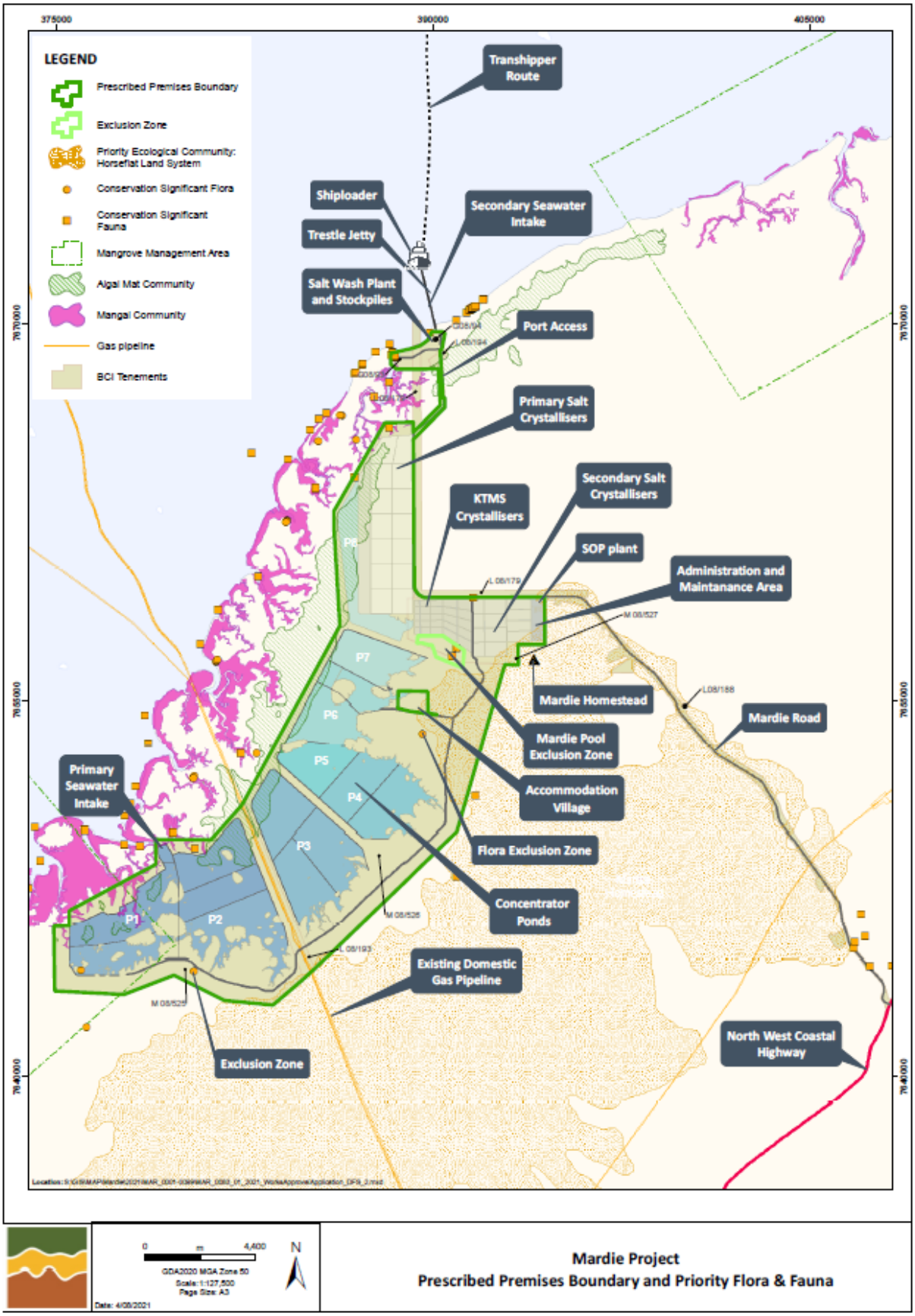

Figure 6: Distance to sensitive receptors

3.2 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 3.1. 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 3.1), 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 W6594/2021/1 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 is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoin operation of the premises i.e. Category 14 activities. 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, commissioning and operations

