



## Application for Works Approval

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

---

<b>Works Approval Number</b>	W6584/2021/1
<b>Applicant</b>	GMA Garnet Pty Ltd
<b>ACN</b>	009 344 227
<b>File number</b>	DER2021/000422
<b>Premises</b>	Port Gregory Garnet Mine 1420 George Grey Drive Yallabatharra WA 6535  Legal description Mining tenements M70/856, M70/204, M70/259, M70/926, M70/927, M70/968, G70/171, M70/1330 and M70/1331 (excluding Lot 58 on Plan 65344)
<b>Date of report</b>	22 December 2021
<b>Decision</b>	Works approval granted

#### **A/MANAGER, RESOURCE INDUSTRIES**

#### **REGULATORY SERVICES**

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

## Table of Contents

<b>1. Decision summary</b>	<b>3</b>
<b>2. Scope of assessment</b>	<b>3</b>
2.1 Regulatory framework	3
2.2 Application summary	3
2.3 Proposed Works	3
2.3.1 Construction of new solar drying ponds	4
2.3.2 Construction of bioremediation facility	7
2.3.3 Addition of Flocculants to the process	7
<b>3. Risk assessment</b>	<b>8</b>
3.1 Source-pathways and receptors	8
3.1.1 Emissions and controls	8
3.1.2 Receptors	10
3.2 Risk ratings	13
3.3 Detailed risk assessment	17
3.3.1 Seepage of tailings slurry water from Solar drying ponds leading to groundwater mounding impacts to vegetation	17
<b>4. Consultation</b>	<b>19</b>
<b>5. Conclusion</b>	<b>19</b>
<b>References</b>	<b>20</b>
<b>Appendix 1: Summary of applicant’s comments on risk assessment and draft conditions</b>	<b>21</b>
<b>Appendix 2: Application validation summary</b>	<b>22</b>
Table 1: capacity of each of the proposed ponds	5
Table 2: Proposed applicant controls	8
Table 3: Sensitive human and environmental receptors and distance from prescribed activity	11
Table 4: Risk assessment of potential emissions and discharges from the premises during construction, commissioning and operation	13
Table 5: Groundwater levels in monitoring bores HM6 to HM14 at the Hose bore field within M70/856 in 1997 and 2020	17
Table 6: Consultation	19
Figure 1: Cross-sections of a proposed solar drying ponds	5
Figure 2: Locations of the proposed groundwater monitoring bores	6
Figure 3: Section view of the Bioremediation area	7
Figure 4: Distance to sensitive receptors	12
Figure 5: Location of monitoring bores HM6 to HM14 at the Hose bore field within M70/856	18

## 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 W6584/2021/1 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

On 26 July 2021, GMA Garnet Pty (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 mineral sands mining or processing at Port Gregory Garnet Mine (the premises). The premises is approximately 3 km to the north-east of town of Port Gregory.

The premises relates to the category and assessed production capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in works approval W6584/2021/1. 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 W6584/2021/1.

### 2.3 Proposed Works

The applicant is currently operating two opencut alluvial garnet mines namely the Hose mine and the Lynton mine. The ore from these two mines are processed within the Hose processing plant on mining tenement G70/171. The extraction of garnet concentration (also contains some ilmenite plus minor amounts of zircon) from raw feed requires wet processing and materials handling equipment, including wet trash screening, spirals, hydrocyclones, hydrosizers and attritioners. Process water is reclaimed using dewatering cyclones and vacuum filtering. The reclaimed water is recycled to the plant after passing through thickeners tanks to remove calcareous slimes (tailings). Thickener underflow (calcareous slimes) from the wet plant processing dries in solar drying ponds before returning to the mining voids as backfill.

The premises is currently served by three solar drying ponds that have a capacity of 32,700 m<sup>3</sup> in aggregate. The ponds are formed by a combination of above ground embankments and excavations below ground, depending on fall of the ground. The applicant is seeking approval to construct five additional below ground solar drying ponds to add into the current operation. Once the new ponds are commissioned, the existing evaporation ponds will be utilised for auxiliary purposes.

In addition to that, the applicant is also seeking approval to construct a hydrocarbon remediation facility which will allow the temporarily storage and bioremediation of hydrocarbon contaminated solid waste produced onsite. The applicant has applied for Category 61A as per the *Environmental Protection Regulation 1987* to be added to the works approval to cover this activity. However, it has been determined that the proposed bioremediation facility does not trigger this category as the premises will not be accepting hydrocarbon contaminated solid waste produced by other premises. Only waste produced from within the premises will be processed by this bioremediation facility.

Therefore, the proposed bioremediation facility will be considered as an auxiliary activity under Category 8.

Finally, the applicant is seeking approval to commence use of a flocculant in the existing processing operations at Port Gregory Garment mine. The applicant claims that the proposed flocculant is non-hazardous, biodegradable and does not persist or accumulate in the environment. It is proposed that much of the flocculant will be recirculated through the processing plant.

The premises currently has an operating licence under Part V of the *Environmental Protection Act 1986*, which is L8561/2011/1 and it regulates the emissions and discharges from the prescribed premises operations. A licence amendment will be required to authorise the ongoing operation of the new infrastructure.

