Decision Report

Application for Works Approval

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

Choose an item.	W6602/2021/1
Applicant	IB Operations Pty Ltd
ACN	165 513 557
File number	DER2021/000516
Premises	Iron Bridge Magnetite Project Marble Bar WA 6760 Mining tenement M45/1226 As defined by the coordinates in Schedule 1 of the works approval
Date of report	29 March 2022
Proposed Decision	Works approval granted

Marko Pasalich

Digitally signed by Marko Pasalich
Date: 2022.03.29 10:52:12 +08'00'

Marko Pasalich
MANAGER WASTE INDUSTRIES
REGULATORY SERVICES

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

Table of Contents

1. Decision summary 3
2. Scope of assessment 3
   - 2.1 Regulatory framework 3
   - 2.2 Application summary and overview of premises 3
   - 2.3 Part IV of the EP Act 5
3. Risk assessment 5
   - 3.1 Source-pathways and receptors 6
     - 3.1.1 Emissions and controls 6
     - 3.1.2 Receptors 8
   - 3.2 Risk ratings 12
   - 3.3 Detailed risk assessment for blended effluent discharge 15
     - 3.3.1 Description of emissions risk event 15
     - 3.3.2 Identification and general characterisation of emission 15
     - 3.3.3 Description of potential adverse impact from the emission 15
     - 3.3.4 Criteria for assessment 16
     - 3.3.5 Applicant controls 16
     - 3.3.6 Consequence of risk event 18
     - 3.3.7 Likelihood of risk event 18
     - 3.3.8 Overall risk rating of RO reject effluent discharge 18
     - 3.3.9 Justification for additional regulatory controls 18
4. Consultation 19
5. Conclusion 20

References 21

Appendix 1: Summary of applicant's comments on risk assessment and draft conditions 22

Appendix 2: Application validation summary 23

Table 1: Proposed prescribed premises categories 5

Table 2: Proposed applicant controls 6

Table 3: Sensitive human and environmental receptors and distance from prescribed activity 8

Table 4: Risk assessment of potential emissions and discharges from the premises during construction and operation 13

Table 5: Expected water quality of discharge water 15

Table 6: Consultation 19

Figure 1: Map of the boundary of the prescribed premises 4

Figure 2: Location of key infrastructure 4

Figure 3: Distance to sensitive receptors.....10
Figure 4: Infrastructure locations.....11

1. Decision summary

Licence L8845/2014/1 is held by IB Operations Pty Ltd (applicant) for the Iron Bridge Magnetite Project (the Premises) located on mining lease M45/1226 in Marble Bar, Western Australia.

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 a wastewater treatment plant and irrigation field at the Premises. As a result of this assessment, works approval W6602/2021/1 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 2 September 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 relating to a wastewater treatment plant (WWTP) and irrigation field at the Premises, which is approximately 74 km west of the town of Marble Bar and 110 km south of Port Hedland.

The applicant is developing the Iron Bridge Magnetite Project, which is a magnetite ore mine approved under Part IV of the EP Act on 6 January 2015, pursuant to Ministerial Statement 993. The applicant holds licence L8845/2014/1 under the EP Act for the project, which is currently under construction.

To support the ongoing construction of the project, the applicant is seeking to expand the capacity of the mining camp (known as the Japal Village) from 1400 people to 1950 people, including by upgrading the WWTP.

Potable water is supplied to the mining camp through the operation of a reverse osmosis plant, which treats groundwater abstracted under licences GWL164321 and GWL179289(5). The reverse osmosis plant volumes are below the Category 85B threshold (0.5GL/year) for licensing under Schedule 1 of the *Environmental Protection Regulations 1987* (the EP Regulations). The applicant discharges the reject water from the reverse osmosis process by combining and blending it with the WWTP effluent, which is then discharged to the irrigation field.

The works approval application is for the upgrade of the existing wastewater treatment plant (WWTP) from 205 m^3/day (as permitted by licence L8845/2014/1) to 600 m^3/day wastewater plus 140 m^3/day of reverse osmosis reject water, to cater for the proposed 1,950 people in the expanded mining camp.

The application requests authorisation for time-limited operations of 90 days to accommodate the use of the facility while a subsequent licence amendment is submitted.

The works approval application applies to the same premises boundary as the licence L8845/2014/1 (i.e., the Iron Bridge Magnetite Project) as shown in Figure 1, however the works proposed to be carried out are in close proximity to the mining camp as shown in Figure 2.