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								
Vehicle movement, excavation and construction machinery	Dust	Air / windborne pathway causing impacts to health and amenity	Mardie Station Homestead 250 m from premises	Refer to Section 3.1	C = Minor L = Possible **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires dust controls to be implemented during the construction phase, such as minimizing disturbance areas and using adequate dust suppression.	N/A
	Noise			Refer to Section 3.1	C = Minor L = Possible **Medium Risk**	Y	N/A	N/A
	Hydrocarbons and chemicals	Direct discharges from spills/leaks	Surrounding vegetation, surface water and groundwater	Refer to Section 3.1	C = Moderate L = Unlikely **Medium Risk**	Y	N/A	N/A
Commissioning and Operations (including time-limited-operations operations)								
Vehicle movement and excavation	Dust	Air/windborne pathway causing impacts to health and amenity	Mardie Station Homestead 250 m from premises	Refer to Section 3.1	C = Minor L = Possible **Medium Risk**	Y	Condition 5, Table 2 Environmental commissioning requirements Requires dust management measures to be implemented and moisture content to be maintained. Condition 10, Table 3 Infrastructure and equipment	N/A

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**				
							requirements during time limited operations Requires dust management measures to be implemented. Conditions 11 and 12 require a time limited operations report.	
Intake pumping, Evaporation Ponds, Crystalliser Ponds harvesting, SOP Plant, Stockyard, Power Station, vehicles etc.	Noise	Air/windborne pathway causing impacts to health and amenity	Mardie Station Homestead 250 m from premises	Refer to Sections 2.2.4 and 3.1.	C = Minor L = Unlikely **Medium Risk**	Y	Condition 5, Table 2 Environmental commissioning requirements Requires only seven out of the nine gas engines to be operational at any time Condition 10, Table 3 Infrastructure and equipment requirements during time limited operations Requires only seven out of the nine gas engines to be operational at any time and harvesting of the Secondary Crystalliser Ponds and KTMS Crystalliser Ponds have restrictions. Conditions 11 and 12 require a time limited operations report.	N/A
Evaporation Ponds and Crystalliser Ponds KTMS stockpiles Salt stockpiles	Brine	Leachate through base and embankments of ponds and stockpiles	Groundwater	Refer to Section 3.1	N/A	N/A	N/A	Regulated via Ministerial Statement 1175.
Processing plant – tank overflows		Unintentional discharge through	Surrounding vegetation	Refer to Section 3.1	C = Minor	Y	N/A	N/A

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**				
Shed spillage/truck washdown Gypsum seepage		spills/leaks from overtopping or pipeline ruptures	and surface water		L = Unlikely **Medium Risk**			
	Bitterns	Discharge through diffuser at end of trestle jetty of the Mardie Port Facility	Marine environment	Refer to Section 3.1	N/A	N/A	N/A	Regulated via Ministerial Statement 1175.
Salt Wash Plant, SOP Plant and stockpiles	Dust	Air/windborne pathway causing impacts to health and amenity	Mardie Station Homestead 250 m from premises	Refer to Section 3.1	C = Minor L = Possible **Medium Risk**	Y	Condition 5, Table 2 Environmental commissioning requirements Requires dust management measures to be implemented and moisture content to be maintained. Condition 10, Table 3 Infrastructure and equipment requirements during time limited operations Requires dust management measures to be implemented and moisture content to be maintained. Conditions 11 and 12 require a time limited operations report.	N/A
	Light	Emitted from lighting structures	Mardie Station Homestead 250 m from premises	Refer to Section 3.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires targeted lighting and red or low-pressure sodium lights.	N/A
	Hydrocarbons and chemicals	Direct discharges from spills/leaks	Surrounding vegetation, surface water and	Refer to Section 3.1	C = Moderate L = Unlikely	Y	N/A	N/A

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**				
			groundwater		**Medium Risk**			
	Contaminated stormwater with salt	Stormwater runoff	Surrounding vegetation and surface water	Refer to Section 3.1	N/A	N/A	N/A	Regulated via Ministerial Statement 1175.

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.

4. 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 18 October 2021	None received	N/A
Local Government Authority advised of proposal on 08 October 2021	None received	N/A
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal 08 October 2021	DMIRS replied on 04 November 2021 stating / advising that DMIRS are currently assessing a mining proposal (MP) and mine closure plan (MCP) corresponding to the activities proposed in the works approval, and has no comment to make at this time in regards to the works approval. The final versions of the MP and MCP have not been received and assessed by DMIRS, and DMIRS is currently constrained as a DMA until the Part IV assessment is finalised. Follow up email to DMIRS on 2 February 2022 – pending response.	N/A
Department of Jobs, Tourism, Science and Innovation (JTSI) advised of proposal on 08 October 2021	None received	N/A
CITIC Pacific Mining Management and Pastoral Management Pty Ltd (landholders of the Mardie Station Homestead) advised of proposal on 16 December 2021	CITIC Pacific Mining Management and Pastoral Management Pty Ltd replied on 12 January 2022 with comments on the continued occupancy of the Mardie Station Homestead and management of emissions that may impact on the Mardie Station Homestead.	N/A
Applicant was provided with draft documents on 03 February 2022	Applicant provided comments on 09 February 2022 Refer to Appendix 1	Applicant provided comments on 09 February 2022 Refer to Appendix 1