### 2.3.1 Construction of new solar drying ponds

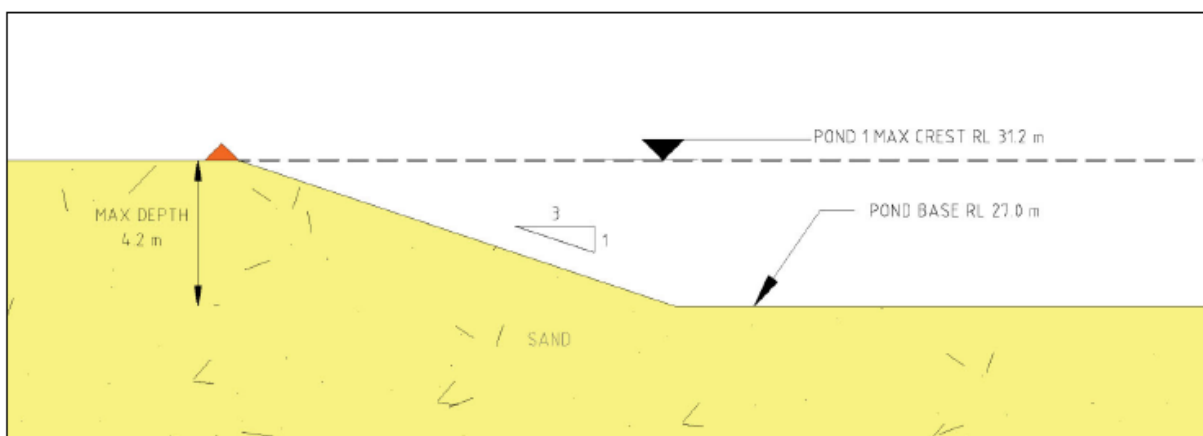
The applicant proposes to construct the five new solar drying ponds below ground and within the mining tenement M70/856. The new ponds will comprise of 4 operational ponds and 1 contingency pond. The tailings will be transferred into a transfer tank prior to the deposition into the solar drying ponds via a pipeline. The transfer tank will be located in one of the existing evaporation ponds to ensure that any potential spills are contained. Tailings will then be transferred into the solar drying ponds via 110mm HDPE pipelines. The transfer tank will include tank level monitors and alarms and emergency shut-off valves.

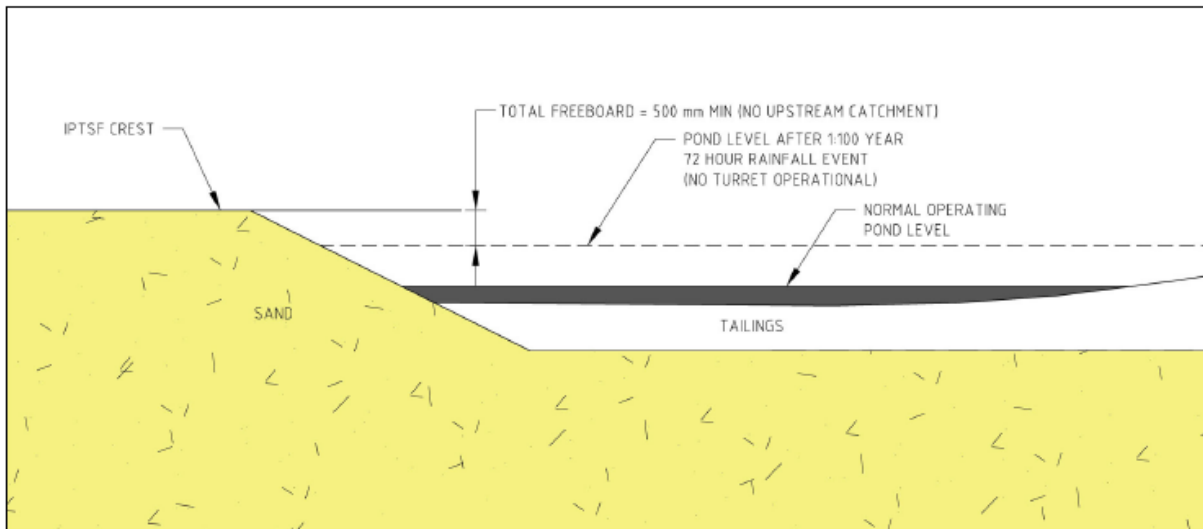
The ponds will be constructed in mostly undisturbed soils. Proposed works predominantly include;

- site preparation work,
- excavation and preparation of embankment foundations, decant points, loader access ramps and the central access road, and
- compaction of embankments and access roads.

The internal batter slope to be constructed at 1V:3H, by excavating coarse tailings/natural sand. Excavated material will form a bund around the perimeter of the solar drying ponds (Figure 1) and any excess will be stockpiled. The embankment heights of the proposed solar drying ponds to be vary from 1.5m to 4.5m depending on the sloping of the natural landform. A minimum operational freeboard of 300mm will be maintained during the operation of the proposed solar drying ponds. Pond design also includes a sufficient freeboard to contain a 1:100-year AEP 72-hour storm event whilst maintaining 0.5 m of freeboard to the crest (Figure 1).

Seepage is likely to occur due to the presence of sandy soils underneath the solar drying ponds. However, the seepage assessments conducted as a part of TSF design study by REC indicated that groundwater mounding is unlikely to occur based on the depth to groundwater (approximately 35 meters below ground level (mbgl)) and associated seepage flow rates. As a result, no underdrainage or basal liner have been proposed.





**Figure 1: Cross-sections of a proposed solar drying ponds**

The designed capacity of the proposed ponds will be 39,530 tonnes in aggregate and the volume of the individual ponds to be as shown in the below Table 1.