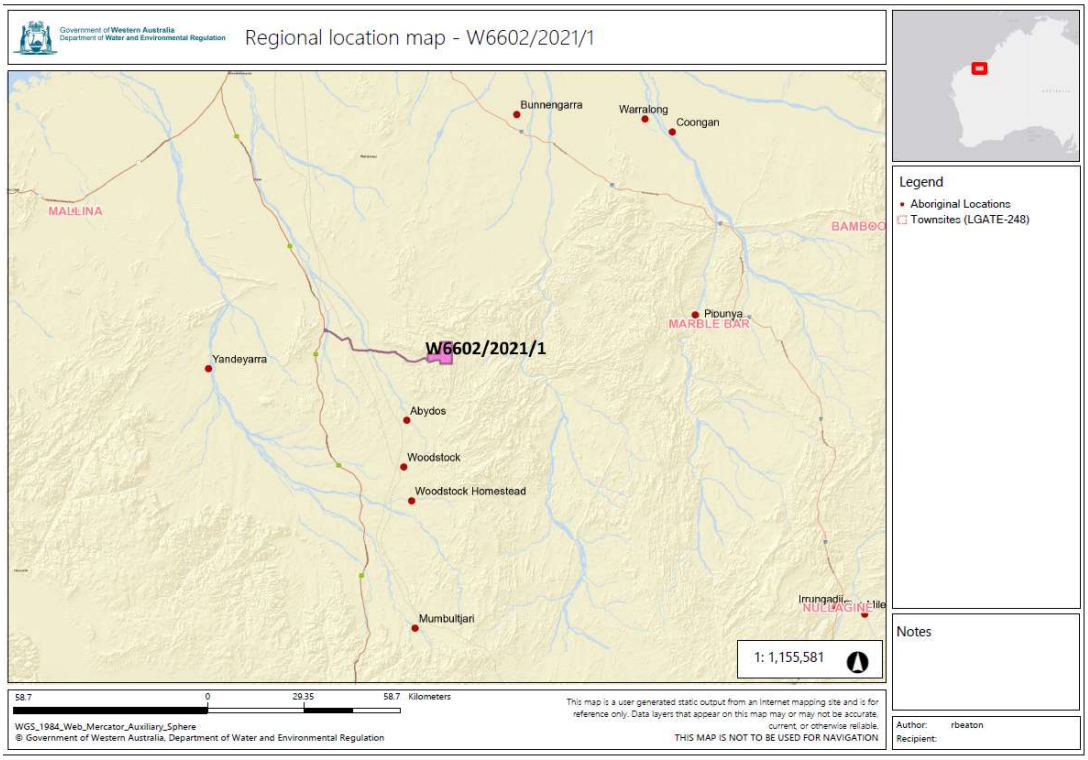

Figure 1: Map of the boundary of the prescribed premises

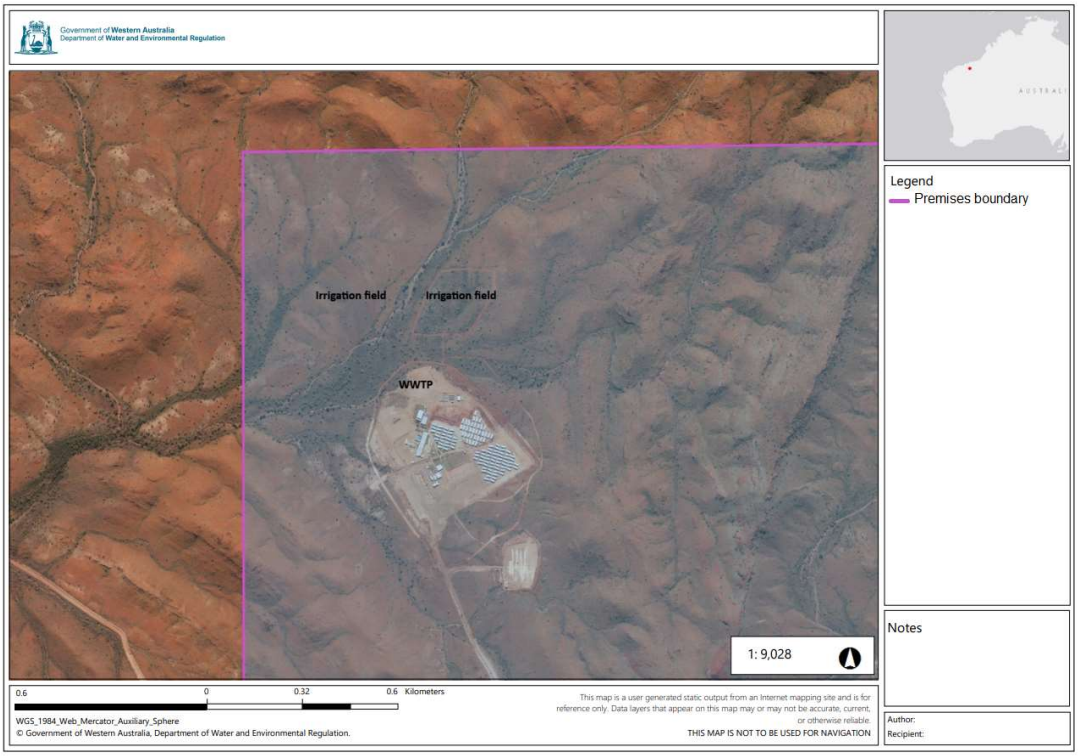

Figure 2: Location of key infrastructure

The proposed upgrade of the WWTP at the Premises relates to category 54 under Schedule 1 of the EP Regulations as shown in Table 2 below.

Table 1: Proposed prescribed premises categories

Classification of premises	Description	Proposed premises production or design capacity
Category 54	Sewage facility: premises – a) on which sewage is treated (excluding septic tanks); or b) from which treated sewage is discharged onto land or into waters.	600 m^3/day wastewater

The infrastructure and equipment relating to the Premises category 54 and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are outlined in works approval W6602.

The proposed upgraded plant includes the modifications to a standard small package treatment plant built to service up to 1500 EP, as follows:

- An additional jet aspirated type aerator to increase aeration.
- The residence time in the aeration zone will be extended for up to 2 additional hours, by delaying the decant after the aeration/decant tank reaches top working level.
- Denitrification already includes a significant safety margin, and by operating the balance tank at an increased minimum level, the overall anoxic volume is increased.

The applicant also proposes to reduce the specified sewage generation rate from 350L/person/day to a less conservative 300L/person/day, based on actual generation rate to date of approximately 280L/person/day.

The existing irrigation spray field (15.8 ha) was originally sized for a blended effluent of 660 m^3/day as part of works approval W6315/2019/1. The applicant proposes to use this existing irrigation spray field for the increased blended effluent volume of up to 740 m^3 per day (including 600 m^3 per day treated effluent and up to 140 m^3/day of RO reject). The design of the irrigation field is discussed further in section 3.3.

2.3 Part IV of the EP Act

The proposal to operate a mine site (including an accommodation camp) known as the North Star Magnetite Project was assessed under Part IV of the EP Act, as published in EPA Bulletin 1514 on 23 June 2014. Ministerial Statement 993 was issued on 9 January 2015. Four separate changes to the proposal under section 45C of the EP Act have been approved between 2016 and 2020. The EPA decided that five key environmental factors were relevant to the proposal. Flora and vegetation was a key environmental factor relevant to the accommodation camp due to clearing within the development footprint. Conditions were placed on MS 993 in relation to the management of flora and vegetation within the Mine Development Envelope.