5. Conclusion

Based on the assessment in this decision report, the delegated officer has determined that a works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

References

1. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
2. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
3. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
4. GHD, 13 January 2021, Noise and odour assessment – BCI Minerals Mardie Project, Perth, Western Australia.
5. GHD, 13 January 2021, Mardie Salt and Potash Project Noise Assessment, Perth Western Australia.
6. BCI Minerals, 15 June 2021, Mardie Project - Works Approval Application Solar Salt Production 1 of 2, Perth, Western Australia.
7. BCI Minerals, 15 June 2021, Mardie Project - Works Approval Application Solar Salt Production 2 of 2, Perth Western Australia.
8. BCI Minerals, 05 August 2021, FW: APPLICANT NOTIFICATION - APPLICATION FOR A WORKS APPROVAL - REQUEST FOR FURTHER INFORMATION, Perth, Western Australia.
9. BCI Minerals, RE: W6594 Mardie Project 15 December 2021, Perth, Western Australia.
10. BCI Minerals, RE: W6594 Mardie Project 17 December 2021, Perth, Western Australia.
11. BCI Minerals, RE: W6594 Mardie Project 18 January 2022, Perth, Western Australia.
12. BCI Minerals, RE: W6594 Mardie Project 25 January 2022, Perth, Western Australia.
13. BCI Minerals, RE: APPLICANT NOTIFICATION - APPLICATION FOR A WORKS APPROVAL W6594/2021/1 - DRAFT INSTRUMENT AND DECISION REPORT 09 February 2022, Perth, Western Australia.
14. BCI Minerals, RE: APPLICANT NOTIFICATION - APPLICATION FOR A WORKS APPROVAL W6594/2021/1 - DRAFT INSTRUMENT AND DECISION REPORT 09 February 2022, Perth, Western Australia
15. BCI Minerals, RE: APPLICANT NOTIFICATION - APPLICATION FOR A WORKS APPROVAL W6594/2021/1 - DRAFT INSTRUMENT AND DECISION REPORT 09 February 2022, Perth, Western Australia

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

Condition	Summary of applicant's comment	Department's response
Works Approval		
Cover page, prescribed category table	Throughput capacity is inconsistent with Application (refer to Appendix 2 of Decision Report) Consistent with section 3A.2 of the application supporting document (and Appendix 2 of the DWER Decision Report): • Salt production capacity is 4,400,000 tpa • SOP is 140,000 tpa	Updated as requested.
Table 1, Row 1	SOP Plant overflow controls • The SOP plant will be constructed with concrete bunding for areas where chemicals are transferred and stored. • Bunds will include inbuilt sumps with automatic pumps to return spilt material to the process. • Process tanks will be fitted with high-level audible alarms and interlocking to automatically cease filling in the event of overfilling.	Updated as requested.
	Stockyards stormwater management • Stockyards will be constructed with compacted basement paving approximately 90% modified maximum dry density (MMDD) with civil design to direct stormwater drainage to: ➢ Contaminated stormwater from within the yards will drain to an HDPE-lined stormwater pond (shown as item number 27 in Figure 14 ➢ of the works approval application supporting document, and ➢ Clean stormwater from the yards will be diverted around the yard into an infiltration sump.	Updated as requested.