**Table 1: capacity of each of the proposed ponds**

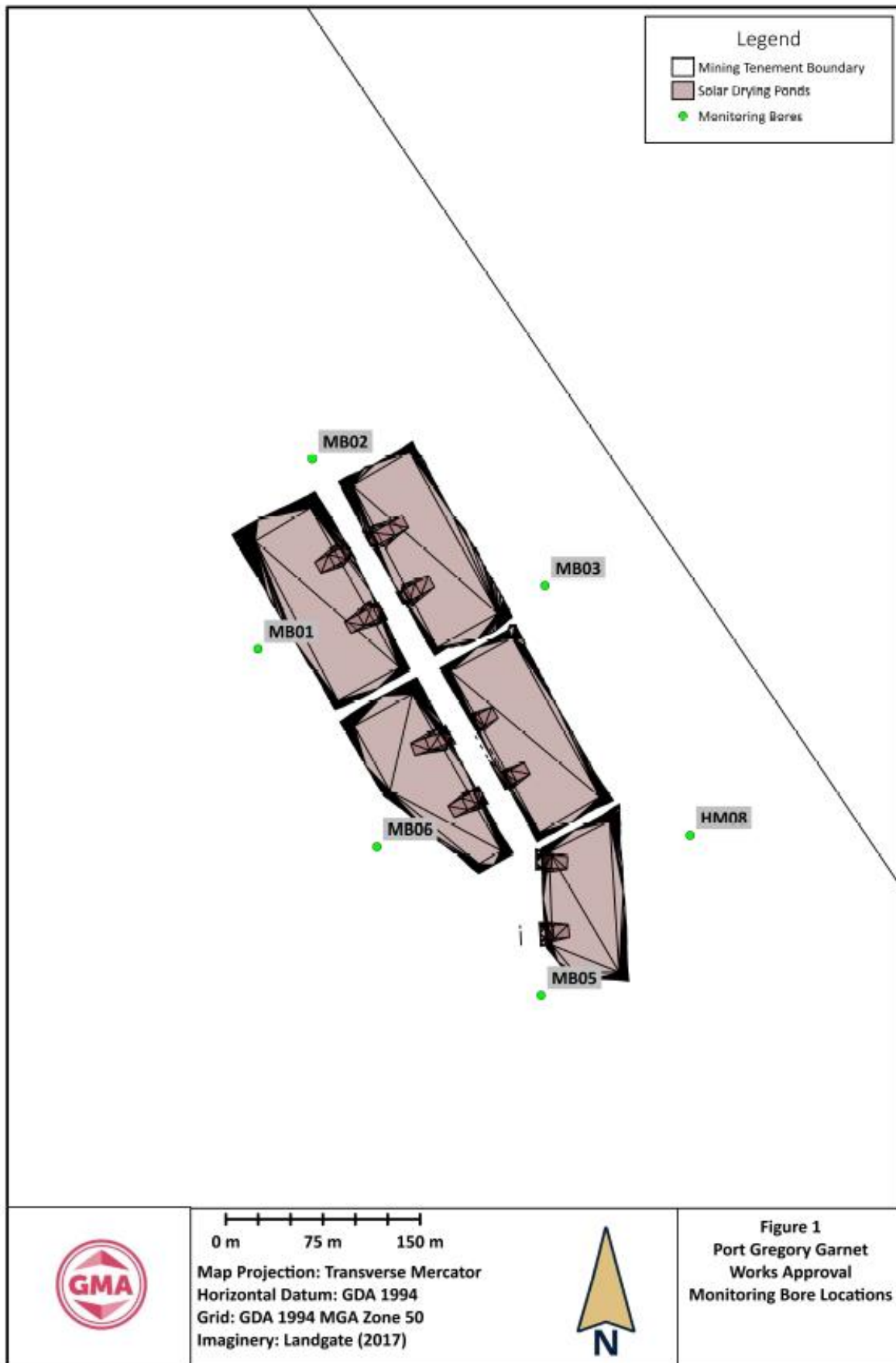
Pond Identification	Capacity (tonnes)
Pond 1	11,034
Pond 2	7,615
Pond 3	7,481
Pond 4	8,105
Pond 5	5,295

**Operation**

Tailings (calcareous slurry) will be transported from the process plant to the solar drying ponds via a large diameter HDPE pipe. The pipeline will be contained within a bunding system so that any spillage of materials resulting from leaks or burst pipes during operation will be retained within the contained bunds. Tailings will be deposited from crest of the batter slopes of the solar drying ponds from a single deposition point in a sub-aerial manner. It is proposed that under normal condition, an operating pond will not exceed 1,400m<sup>3</sup>. Water recovery will be maximise to reduce the amount of water seeping through the base of the ponds. The minimum recommended water removal is 20 tonnes per hour based on the design of the return water system (turret pumps and pipes).

Tailings are primarily composed of fine carbonate sand and silt with lesser proportions of quartz. Therefore, the tailings are geochemically inert, and no acid or metalliferous drainage is expected. The only chemical additive that the process utilise will be an anionic high molecular weight flocculant (Flopam<sup>TM</sup> AN910VHM-15). Much of the flocculant will be recirculated through the processing plant and the rest will be absorbed onto suspended solids and removed from the water phase.

Groundwater level monitoring has been proposed to identify any potential groundwater mounding impacts during the operation of the solar drying ponds. Figure 2 below shows the location of the 5 proposed groundwater monitoring bores at the solar drying ponds area.