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 construction 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	Installation of WWTP, including vehicle movements.	Air / windborne pathway	Infrastructure upgrades are to an existing facility which has been installed on concrete or compact ground to control any unplanned releases of wastewater. No earthworks are described as part of the application.
Noise	Installation of WWTP, including vehicle movements	Air / windborne pathway	None proposed.
Sediment	Installation of WWTP, including vehicle movements	Direct discharge and stormwater/ overland flow	Infrastructure upgrades are to an existing facility which is located outside the 1-in-100 year average flood extent and has been installed on concrete or compact ground to control any unplanned releases of wastewater. No earthworks are described as part of the application.
Hydrocarbon discharges	Leaks from machinery or fuel storage	Direct discharge and stormwater/ overland flow Infiltration to groundwater	Spill response equipment will be maintained and training provided to the construction staff. The WWTP is located outside the 1-in-100 year average flood extent.
Time-limited operations			
Leaks/overflow of sewage (raw and treated)	Operation of the WWTP	Direct discharge Migration via overland/stormwater flow Infiltration to groundwater Potential for eutrophication and degradation of riparian vegetation	Overflow containment pond upstream of the screening system for emergency use if the WWTP is unable to accept wastewater.
Odour	Operation of the WWTP, including storage of liquid	Air/windborne migration causing	Odour emissions are expected to be controlled within the WWTP based on its design as it is contained within storage

Emission	Sources	Potential pathways	Proposed controls
	effluent and solid waste/sludge	impacts to amenity	containers and managed within processing tanks. The maintenance schedule for the WWTP will include a check for odours outside the facility, and if detected necessary repairs will be performed.
Stormwater contaminated, or potentially contaminated, with sewage and sewage chemicals	Operation of the WWTP	Migration via overland/stormwater flow Infiltration to groundwater Potential for eutrophication and degradation of riparian vegetation	The WWTP has been installed on concrete or compact ground to control any unplanned releases of wastewater. The WWTP is installed with systems to monitor tank volume levels, and alarm system to notify the operator of high-risk volumes to reduce the risk of an overflow event. All wastewater storage components of the WWTP are impermeable (constructed from fibreglass, concrete or HDPE-lined) and have been installed as per manufacturer specifications on an impermeable concrete pad. The WWTP is located outside the 1-in-100 year average flood extent. Effluent is disposed to the irrigation field by an automated system that is managed by a trained operator. Freeboard in all tanks is maintained at 400 mm above the top working level (TWL). Overflows for each tank are set at 300 mm above TWL and are plumbed to the overflow pond.
Treatment chemicals, including liquid caustic or soda ash; aluminium sulphate: liquid chlorine and citric acid.	Operation of the WWTP		Chemical storage tanks are located in purpose-built, fully funded storage containers in line with Australian standards AS1940-2004 (Storage and Handling of Flammable and Combustible Liquids), AS3780-2008 (Storage and Handling of Corrosive Substances) and AS3833-2007 (Storage and Handling of Mixed Classes of Dangerous Goods).
Solid waste/sludge	Operation of the WWTP		Sludge produced by the WWTP will be collected in sludge tanks and periodically removed by a licensed carrier, taken off-site for disposal at an appropriately licensed facility.
Treated effluent and reverse osmosis reject water	Discharge to the irrigation field	Direct discharge of effluent by irrigation and spray drift Migration via overland/stormwater	The proposed total dissolved solids (TDS) limit is below the ANZECC guidelines for tolerant crops and is not expected to have a detrimental impact on vegetation health.

Emission	Sources	Potential pathways	Proposed controls
		flow Infiltration to groundwater	The spray field is fenced with lockable gates and has visible safety signs to advise of treated effluent disposal. The minimum area of the irrigation spray field has been calculated to minimise waterlogging that could lead to potential surface water run-off, and to control eutrophic risk. The irrigation spray field is positioned outside of the 1-in-100 year average flood extent, on naturally level ground with soil permeability suitable to accept the irrigation volumes and expected rainfall events. Effluent is disposed to the irrigation field by an automated system that is managed by a trained operator. If it is raining or there has been a large rainfall event, irrigation may not take place. Earthen windrows 300 mm high are located down slope, acting as a buffer to prevent run-off leaving the fenced perimeter of the spray fields. Groundwater is anticipated to be 20 m BGL and as such the risk of infiltration to groundwater is low.

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 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
Determined Native Title Holders, the Nyamal People #1	The Premises is located within the Nyamal People #1 Native Title Determination area. Native Title Holders visiting this area are considered a potential human receptor to activities on the Premises.
Environmental receptors	**Distance from prescribed activity**
Underlying groundwater – Pilbara Groundwater Area	Underlying groundwater is within the Pilbara Groundwater Area proclaimed under the RIWI Act.

	Depth to groundwater in the vicinity of the proposed WWTP and irrigation area is approximately 5 to 20 m below ground level (m bgl). Groundwater salinity in the project area is fresh to marginally brackish.
Surface water – Intermittent creeks which flow into the Turner River	The proposed activities are within the Turner River surface water catchment, which is within the Pilbara Surface Water Area proclaimed under the RIWI Act. The closest creek line is approximately 150 m from the WWTP, but between the two parts of the irrigation field. Groundwater-fed pools of the Turner River surface water catchment are within the Premises, but are reported by the applicant to be more than 500 metres from the WWTP.
Aboriginal and other heritage sites	Lodged Aboriginal Heritage Site NSG11-01 (grinding patches, grooves) is located 400m east-north-east of the proposed WWTP, and 350m east of the proposed irrigation field, along an upstream watercourse. Aboriginal Heritage Site NJA20-017 is located 1km west-south-west of the proposed WWTP, along a watercourse downstream of the proposed irrigation field. Lodged Aboriginal Heritage Site NJA15-004 (Artefacts / Scatter, Grinding Patches / Grooves) is located 1.4km west-south-west of the proposed WWTP, along a watercourse downstream of the proposed irrigation field. Aboriginal Heritage Site NJA20-018 (Artefacts / Scatter) is located 1km south-west of the proposed WWTP.