Condition	Summary of applicant's comment	Department's response
	Dust suppression • The key dust mitigation measures in the SOP Plant are: ➢ Outdoor stockpiled KTMS product is maintained at >7.5% moisture. ➢ The SOP drying area, the SOP compaction plant, and the SOP product storage area are all fully enclosed and fitted with dust filtration extraction systems.	Updated as requested.
	High risk weather Weather forecasts and real-time onsite weather conditions (measured at the adjacent Mardie Station meteorological station) will be monitored for adverse weather conditions that pose an increased risk of emissions or discharges to the environment and worker safety. Conditions could include elevated wind speeds, high fire risk forecasts (by DFES) and heavy rainfall/cyclone events. Proactive actions would be taken to adjust activities to minimise the risk of dust emissions such as relocating or ceasing bulk material movement, clearing vegetation and/or increasing dust suppression by water carts.	Updated as requested.
Table 1, Row 2	Bulk fuel facility The bulk fuel (diesel) facility will be licensed via Dangerous Goods Storage Licence. The capacity is yet to be determined (less than 1000 m^3 triggering the prescribed category for bulk storage) but is planned to be modular, using up to four self-bunded ISO tanks (each approximately 110 kL capacity). Consistent with Australian Standards AS1940 / AS60079, the fill/transfer points will be fully bunded and the facility will be bollarded to prevent vehicle collision.	Updated as requested.
Table 2, Row 1	Seawater intake commissioning The Primary Seawater intake commissioning is required for the duration of commissioning Evaporation Ponds 1-9, hence the seawater intake commissioning duration needs to be up to 24 months (see item #9 for Evaporation Pond commissioning).	Updated as requested.
Table 2, Row 2	UITED (typo)	Updated as requested.

Condition	Summary of applicant's comment	Department's response
	Typographical error to be removed. Suggest replacing with a seawater intake commissioning duration that reflects the pumps testing period of approximately 2 months plus ongoing operation of the seawater intake to allow commissioning of Evaporation Ponds (see item #9 for Evaporation Pond commissioning timeframes).	
	Commissioning completion / Production commencement The estimated timeframes that BCI provided for commissioning ponds were based solely on pond filling. Commissioning of ponds must include filling and evaporation until the pond reaches the target brine density such that product harvesting could commence. Using this definition of commissioning for evaporation ponds and crystallizer ponds, commissioning durations are as follows: • Evaporation Ponds 1 to 9 : 24 months (18 months expected, with a 6-month weather delay allowance) • Crystalliser Ponds 1 to 5 (Salt) : 19 months (13 months expected, with a 6-month weather delay allowance) • Crystalliser Ponds 6 to 8 (SOP) : 32 months (26 months expected, with a 6-month weather delay allowance) The above durations overlap, hence the total commissioning duration from commencing seawater intake to commencement of SOP production is 48 months (42 months expected, with a 6-month weather delay allowance) Salt production is estimated to commence in September 2024 when first harvest is scheduled, and SOP production is estimated to commence in November 2025 when first KTMS is transferred to the SOP Plant.	Updated as requested.
	Emergency overflow The evaporation and crystalliser ponds are designed with a minimum freeboard of 0.5m which will be sufficient to prevent overflows during normal operation, which includes during a 1:100 ARI rainfall event. A 1:100 year 72-hour event is reportedly 355 mm. Overflows from these ponds could be expected is if surface run-off upstream of the ponds (i.e. from the east) overflows the flood levee protecting the eastern side of the ponds, and enters these ponds during a storm event. During these events, the following contingency discharge points will come into effect:	Updated as requested.

Condition	Summary of applicant's comment	Department's response
	• Evaporation Ponds: Rainwater will skim off the top of the Evaporation Ponds and discharge to the marine environment via dedicated spillways located along the length of the main evaporation pond seawall • Crystalliser Ponds: Rainwater will skim off the top of the Crystalliser Ponds into adjacent brine collection channels, from where it will either be pumped, or gravity discharged into the Evaporation Ponds	
Table 2, Row 3	Dust controls KTMS stockpiles outdoors (i.e. prior to commencing processing for SOP) will be >7.5% moisture. Drying and crushing of SOP will be conducted in fully enclosed metal-clad buildings with dust filtration (refer to item #4 above).	Updated as requested.
Table 2, Row 4	Power Station specifications Noise modelling of the preliminary design for the 14-megawatt power station indicated that if up to seven gas-fired engines were used, night-time noise limits were complied with. BCI is planning to outsource design and operation of the power station to an independent power provider. Whilst the final engine configuration is subject to the tendering/contract process, the contract will limit noise levels received at sensitive receivers (currently Mardie Station homestead) to regulatory requirements under the *Environmental Protection (Noise) Regulations 1997*. Therefore, consider removing reference to the number of engines in operation of the permanent power station. Noise impacts are the subject of written agreements with the station occupier and are also regulated under the EP Noise Regulations.	This is during commissioning and time limited operations. Can be updated if no issues for the licence.
Table 3 Row 1	Seawater Intake 75 GL is proposed for time limited operations in the draft works approval, which is presumed to be based on BCI's average intake rate per annum. Average intake rate does not consider the pumping rate that would be required if time limited operations were to coincide with operations during the peak summer evaporation months. To allow for this contingency, BCI requests time limited operations of the seawater intake be increased to up to 100 GL .	Updated as requested.