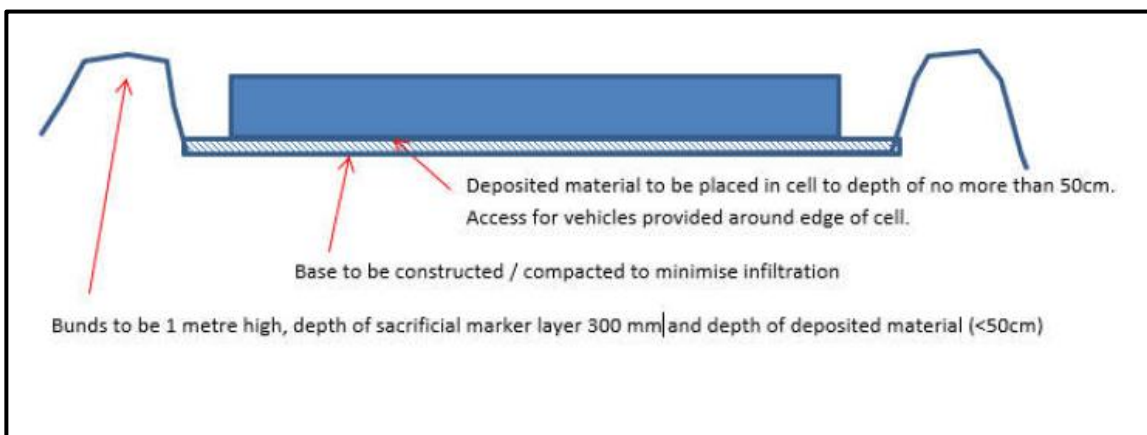


**Figure 2: Locations of the proposed groundwater monitoring bores**

### 2.3.2 Construction of bioremediation facility

The applicant proposes to construct the bioremediation facility within the mining tenement M70/856. The bioremediation facility will include two pads and two stormwater sumps to the west and east. The pads will be constructed with a gradient of 2%-5% to ensure that the surface water will be directed to the stormwater sumps. These sumps will be designed with the allowance of a 1 in 100-year over 72 hours rainfall event. Stormwater sumps will be regularly checked, particularly after a rainfall event, to determine whether the water or sediment build-up may need to be removed to maintain capacity. Internal earthen bunds will be constructed to a minimum of 1m to manage the stormwater flows (Figure 3).

Clean soil fill will be used and compacted to construct the base of the pads. HDPE liners with minimum thickness of 1.5mm will be installed and heat welded. Panels of the liners will be overlapped by a minimum of 100 mm, prior to heat welding or mechanical joining. The heat welding material will be identical to the liner membrane. Liner material will be installed over a marker layer with a minimum thickness of 0.3 m to ensure that the liner is not penetrated during aeration or removal operations.



**Figure 3: Section view of the Bioremediation area**

#### Operation

A contaminated soil checklist will be completed and approved prior to placing waste within the bioremediation facility to ensure only hydrocarbon contaminated waste is treated. The hydrocarbon contaminated soil will be weighed and then placed on the bioremediation pads at a 0.5m maximum thickness. In the event of where there's a doubt in the contamination type, the soil will be tested prior to placement within the facility.

Landfarming technique will be used as the soil bioremediation process. Minerals, nutrients, and moisture will be added together with aeration to enhance the breakdown process. Microbial or chemical additions will be assessed based on the contamination level of the material. Mechanical turning and mixing will be undertaken, and water carts will be used for dust suppression during the summer. The remediated material will be used to backfill the mining voids once it reaches the Uncontaminated Fill Thresholds outlined in DWER *Landfill Waste Classification and Waste Definitions 1996 (as amended 2019)*.

### 2.3.3 Addition of Flocculants to the process

The applicant is seeking approval to commence usage of a flocculant as the major reagent of the wet processing operation. The applicant has stated within their application that the proposed flocculant is non-hazardous and biodegradable. The flocculant will be added to the thickeners at a rate of 1.1 kilogram of flocculant to 220 tonne of ore feed per hour. Much of the flocculant will recirculate through the process. The rest will generally absorb onto the suspended solids (calcareous slimes) and removed from the water phase. These calcareous tailings will be sent to the solar drying ponds and

allow to dry before going into the mining voids as backfill.

### 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] / 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
<b>Construction</b>			
Dust	Earthworks and vehicle movements	Air/windborne pathway	Dust management plan to be implemented including: Use of water trucks and/or water cannons to dampen areas identified as being potentially dust generating Reduce speed limits to minimise dust generation as required Topsoil stripping to be scheduled to avoid periods of high winds from unfavourable directions Topsoil stripping operations will be suspended during high wind conditions if there's a risk of dust sensitive receptors Dust suppressant applied proactively to overburden/topsoil stockpiles
Noise		Air/windborne pathway	No controls proposed Current operating licence has noise management conditions to mitigate
<b>Commissioning</b>			
Spill/leak of tailings	Hydrotesting of pipes and associated infrastructure for tailings delivery to	Direct discharge to soil	HDPE pipeline will be located within a containment bunding