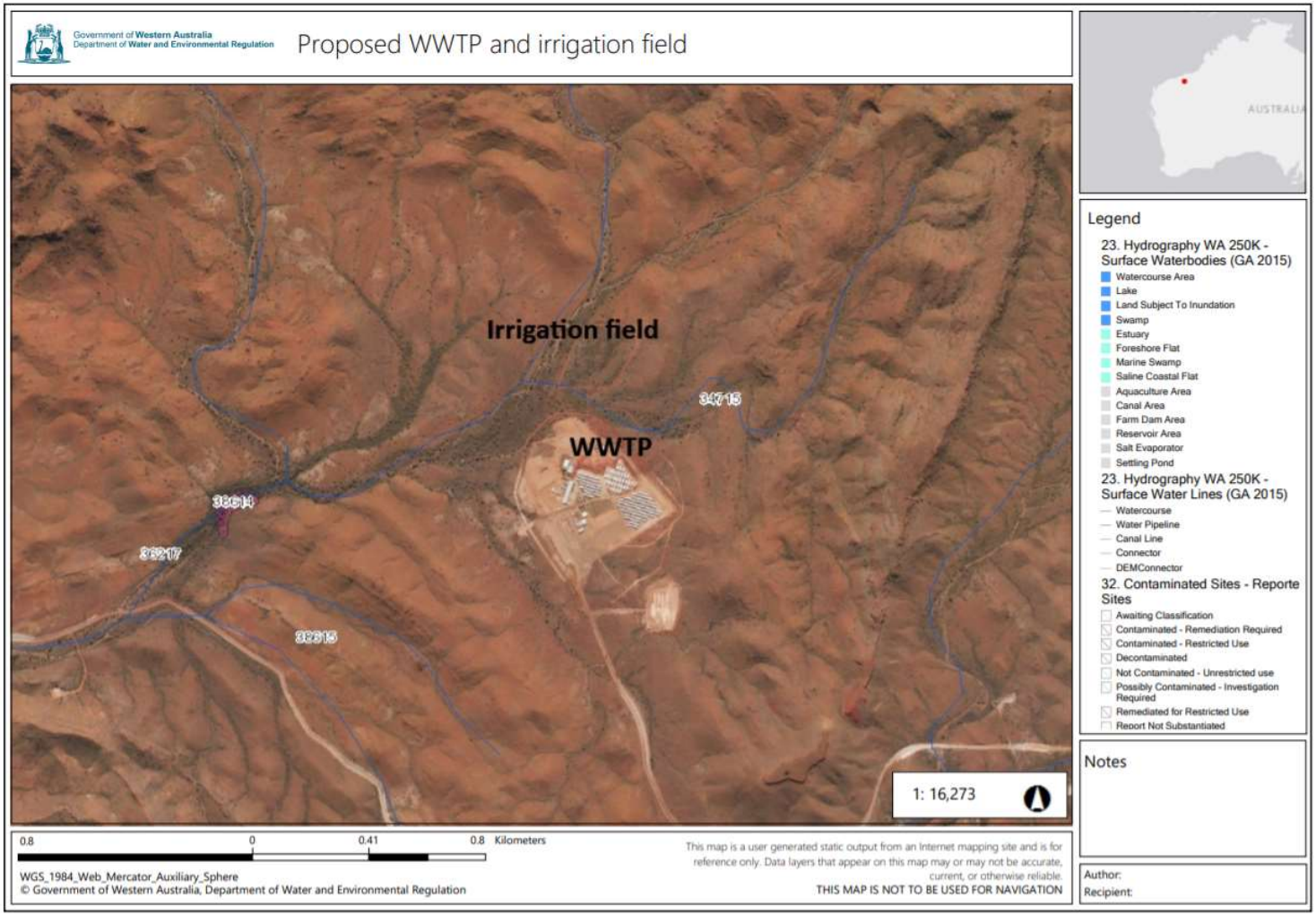

Figure 3: Distance to sensitive receptors.

The map above shows surface water bodies (blue lines) and Aboriginal heritage sites (white numbers).