Condition	Summary of applicant's comment	Department's response
Table 3 Row 2	Harvesting Secondary Crystallisers Harvesting limitations for noise management apply to the ponds which are closest to Mardie Station homestead and are mechanically harvested. This is the KTMS Crystallisers not the Secondary Crystallisers.	Updated as requested.
Figure 1	Prescribed Premises Boundary BCI acknowledges that Figure 1 in the draft works approval is taken from Figure 2 in the works approval application. Figure 2 in the application presented the Prescribed Premises boundary however it used an outdated footprint design. The correct DFS footprint design was shown in multiple other figures in the application supporting document (Figure 11, Figure 18 (partial), Figure 23, Figure 24, Figure 25, Figure 27, Figure 28, Figure 30, Figure 31 and Figure 32). BCI provides the correct DFS footprint design in a figure of the prescribed premises boundary as Attachment 1. This footprint is the same as that assessed under Part IV and approved under Ministerial Statement No. 1175.	Updated as requested.
Decision Report		
Section 2.2.2	Desalination Change second sentence to: Approximately 3.7 GL/annum of seawater will be processed, with the 2.2 GL/annum of resultant reject brine discharged to Evaporation Pond 8 for recovery of salt. BCI notes that the desalination plant capacity does not trigger a prescribed category and waste product (brine) is being reused in the process to create a useable product.	Updated as requested.
	Power Generation Construction contractors will be responsible for their own power generation, the following is an estimate only. Estimated maximum combined installed capacity of temporary power generators is 8.0 MW. Estimated amount of Diesel Fuel to be stored for Temporary Power will be 120 kL. Estimated amount of Diesel Fuel to be stored for Mobile Equipment will be	Updated as requested.

Condition	Summary of applicant's comment	Department's response
	400 kL. The above fuel storage does not trigger the prescribed category for bulk storage of chemicals. See also item #6 Estimated duration for the use of Temporary Power Generators is two years whilst the ponds and permanent power station are constructed. Estimated overlap period is 6 months for the transition from temporary power generators to permanent power station	
Section 2.2.4	Secondary and KTMS crystalllisers Replace secondary with KTMS and vice versa, to reflect the corrected DFS design as per item #14	Updated as requested.
Table 2 page 10	Dust • In sixth dot point in Proposed controls, replace "SOP plant" with "SOP storage shed". • In seventh dot point, the SOP drying area has a dust extraction cyclone and the SOP compaction plant has a dust baghouse.	Updated as requested.
Table 2 page 11	Noise In second dot point, replace secondary with KTMS.	Updated as requested.
Table 3	Human Receptors Confirmed that the Mardie Station homestead is occupied by the station manager appointed by Pastoral Management Pty Ltd (a subsidiary of Citic Pacific). The station is active. Stock bores are located throughout the region, however BCI is not privy to their operational status. BCI will continue to liaise with DWER for assessment and approvals under the RIWI Act.	Updated as requested.
Appendix 2	Application Summary Note Category 14 throughputs are correct and should be reflected in the works approval.	Updated as requested.