Emission	Sources	Potential pathways	Proposed controls
	solar drying ponds.		
<b>Operation</b>			
Seepage	Operation of solar drying ponds	Seepage to groundwater	<ul style="list-style-type: none"> <li>• Sub-areal deposition to promote air-drying</li> <li>• Maintaining a small decant pond</li> <li>• 5 new monitoring bores to be installed to continual monitoring of groundwater levels around the solar drying ponds</li> </ul>
Clay slimes or tails water overtopping ponds		Direct discharge to soil	<ul style="list-style-type: none"> <li>• Earthen bunding and fencing will be constructed around the perimeter of the solar drying ponds</li> <li>• Minimum operational freeboard of 300 mm to be maintained</li> <li>• Daily inspections of solar drying ponds to be undertaken</li> </ul>
Discharge of slimes or tails water due to pipeline spill or overflow of transfer tank		Direct discharge to soil	<ul style="list-style-type: none"> <li>• Pipeline constructed in containment bund</li> <li>• Routine Daily inspections of the pipeline by trained personnel</li> <li>• Transfer tank to be placed within a contained area (utilising existing solar drying pond)</li> <li>• Level indicators to monitor transfer tank levels and alarm if freeboard level is breached and turn off pumps feeding tailings from the wet plant to the tank</li> <li>• Tank will be covered to prevent rainfall infiltration</li> </ul>
Dust	Class 1 to 3 soils undergoing bioremediation	Air/windborne pathway	<ul style="list-style-type: none"> <li>• Material to be placed at a maximum depth of 0.5 m, lower than the height of the earthen bund</li> <li>• Windrows will be established around the perimeter of the bioremediation facility</li> <li>• Dust suppression (water carts) is used during mechanical tilling</li> <li>• Ongoing inspections to ensure compliance with the bioremediation management procedure</li> <li>• Covering will be placed over the soil if other controls fail to mitigate dust lift-off</li> </ul>
Stormwater runoff		Direct discharge of hydrocarbon contaminated	<ul style="list-style-type: none"> <li>• Earthen bund constructed to direct any stormwater from the bioremediation facility into stormwater sumps</li> </ul>

Emission	Sources	Potential pathways	Proposed controls
		water	<ul style="list-style-type: none"> <li>Material to be placed at a maximum depth of 0.5 m, lower than the height of the earthen bund</li> <li>Bioremediation management procedure to be implemented</li> <li>Ongoing inspections to ensure compliance with the bioremediation management procedure</li> </ul>
Leachate		Seepage into groundwater	<ul style="list-style-type: none"> <li>HDPE lined to contain any leachate</li> <li>Contaminated soil to be tested before prior to bioremediation</li> <li>A marker layer of material with minimum thickness of 0.3m to be installed to prevent damage to the lining</li> <li>Panels of the liner overlapped by a minimum of 100 mm, prior to heat welding or mechanical joining</li> <li>Membrane welding material to be identical to the liner material</li> <li>All seams and joints shall be constructed and tested as watertight over their full length using a vacuum test unit, air pressure testing, or other approved method used in the HDPE membrane industry</li> <li>HDPE liner shear resistance shall be tested in accordance with ASTM D5321-02</li> </ul>
Changed chemistry of seepage from tailings	Addition of flocculent to process	Seepage from unlined mine voids	<ul style="list-style-type: none"> <li>Non-hazardous, flocculant recirculated through the plant</li> <li>Remaining Flocculent will be absorbed onto suspended solids and removed from the water phase.</li> </ul>