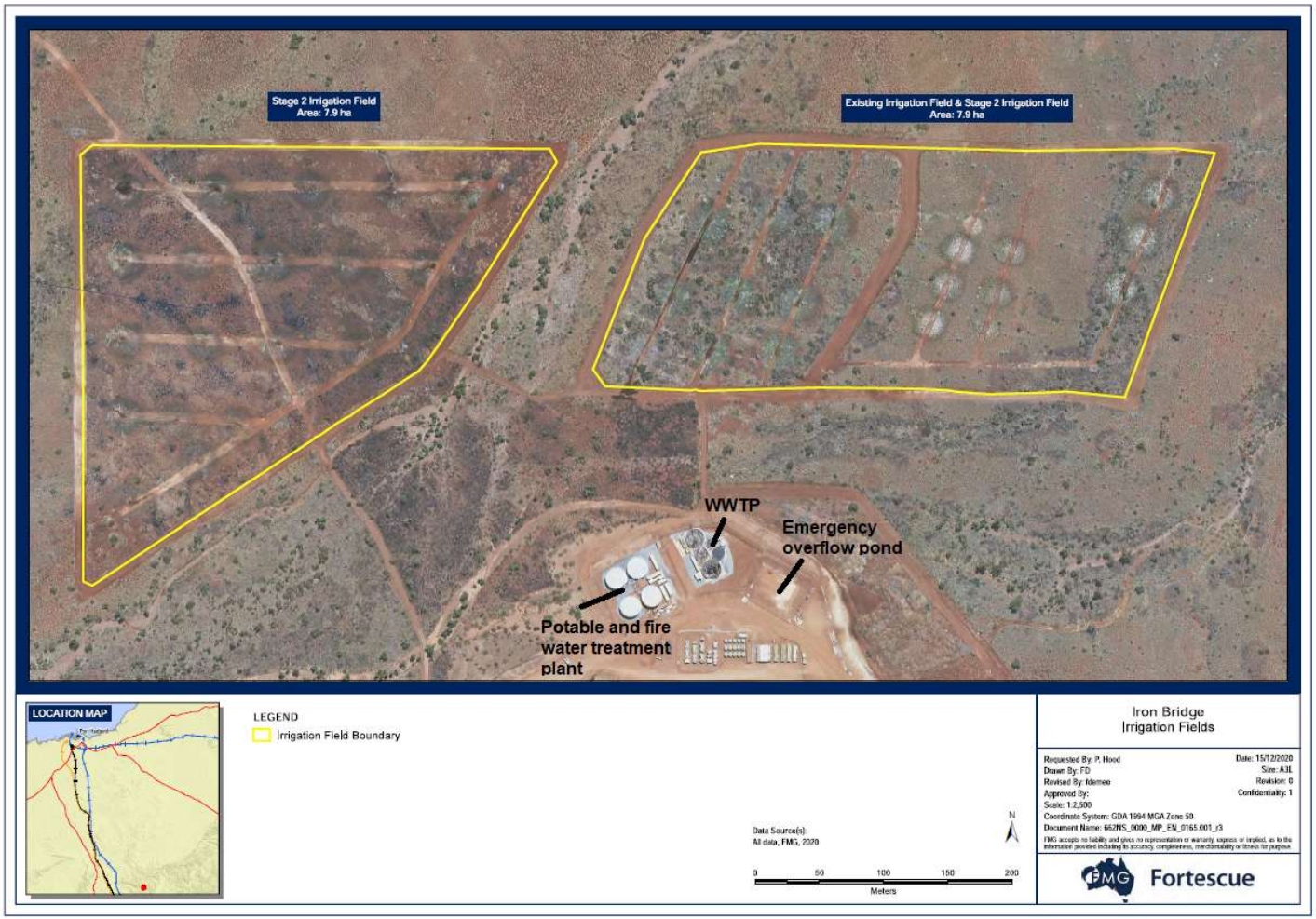

Figure 4: Infrastructure locations

The figure above shows the locations of the irrigation field, WWTP and potable water plant in more detail. It also shows that an intermittent watercourse runs between the two parts of the irrigation field.

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 W6602 that accompanies this decision report authorises construction only. 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 to authorise emissions associated with the ongoing operation of the Premises i.e. wastewater treatment and irrigation. 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								
Installation of WWTP	Dust and Noise	Air/windborne migration causing impacts to health and amenity	Determined Native Title Holders	Refer to Section 3.1	C = Minor L = Rare **Low Risk**	Y	N/A The proposed works are within an existing building and earthworks are not described within the application. The Delegated Officer has considered the separation distance between the source and receptors; the likely infrequency of visits to the area by the determined native title holders as a guide to inform the risk of dust and noise emissions as not foreseeable. Dust can be adequately regulated by section 49 of the EP Act. Noise can be adequately regulated by the EP Noise Regs.	N/A
	Spills	Direct discharge; stormwater/ overland flow; seepage to groundwater	Soils, surface water, flora, fauna and groundwater	Refer to Section 3.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1	N/A

Operation including time-limited operations								
Operation of the WWTP	Odour	Air/windborne migration causing impacts to amenity	Determined Native Title Holders, the Nyamal People #1	Refer to Section 3.1	C = Minor L = Rare **Low Risk**	Y	N/A The WWTP is designed as a contained system. The Delegated Officer has considered the separation distance between the source and receptors as a guide to inform the risk of odour emissions as not foreseeable. Odour can be adequately regulated by section 49 of the EP Act.	N/A
	Spills	Direct discharge; stormwater/ overland flow; seepage to groundwater	Soils, surface water, Aboriginal heritage places along creeklines, groundwater	Refer to Section 3.1	C = Minor L = Unlikely **Medium Risk**	N	Conditions 1, 2 and 6	N/A
Discharge of treated effluent to the Irrigation Field	Treated effluent Reverse osmosis reject water	Direct discharge of effluent by irrigation and spray drift Migration via overland/stormwater flow	Soils, flora, fauna, surface water and groundwater, Aboriginal heritage places	Refer to Section 3.1	C = Moderate L = Possible **Medium Risk**	N	Conditions 1, 2, 6, 8 and 9, **including paragraphs 2(c) and 2(d) of Table 2 in condition 6.**	Refer to section 3.3.

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.

3.3 Detailed risk assessment for blended effluent discharge

3.3.1 Description of emissions risk event

The Applicant proposes to discharge an increased volume of treated wastewater combined with RO reject to the existing 15.8 ha irrigation field. The proposed volumes are 600 m^3/day wastewater effluent plus 140 m^3/day of reverse osmosis reject water. The blended effluent will comprise nutrient rich water with elevated salts, and therefore has the potential to cause contamination of soil or environmental impacts such as degradation to groundwater, surface water or native vegetation.

3.3.2 Identification and general characterisation of emission

The Applicant proposes to discharge blended effluent to a spray irrigation field. Based on information provided by the Applicant, the water quality is expected to be as per Table 5.

Table 5: Expected water quality of discharge water

Parameter	Treated wastewater effluent	RO reject water
Total dissolved solids (TDS)	-	3,500 mg/L[1]
5-day biochemical oxygen demand (BOD5)	<20 mg/L	-
Total suspended solids (TSS)	<30 mg/L	-
Total nitrogen (TN)	<20 mg/L	2.1 mg/L[2]
Total phosphorous (TP)	<8 mg/L	0.29 mg/L[2]
Thermotolerant coliforms	<1000 cfu/100mL	-
pH	6.5 to 8.5	8.1[2]
Residual free chlorine	0.0 mg/L to 2.0 mg/L[3]	-

[1] The blended effluent is expected to have a TDS of 1,500 mg/L for normal operation, up to a maximum of 2,000 mg/L to account for seasonal variation and fluctuations in the reverse osmosis recovery rate. The Applicant has requested a limit of 3,500 mg/L, which represents the expected quality of unblended RO reject water.

[2] Based on a sample collected by the Applicant in February 2022.

[3] The Applicant advises that residual free chlorine may be measured either before or after mixing with RO reject. Mixing RO brine will reduce the residual chlorine concentrations in the final blended effluent.

3.3.3 Description of potential adverse impact from the emission

Excess nutrient (TN and TP) may impact native vegetation growth within the spray irrigation field. It may also impact groundwater quality via infiltration through soils to underlying groundwater. If groundwater discharge into surface water occurred close to the irrigation field, poor groundwater quality would also have the potential to impact surface water quality. Groundwater-fed pools of the Turner River surface water catchment are within the Premises but are reported by the applicant to be more than 500 metres from the WWTP.

Pooling of blended effluent water in the spray irrigation field may lead to the discharge of water to the adjacent intermittent waterway, which has the potential to impact surface water quality. Pooling also has the potential to pose a human health risk through direct exposure to pathogens present in the blended effluent. The proposed activities are within the Turner River surface water

catchment, which is within the Pilbara Surface Water Area proclaimed under the RIWI Act. The closest creek line is approximately 150 metres from the WWTP and around 45 metres from the spray irrigation field.

RO reject can contain high concentrations of salt (TDS) causing soil contamination and degradation of vegetation.