Appendix 2: Application validation summary

<table>
<tr><th colspan="6">SECTION 1: APPLICATION SUMMARY</th></tr>
<tr><td colspan="6">Application type</td></tr>
<tr><td>Works approval</td><td>☒</td><td colspan="4"></td></tr>
<tr><td rowspan="4">Licence</td><td rowspan="4">☐</td><td>Relevant works approval number:</td><td></td><td>None</td><td>☐</td></tr>
<tr><td colspan="3">Has the works approval been complied with?</td><td>Yes ☐ No ☐</td></tr>
<tr><td colspan="3">Has time limited operations under the works approval demonstrated acceptable operations?</td><td>Yes ☐ No ☐ N/A ☐</td></tr>
<tr><td colspan="3">Environmental Compliance Report / Critical Containment Infrastructure Report submitted?</td><td>Yes ☐ No ☐</td></tr>
<tr><td colspan="5">Date Report received:</td></tr>
<tr><td>Renewal</td><td>☐</td><td>Current licence number:</td><td colspan="3"></td></tr>
<tr><td>Amendment to works approval</td><td>☐</td><td>Current works approval number:</td><td colspan="3"></td></tr>
<tr><td rowspan="2">Amendment to licence</td><td rowspan="2">☐</td><td>Current licence number:</td><td colspan="3"></td></tr>
<tr><td>Relevant works approval number:</td><td></td><td>N/A</td><td>☐</td></tr>
<tr><td>Registration</td><td>☐</td><td>Current works approval number:</td><td></td><td>None</td><td>☐</td></tr>
<tr><td colspan="2">Date application received</td><td colspan="4">15 June 2021</td></tr>
<tr><td colspan="6">Applicant and Premises details</td></tr>
<tr><td colspan="2">Applicant name/s (full legal name/s)</td><td colspan="4">Mardie Minerals Pty Ltd</td></tr>
<tr><td colspan="2">Premises name</td><td colspan="4">Mardie Project</td></tr>
<tr><td colspan="2">Premises location</td><td colspan="4">L08/179, L08/194, G08/93, G08/94, M08/525, M08/526 and M08/527</td></tr>
<tr><td colspan="2">Local Government Authority</td><td colspan="4">City of Karratha</td></tr>
<tr><td colspan="6">Application documents</td></tr>
<tr><td colspan="2">HPCM file reference number:</td><td colspan="4">DWERDT465093 and DWERDT465095</td></tr>
<tr><td colspan="2">Key application documents (additional to application form):</td><td colspan="4">• Mardie Project, Solar Salt Manufacturing Works Approval, Supporting Document, 10 June 2021, Prepared for Mardie Minerals Pty td by Preston Consulting Pty Ltd</td></tr>
<tr><td colspan="6">Scope of application/assessment</td></tr>
</table>

Summary of proposed activities or changes to existing operations.	Construction of the Mardie Project, a greenfields high quality salt and sulphate of potash project and associated export facility. Located at Mardie, approximately 80 km south west of Karratha, WA. Infrastructure includes: • Primary and Secondary Saltwater Intake • Evaporation ponds • Primary and Secondary Crystallisers • Tertiary Crystallisers • Salt Water Plant • SOP Plant • Salt and SOP stockyard • Brine outfall diffuser • Desalination Plant • Causeway • Pipelines Supporting facilities include: • Laydown; • WWTP (works approval pending) • Temporary and Permanent Power Supply • Offices • Workshops • Accommodation village

Category number/s (activities that cause the premises to become prescribed premises)

Table 1: Prescribed premises categories

Prescribed premises category and description	Proposed production or design capacity	Proposed changes to the production or design capacity (amendments only)
Category 14: Solar salt manufacturing	4.4 million tonnes of Salt 140 000 tonnes per annum of Sulphate of Potash	N/A

Legislative context and other approvals

Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes ☒ No ☐	Referral decision No: 2167 Managed under Part V ☐ Assessed under Part IV ☒
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes ☐ No ☒	Ministerial statement No: EPA Report No:
Has the proposal been referred and/or assessed under the EPBC Act?	Yes ☐ No ☒	Reference No:
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes ☒ No ☐	Certificate of title ☐ General lease ☐ Expiry: Mining lease / tenement ☒ Expiry: Application status of tenements is

		pending until EPA has finished with approval process. Other evidence ☐ Expiry:
Has the applicant obtained all relevant planning approvals?	Yes ☐ No ☐ N/A ☒	Approval: Expiry date: If N/A explain why? Project to be developed under *Mining Act 1978*
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes ☐ No ☒	CPS No: N/A Assessed under Part IV
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes ☐ No ☒	Application reference No: N/A Licence/permit No: N/A Assessed under Part IV
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes ☐ No ☒	Application reference No: Licence/permit No: Licence / permit not required.
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes ☒ No ☐	Name: Pilbara Groundwater Area and Pilbara Surface Water Area Type: Proclaimed Groundwater Area/Surface Water Area Has Regulatory Services (Water) been consulted? Yes ☐ No ☐ N/A ☐ Regional office: North West
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes ☐ No ☒	Name: N/A Priority: N/A Are the proposed activities/ land use compatible with the PDWSA (refer to WQPN 25)? Yes ☐ No ☐ N/A ☒
Is the Premises subject to any other Acts or subsidiary regulations (e.g. *Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx*)	Yes ☒ No ☐	*Mining Act 1978*

Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes ☐ No ☒	N/A
Is the Premises subject to any EPP requirements?	Yes ☐ No ☒	N/A
Is the Premises a known or suspected contaminated site under the *Contaminated Sites Act 2003*?	Yes ☐ No ☒	Classification: N/A Date of classification: N/A