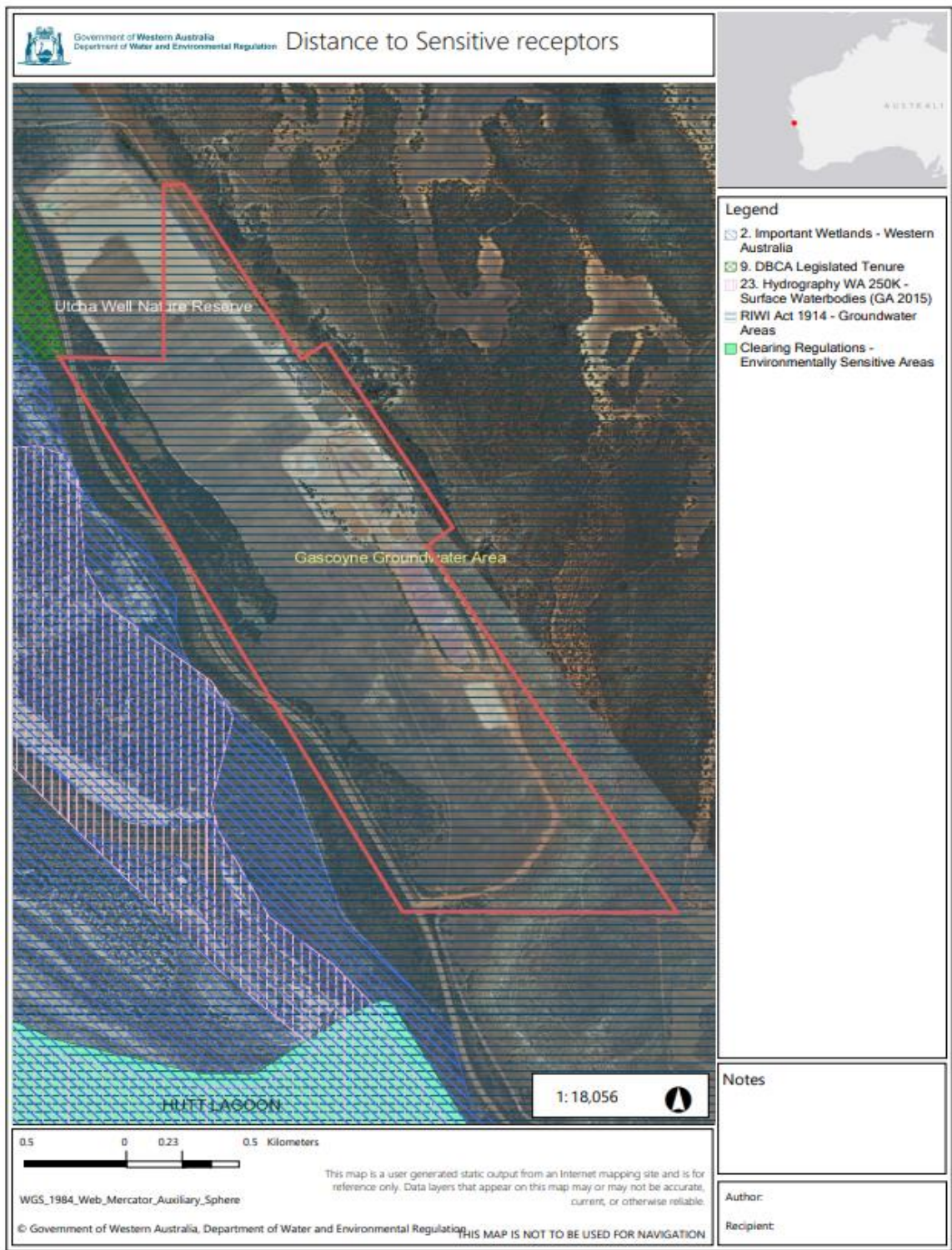
### 3.1.2 Receptors

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 4 and Figure 4 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**

<b>Human receptors</b>	<b>Distance from prescribed activity</b>
Town of Port Gregory	Approximately 3 km south-west of the Premises
Residential Premises	5 km east of premises
Lynton Station homestead and Caravan Park	Approximately 250 m south-east of premises boundary and approximately 15km south from proposed works
Lucky Bay campground	Approximately 4 km north-west of the premises
<b>Environmental receptors</b>	<b>Distance from prescribed activity</b>
Utcha Well Nature Reserve – (microscale elongate sumpland, Registered Aboriginal Heritage Site)	Approximately 1000m north of the proposed Bioremediation facility and approximately 1800m northwest of the proposed solar drying ponds
Hutt Lagoon system (Specified ecosystem: Important wetlands, Western Australia; Environmental Sensitive Area)	Approximately 1000m west of the proposed solar drying ponds and approximately 2300m southwest of the proposed bioremediation facility.  During winter, the lagoon is partly or wholly filled with hypersaline water and during summer the lagoon is mostly empty.
Groundwater Area – RIWI Act 1914 proclaimed area	Gascoyne Groundwater Area - Intersects the premises  Groundwater levels within the proposed project area is approximately 35 mbgl. The salinity within the project area generally varies from about 800 mg/L to 1500 mg/L. Groundwater flows south-westwards and discharges into Hutt Lagoon, the adjoining wetlands, or the ocean.



**Figure 4: 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 6584/2021/1 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 amendment is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the premises i.e. operation of new solar drying ponds, operate bioremediation facility and commencement of using of a flocculant in the existing processing operations. 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 operation**

Risk events					Risk rating <sup>1</sup> C = consequence L = likelihood	Applicant controls sufficient?	Conditions <sup>2</sup> of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
<b>Construction</b>								
Earthworks and vehicle movements.	Dust	Air / windborne pathway causing impacts	Native vegetation, including the Hutt Lagoon ESA	Refer to Section 3.1.1	C = Minor L = Rare <b>Low Risk</b>	Y	N/A	The Delegated Officer considers that the applicant controls, summarised in section 3.1, are sufficient to mitigate any impacts to the nearby environmental receptors from the potential dust emissions during construction. Additional regulatory controls are not required.
	Noise		Separation distance to residential sensitive receptors is sufficient to avoid any potential impacts from construction phase.	Refer to Section 3.1.1	No pathway to receptor. Further risk assessment not needed	N/A	N/A	N/A
<b>Commissioning</b>								
Hydrotesting of pipelines for tailings delivery to solar drying ponds.	Spill/leak of process water	Direct discharge to soil; contamination of surface water	Soil; Hutt Lagoon ESA	Refer to Section 3.1.1	C = Minor L = Possible <b>Medium Risk</b>	Y	Condition 1 - Infrastructure requirements for tailing delivery pipeline Condition 9, 10 and 11 – Environmental commissioning requirements	Construction/installation requirements of tailings transfer pipelines are outlined in Condition 1 of the issued works approval. These pipelines need to be commissioned prior to operation to track any potential leaks during transferring tailings. The Delegated Officer has determined that the applicant's proposed controls are adequate to mitigate any potential impacts from pipeline rupture. Those controls have conditioned within the works approval in accordance with <i>Guidance statement: Risk Assessments (DER 2017)</i> .