Three Aboriginal heritage sites are located 1-1.4km south-west and west-south-west of the proposed WWTP, along watercourses downstream of the spray irrigation field as described in Table 3. Limited information as to the nature of these sites was available to DWER at the time of assessment. Based on their distance from the proposed activities, it is not likely that they will be directly impacted by this application. However, based on their locations along waterways, they may represent locations of permanent groundwater-fed pools or important temporary waterways, and may therefore be relevant to this detailed risk assessment.

3.3.4 Criteria for assessment

The guidance documents used for assessment were the Australian and New Zealand Standard AS/NZS 1547/2012 *On-site domestic wastewater management* and the Department of Planning, Lands and Heritage (DPLH) (2019) *Government Sewerage Policy*. The Department of Water and Environmental Protection (2008) *Water Quality Protection Note 22 (WQPN22): Irrigation with nutrient rich wastewater* was also used to provide guidance for comparable rates of application for both total nitrogen and phosphorus.

The closest intermittent creek is approximately 150 metres from the WWTP and around 45 metres from the spray irrigation field. The *Government Sewerage Policy* (DPLH, 2019) states that "*an on-site sewage system is not to be located within 100 metres of a waterway*". Smaller setbacks may be considered where the reduced setbacks will not have a significant impact on the environment or public health. In seeking a reduced setback, "*it is likely that secondary treatment systems with nutrient removal will be required*".

3.3.5 Applicant controls

The spray field is positioned outside of the 1-in-100 year average flood extent, and on level ground with minor undulations, which is expected to have very low run-off potential.

The irrigation area is located in an area where groundwater is anticipated to be 20 metres below ground level, so the risk of infiltration to groundwater is considered to be low. As such, and given the distance of more than 500 metres to groundwater dependent ecosystems, the risk of nutrient-rich groundwater discharging into surface water should also be low.

The existing irrigation spray field (15.8 ha) was originally sized for a blended effluent of 660 m³/day as part of works approval W6315/2019/1. The applicant proposes to use the existing field for the increased blended effluent volume of up to 740 m³ per day (including 600 m³ per day treated effluent and up to 140 m^3/day of RO reject).

The Applicant provided DWER with a soil characterisation report which included soil sampling and particle size distribution analysis. The report provided says that:

> *"These soils were typically described in the field as a thin layer of loamy sand to silty loam overlying weathered greenstone and sedimentary units. The material was described as well drained and containing approximately 50% gravels, which increased with depth due to the inclusion of rock fragments. … The particle size distribution data show that these soils have higher average clay content than the other identified SMUs; with reported clay percentages ranging from 7 to 40%. They retain high gravel (>2.36 mm fraction) percentages, averaging 70%. The < 2.36 mm size fraction contained 53 – 86 % sand-size particles, with the silt and clay fraction comprising between 14 – 57% (Table 5.2). Based on this particle size distribution, soils from this SMU are classed as having a Clay to Sandy loam texture."*

Based on that description, the Applicant characterized the eutrophication risk in accordance

with WQPN22 as Risk category “D” (fine-grained soils such as loam, clays or peat with a low eutrophication risk in nearby surface waters).

The applicant has proposed secondary treatment to the expected effluent quality as shown in Table 5. Based on the Applicant’s expected wastewater effluent quality of 20mg/kg nitrogen and 8mg/kg phosphorus[1], the annual loading to the spray irrigation field will be 4,380 kg/year of total nitrogen and 1,752 kg/year of total phosphorus. Guidance in WQPN22 for soil category “D” is that irrigation should allow for a maximum of 480 kg/ha/year of total nitrogen and 120 kg/ha/year of total phosphorus. Using the calculation methods in WQPN22, the areas required for irrigation of nitrogen and phosphorus are therefore 9.1 ha and 14.6 ha respectively. The existing spray irrigation field is 15.8 ha which exceeds the requirement for nutrient application.

To calculate the area required for hydraulic loading to mitigate run-off of irrigated liquid, the Applicant chose a hydraulic application rate of <5 mm/day (0.005m/day) for gravels and sandy loams from Table M1 of AS/NZS 1547/2012. The irrigation field sizing can then be calculated as follows

$$\text{Area required} = \frac{\text{Flow volume } (m^3/day)}{\text{Application rate (m/day)}} = \frac{740\ m^3/day}{0.005m/day} = 148{,}000\ m^2 = 14.8\ ha$$

At a hydraulic application rate of <5 mm/day (0.005m/day) for gravels and sandy loams, the area required for the irrigation spray field would be 14.8 ha, which is less than the existing sprayfield. However, DWER notes that the soil type is described as having a “Clay to Sandy loam texture”. AS/NZS 1547/2012 also provides hydraulic application rates of 4 mm/day for loams, and 3.5 mm/day for clay loams. Previous works approval W6315/2019/1 for this irrigation spray field used a hydraulic application rate of 4 mm/day, which if used for this application would lead to an irrigation field sizing of 18.5 ha – which is larger than the existing sprayfield.

DWER notes that the calculations provided in AS/NZS 1547/2012 are generic. At this location, the regional climate has a high evaporation rate (3,000 mm/year) and low average rainfall (457.9 mm), which is likely to reduce the risk of waterlogging or pooling within the spray irrigation field.

The applicant has conducted analysis of remote sensing data (vegetation cover) for the sprayfield to determine any impact arising from the operation of the sprayfield. Since irrigation began in 2014, the measured cover has generally been higher than predicted by the baseline model. The applicant expects that the receiving vegetation community in the irrigation spray field will continue to display tolerance to the irrigation discharge. The proposed total dissolved solids (TDS) limit is below the ANZECC and ARMCANZ (2000) guidelines for tolerant crops. The volume of RO discharge is also not increasing as part of this application.

Effluent is disposed of to a dedicated irrigation field by an automated system that is managed by a trained operator. The trained operator will be responsible for the disposal of effluent to the conditions present. If it is raining or there has been a large rainfall event irrigation will be assessed and may not take place in these periods.

A 300 mm earthen bund is also located around the down-slope perimeter of the spray field as an additional control to prevent run-off outside the spray field perimeter and/or into the nearby intermittent waterway.

The applicant has proposed regular maintenance and inspections of the wastewater treatment plant and spray field.

[1] As shown in Table 5, the RO brine contains a low concentration of nutrients in comparison to the treated wastewater effluent. The Applicant has assumed that that these amounts are insignificant when calculating nutrient loading for the purposes of sizing the spray irrigation field.

3.3.6 Consequence of risk event

If irrigation of excessive nutrients (TN or TP) and RO reject effluent results in increased vegetation degradation and soil sodicity, or eutrophication or degradation of the adjacent intermittent waterway, then the Delegated Officer has determined that mid-level on-site impacts and low off-site impacts with Specific Consequence Criteria are at risk of not being met. Therefore, the Delegated Officer considers the consequence excessive nutrients (TP) and RO reject effluent discharge and soil sodicity to be Moderate.

3.3.7 Likelihood of risk event

The calculations for nutrient and hydraulic loading in section 3.3.4 indicate that the spray irrigation field is large enough for the proposed nitrogen and phosphorus application. The expected effluent quality (E. Coli, TN and TP) as proposed by the applicant does exceed the standards for secondary treatment systems with nutrient removal as published in the *Government Sewerage Policy* (DPLH, 2019), which is relevant because the irrigation field is less than 100 metres from a waterway. However, the applicant has proposed additional controls to reduce the likelihood of pooling and/or surface water run-off into the waterway, as described in section 3.3.5.

The spray irrigation field is also likely to be large enough on average for the hydraulic loading given the regional climate (much greater evaporation rate compared to average rainfall), but there will be seasonal variation in climate that may necessitate additional monitoring or management to prevent adverse impacts during the wet season. The applicant has proposed that a trained operator will assess conditions when it is raining or there has been a large rainfall event and irrigation may not take place in these periods.

Taking into account the design, location and proposed management of the spray irrigation field, the Delegated Officer has determined that the risk event will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of the risk event to be **Unlikely**.

3.3.8 Overall risk rating of RO reject effluent discharge

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix contained in Guidance Statement: Risk Assessment (DER 2017) and determined that the overall rating for the risk of blended effluent discharge to the spray irrigation field is **Medium**.

3.3.9 Justification for additional regulatory controls

The controls proposed by the applicant to reduce the likelihood of pooling and/or surface water run-off into the waterway are key to preventing adverse impacts to the intermittent waterway, which is less than 100 metres from the spray irrigation field. To ensure that these controls are effective, the Delegated Officer will require weekly visual inspections of the irrigation area during time-limited operations to ensure that there is no ponding or pooling of blended effluent on the ground surface of the irrigation spray field, and that no blended effluent is permitted to run-off or discharge beyond the spray irrigation field.

Consistent with AS 1547-2012 and the definition of a secondary treatment system in the *Government Sewerage Policy* (DPLH, 2019), the Delegated Officer will require a design and installation specification of <10 cfu/100mL for E. Coli.

The blended effluent is expected to have a TDS of 1,500 mg/L for normal operation, up to a maximum of 2,000 mg/L to account for seasonal variation and fluctuations in the reverse osmosis recovery rate. The Applicant has requested a limit of 3,500 mg/L, which represents the expected quality of unblended RO reject water. To ensure that the discharge of RO reject to the irrigation field does not cause vegetation degradation and soil sodicity, the Delegated Officer will require that no discharge of undiluted RO brine is permitted during time-limited operations.

4. Consultation

Table 6 provides a summary of the consultation undertaken by the department.

Table 6: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 25 November 2021	None received	N/A
Application advertised in the West Australian newspaper on 29 November 2021	None received	N/A
Shire of East Pilbara (Local Government Authority) advised of proposal on 26 November 2021	None received	N/A
Nyamal Aboriginal Corporation advised of proposal on 26 November 2021	None received	N/A
Department of Health (DoH) advised of proposal on 26 November 2021	DoH replied on 22 December 2021 supporting the proposal subject to a number of comments and recommendations, listed below. The WWTP and irrigation field require a formal application to be submitted to the Shire of East Pilbara for assessment prior to forwarding on to DoH. The water quality criteria of treated effluent should meet DoH's requirements in accordance with the *Health Regulations 1974 (Treatment of Sewage and Disposal of Effluent and Liquid Waste)*. The disposal area must meet 100 metre setbacks from environmentally sensitive winter or wet seasonal creeks. A specific site and soil evaluation report is required to be undertaken by a qualified consultant during the wettest seasonal time of the year (January/February) as per AS/NZS 1547:2012. Guidance is available at https://ww2.health.wa.gov.au/Articles/S_T/Site-	DWER will advise the applicant that additional approvals from the Shire of East Pilbara and/or DoH may be required prior to commencing works and/or operations. Refer to section 3.3 for detailed risk assessment for effluent discharge.

	and-soil-evaluation-for-onsite-wastewater-management. The disposal area and permeability findings of the system must be sized in accordance to AS/NZS 1547:2012. The higher concentration of salt in the brine from reverse osmosis, if blended with wastewater effluent, may require increased maintenance and management of plumbing fittings and equipment and disposal area sprinklers. DoH recommends that metals should be monitored and managed to DWER requirements.	
Applicant was provided with draft documents on [date]	N/A	N/A

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.

The assessment and regulation of a premises under Part V, Division 3, of the EP Act does not exempt the applicant from requiring other approvals from other relevant Decision Making Authorities (e.g approval from the Department of Health, via referral from the Shire of East Pilbara, under the *Health Act 191*).