Risk events					Risk rating <sup>1</sup> C = consequence L = likelihood	Applicant controls sufficient?	Conditions <sup>2</sup> of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
<b>Operation (including time-limited-operations)</b>								
Solar Drying ponds operation	Seepage	Seepage to groundwater leading to mounding of groundwater table inundating vegetation rootzones	Soil and native vegetation adjacent to the proposed ponds. Groundwater	Refer to Section 3.1.1	C = Moderate L = Possible <b>Medium Risk</b> (During the time-limited operation duration)	N	Condition 1 - Infrastructure requirements <b><u>Condition 2 – construction requirements – monitoring bores</u></b> <b><u>Condition 3 and 4 – Baseline groundwater monitoring</u></b> <b><u>Condition 19 and 20 – groundwater monitoring during time-limited operation, with SWL limit.</u></b> <b><u>Condition 22(b) – Time-limited operation reporting – groundwater monitoring results</u></b>	Refer to Detailed risk assessment Section 3.3
		Seepage to groundwater leading to changes to groundwater quality	Groundwater users	Refer to Section 3.1.1	C= Minor L= Unlikely <b>Medium Risk</b>	N	<b><u>Condition 2 – construction requirements – monitoring bores</u></b> <b><u>Condition 3 and 4 – Baseline groundwater monitoring</u></b> <b><u>Condition 19 and 20 – groundwater monitoring during time-limited operation</u></b> <b><u>Condition 22(b) – Time-limited operation reporting – groundwater monitoring results</u></b>	Tailings are primarily composed of fine carbonate sand and silt with lesser proportions of quartz. Therefore, the tailings are geochemically inert, and no acid or metalliferous drainage is expected  As the risk rating is medium conditions requiring baseline groundwater quality monitoring prior to deposition of clay fines to the ponds and ongoing monitoring during time limited operations have been added to the works approval.
	Clay slimes of tails water overtopping ponds	Direct discharge to land - resulting soil degradation, contamination of surface water or impacts to native vegetation	Soil and native vegetation adjacent to the proposed ponds Hutt Lagoon ESA – approximately within 1km	Refer to Section 3.1.1	C = Moderate L = Unlikely <b>Medium Risk</b>	Y	Condition 1- Infrastructure requirements Condition 14 – Time-limited operation requirements – solar drying ponds Condition 18 – Inspection of infrastructure – solar drying ponds	The Delegated Officer considers that the applicant controls, summarised in section 3.1, are sufficient to mitigate any impacts from overtopping of tailings from the solar drying ponds. Those controls have conditioned within the works approval.
	Discharge of slimes or tails water due to pipeline spill overflow of transfer tank	Direct discharge to land - resulting soil degradation, contamination of surface water or impacts to native vegetation	Soil and native vegetation adjacent to the proposed ponds Hutt Lagoon ESA - approximately within 1km	Refer to Section 3.1.1	C = Moderate L = Possible <b>Medium Risk</b>	Y	Condition 1- Infrastructure requirements Condition 9, 10 and 11 – Environmental commissioning requirements Condition 14 – Time-limited operation requirements – tailings delivery pipelines and tailings transfer tank Condition 18 – Inspection of	The Delegated Officer has determined that the applicant's proposed controls are adequate to mitigate any potential impacts from pipeline rupture. Those controls have conditioned within the works approval in accordance with <i>Guidance statement: Risk Assessments (DER 2017)</i> .

Works approval: W6584/2021/1

Risk events					Risk rating <sup>1</sup>	Applicant controls sufficient?	Conditions <sup>2</sup> of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood			
							infrastructure – tailings delivery pipelines and tailings transfer tank	
Class 1 to 3 soils undergoing bioremediation	Dust	Air/windborne pathway causing impacts to vegetation	Native vegetation,	Refer to Section 3.1.1	C = Slight L = Possible <b>Low Risk</b>	Y	Condition 14 – Time-limited operation requirements – bioremediation facility	No additional regulatory conditions required. The Delegated Officer considers the applicant controls, which are conditioned in the issued works approval are sufficient to mitigate and regulate the risk of dust emissions during the operation of the bioremediation pads.
	Contaminated Stormwater runoff	Overtopping or escape of stormwater from facility resulting in direct discharge of hydrocarbon contaminated water to land	Soil and native vegetation adjacent to the facility	Refer to Section 3.1.1	C = Minor L = Unlikely <b>Medium Risk</b>	Y	Condition 1 - Infrastructure requirements – bioremediation facility Condition 14 – Time-limited operation requirements – bioremediation facility	The applicant's proposed controls are deemed adequate to mitigate any potential impacts from the hydrocarbon contaminated water to ground and surface water. Those controls have conditioned within the works approval in accordance with <i>Guidance statement: Risk Assessments (DER 2017)</i> .
	Leachate	Seepage (containing hydrocarbons) into groundwater	Groundwater	Refer to Section 3.1.1	C = Moderate L = Unlikely <b>Medium risk</b>	Y	Condition 1 - Infrastructure requirements – bioremediation facility Condition 5 – Baseline soil testing Condition 14 – Time-limited operation requirements – bioremediation facility Condition 18 – Inspection of infrastructure – bioremediation facility	The Delegated officer has reviewed the proposed applicant's controls related to construction and operation of the bioremediation facility including the layout of the bioremediation pad, maintaining a marker layer, physical characteristics of the proposed HDPE liner, membrane welding material, welding method and weld testing. Those proposed controls are adequate to mitigate any potential seepage of leachate from the bioremediation facility.  The proposed applicant controls have conditioned within the works approval in accordance with <i>Guidance statement: Risk Assessments (DER 2017)</i> .
	Use of remediated soil as backfill for mined voids	Direct discharge to land of remediated soil. Impacts to soil and groundwater quality may occur if soil is not free of hydrocarbons.	Soil and groundwater	Refer to Section 3.1.1	C = Minor L = Unlikely <b>Medium risk</b>	N	Condition 14 – Time-limited operation requirements – bioremediation facility Condition 15 – authorised discharge points – bioremediated soil to mine voids Condition 16 and 17 – sampling and testing of bioremediated soil during time-limited operation <b>Condition 22(c) – Time-limited operation reporting – bioremediated soil testing results</b>	The applicant is committed to remediate the hydrocarbon contaminated soil to meet the Uncontaminated Fill Criteria outlined in Table 6 of the <i>Landfill Waste Classification and Waste Definitions 2019</i> prior to disposal into the mine voids.  Regular testing is required to ensure that the bioremediated soil have met the Uncontaminated Fill Criteria. These controls are in line with the applicant's commitment and have conditioned within the works approval in accordance with <i>Guidance statement: Risk Assessments (DER 2017)</i> .