References

1. Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000, *National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3: Primary Industries – Rationale and Background Information*, Canberra, Australian Capital Territory.
2. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
3. Department of Health (DoH) 2021, *Site and soil evaluation for onsite wastewater management*, Perth, Western Australia. Available from: https://ww2.health.wa.gov.au/Articles/S_T/Site-and-soil-evaluation-for-onsite-wastewater-management [February 2022]
4. Department of Planning, Lands and Heritage 2019, *Government Sewerage Policy,* Perth, Western Australia
5. Department of Water and Environmental Protection (2008) *Water Quality Protection Note 22 (WQPN22): Irrigation with nutrient rich wastewater*, Perth, Western Australia.
6. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
7. DWER 2020, *Guideline: - Risk Assessments*, 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
Decision Report	Potable water is supplied to the mining camp from groundwater bores GWL164321 and GWL179289(5).	The background information has been updated as requested.
	The Applicant confirms that the reverse osmosis volumes are still below the 0.5 GL/year threshold for licensing under Schedule 1 of the EP Regulations.	No changes to the text were required.
	The Applicant confirms that the reverse osmosis discharge volumes are not increasing as part of this application.	No changes to the text were required.
Works Approval Conditions		
1(b)(2)	DWER requested that the Applicant provide the specifications for compaction in the overflow containment pond. The Applicant responded that it does not have compaction results available for the containment pond. The Applicant notes that these were not required as part in the initial (construction) assessment, and the containment pond remains unchanged as part of this application.	No specifications included in the condition, as requested. The Delegated Officer considers that the Applicant has controls in place to reduce the likelihood of an overflow event, including systems to monitor tank volume levels and an alarm system to notify the operator of high-risk volumes. The WWTP is also sited away from sensitive receptors i.e. • Outside the 1-in-100 year average flood extent; • 150 metres from the closest creek line; and • More than 500 metres from groundwater-fed pools. The Delegated Officer also notes that draft Condition 6 of the Works Approval requires that "Spills of wastewater, RO brine or chemicals outside of a vessel/container are cleaned up immediately."

Appendix 2: Application validation summary

<table>
<tr><th colspan="7">SECTION 1: APPLICATION SUMMARY</th></tr>
<tr><td colspan="7">Application type</td></tr>
<tr><td>Works approval</td><td>☒</td><td colspan="5">Current licence number: L8845/2014/1</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 colspan="2">Yes ☐ No ☐</td></tr>
<tr><td colspan="3">Has time limited operations under the works approval demonstrated acceptable operations?</td><td colspan="2">Yes ☐ No ☐ N/A ☐</td></tr>
<tr><td colspan="3">Environmental Compliance Report / Critical Containment Infrastructure Report submitted?</td><td colspan="2">Yes ☒ No ☐</td></tr>
<tr><td colspan="6">Date Report received:</td></tr>
<tr><td>Renewal</td><td>☐</td><td>Current licence number:</td><td colspan="4"></td></tr>
<tr><td>Amendment to works approval</td><td>☐</td><td>Current works approval number:</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Amendment to licence</td><td rowspan="2">☐</td><td>Current licence number:</td><td colspan="4"></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="5">2 September 2021</td></tr>
<tr><td colspan="7">Applicant and Premises details</td></tr>
<tr><td colspan="2">Applicant name/s (full legal name/s)</td><td colspan="5">IB Operations Pty Ltd</td></tr>
<tr><td colspan="2">Premises name</td><td colspan="5">Iron Bridge Magnetite Project</td></tr>
<tr><td colspan="2">Premises location</td><td colspan="5">Iron Bridge Magnetite Project
Marble Bar WA 6760
M45/1226 granted under the Mining Act 1978</td></tr>
<tr><td colspan="2">Local Government Authority</td><td colspan="5">Shire of East Pilbara</td></tr>
<tr><td colspan="7">Application documents</td></tr>
<tr><td colspan="2">HPCM file reference number:</td><td colspan="5">DWERDT499407</td></tr>
<tr><td colspan="2">Key application documents (additional to application form):</td><td colspan="5">• Premises map
• Supporting document</td></tr>
<tr><td colspan="7">Scope of application/assessment</td></tr>
</table>

Summary of proposed activities or changes to existing operations.	This works approval is for the construction (upgrade) of a wastewater treatment plant (WWTP) to raise capacity from 1400 equivalent persons (EP) to 1950 EP. This means 600 m^3/day wastewater treatment and irrigation of 600 m^3/day wastewater plus 140 kL/day of reverse osmosis reject. The proposed upgraded plant includes the following modifications to a standard small package treatment plant built to service up to 1500 EP: • An additional jet aspirated type aerator to increase aeration. • The residence time in the aeration zone will be extended for up to 2 additional hours, by delaying the decant after the aeration/decant tank reaches top working level. • Denitrification already includes a significant safety margin, and by operating the balance tank at an increased minimum level, the overall anoxic volume is increased. The applicant also proposes to reduce the specified sewage generation rate from 350L/person/day to a more realistic 300L/person/day. Actual generation rate to date is approximately 280L/person/day. The size of the existing irrigation spray field (15.8 ha) is based on the final output potential of the WWTP at full design capacity (1950 EP), for the irrigated disposal of up to 600 kL/day treated effluent and up to 140 kL/day of RO reject. The design is determined by engineering requirements and the nutrient loading application criteria, as published in the *Guideline for the Non-Potable Uses of Recycled Water in Western Australia* (Department of Health, 2011). Time limited operations are requested for 90 days.

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
Category 5: Processing or beneficiation of metallic or non-metallic ore	50,000 tonnes per annual period	No change
Category 52: Electric power generation	14 MWe per annual period	No change
Category 54: Wastewater Treatment Plant and irrigation spray field	205 cubic metres per day	600 cubic metres per day
Category 77: Concrete batching or cement products manufacturing	217,000 tonnes per annual period	No change

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: 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: MS 993 EPA Report No: 1514
Has the proposal been referred and/or assessed under the EPBC Act?	Yes ☒ No ☐	Reference No: EPBC 2012/6689
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes ☒ No ☐	Certificate of title ☐ General lease ☐ Expiry: Mining lease / tenement M45/1226 ☒ Expiry: 30/10/2033 Other evidence ☐ Expiry:
Has the applicant obtained all relevant planning approvals?	Yes ☐ No ☐ N/A ☒	Approval: Expiry date: If N/A explain why? Not relevant to proposed activities
Has the applicant applied for, or have an existing EP Act clearing permit in	Yes ☐ No ☒	CPS No: N/A, Clearing permit exemption applies (clearing

relation to this proposal?		approved under MS993)
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, clearing approved under MS993 Licence/permit No: N/A
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes ☒ No ☐	Application reference No: N/A Licence/permit No: GWL164321
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 Surface Water Area, Pilbara Groundwater Area Type: Proclaimed 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/ landuse 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 ☐	Approvals are being sought under the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulation 1974.* The proponent is approved under *Mining Act* 1978, Mining Proposal (Reg ID 88861).
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes ☐ No ☒	
Is the Premises subject to any EPP requirements?	Yes ☐ No ☒	
Is the Premises a known or suspected contaminated site under the *Contaminated Sites Act 2003*?	Yes ☐ No ☒	