Risk events					Risk rating <sup>1</sup>	Applicant controls sufficient?	Conditions <sup>2</sup> of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood			
Addition of flocculent to process	Changed chemistry of seepage from solar drying ponds	Seepage from unlined solar drying ponds	Groundwater	Refer to Section 3.1.1	C = Slight L = Unlikely <b>Low Risk</b>	Y	N/A	The Delegated Officer has reviewed the material safety data sheet provided for the proposed flocculant and is satisfied that it is not environmentally hazardous. Therefore, additional regulatory conditions are not required.

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

#### 3.3.1 Seepage of tailings slurry water from Solar drying ponds leading to groundwater mounding impacts to vegetation

The calcareous tailings from the wet concentrate plant will be deposited to a collection of Solar drying ponds. The process design assumes that the 70-75% of slurry water will be removed at the solar drying ponds to achieve the in-situ dry density of 1.45 t/m<sup>3</sup> required for backfilling of mine voids. To achieve the dry density required, slurry water will need to drain through the permeable base of the solar drying ponds in addition to being removed via evaporation.

The main aquifer under the project area is within the superficial formations and comprises of the Tamala Limestone and the overlying aeolian and beach sand deposits. Therefore, it is expected that a significant amount of slurry water will be removed via seepage due to the presence of sandy soils underlying the proposed solar drying ponds. Based on the water balance provided by the applicant, it is expected that 6.4 tonnes of slurry water will be removed per hour via seepage.

Based on the groundwater monitoring study that was carried out from January 2020 to December 2020 it was observed that the groundwater levels in most monitoring bores have generally remained steady and have continued a long-term steady trend over the years (Table 4). The location of the existing monitoring bores within mining tenement M70/856 are depicted in Figure 5. The closest monitoring bore to the existing evaporation ponds located at the processing plant area is HM7 (Figure 5). Groundwater levels have remained stable and around 26 mbgl during operation of these ponds.

Monitoring bores on site are not compliance bores on the licence but bores approved for monitoring under the groundwater licence (*Rights in Water and Irrigation Act 1914*).

**Table 5: Groundwater levels in monitoring bores HM6 to HM14 at the Hose bore field within M70/856 in 1997 and 2020**

Monitoring Bore No. (located within M70/856)	Baseline Groundwater Level (Nov 1997) (mbrp)	Current Groundwater Level (Dec 2020) (mbrp)	Fluctuation (m)
HM6	35.00	35.29	0.29
HM7	26.07	26.87	0.8
HM8	30.95	31.98	0.97
HM9	21.95	22.56	0.61
HM10	5.05	5.46	0.41
HM11	8.65	8.92	0.27
HM12	1.60	1.95	0.35
HM13	5.06	5.50	0.44
HM14	3.52	3.77	0.25



**Figure 5: Location of monitoring bores HM6 to HM14 at the Hose bore field within M70/856**

The underlying hydrogeology reveals that the groundwater flows south-westwards and discharges into Hutt Lagoon, the adjoining wetlands, or the ocean. It also revealed that the Tamala aquifer is become progressively thin towards the Hutt lagoon. Therefore, based on the groundwater migration direction and the low depths to groundwater (eg: groundwater levels in HM10, HM11 in Table 4), mounding of groundwater may occur around the south-western area of the mining tenement M70/856.

Previous flora surveys and DWER GIS data identified that vegetation in the project area predominately comprised of shrublands and low forests of *Acacia rostellifera*. If potential groundwater mounding reaches into the root zone of this vegetation, it could lead to vegetation stress or death due to increased duration of root saturation.

The applicant has proposed 5 new monitoring bores to be constructed around the solar drying pond to monitor the groundwater levels over time (Figure 2). A condition has been included in the works approval to require groundwater levels and quality monitoring at the above-mentioned monitoring bores proposed by the applicant. Additionally, it is required to conduct a baseline groundwater monitoring programme prior to commencement of time-limited operation. This will allow monitoring of any potential groundwater mounding impacts due to tailing seepage from the solar drying ponds overtime. Other proposed applicant controls to minimise seepage from the base of the ponds are summarised in section 3.1.1.

The Delegated officer considers that the proposed seepage controls are deemed suitable to manage any potential impacts for the short term. Therefore, time limited operations will be authorised for 180 days with the requirement to monitor the groundwater levels surrounding solar drying ponds.

The Delegated Officer considers it is possible that seepage from solar drying ponds will lead to mounding into the root zone of nearby vegetation during long term operation but **Unlikely** in the short term during the 6-month time limited operations phase. If mounding was to occur, it is

expected that impacts will be **Moderate** (potential for stress / death of vegetation). The final risk rating for this event is therefore **‘Medium’**.

It has been determined that additional conditions will be added to the works approval requiring the proper installation of groundwater monitoring bores, baseline groundwater monitoring (water level and quality) prior to the start of time limited operations and continued monthly monitoring of groundwater levels and quality during time limited operations. A limit for standing water levels within the groundwater monitoring bores (4 mbgl) have also been added to the works approval to ensure groundwater mounding does not impact surface vegetation.

Monitoring data will be required to be submitted to the department as part of the time limited operations report. This data will help support the licence amendment application required to operate the new solar drying ponds on a long-term basis. The risk of groundwater mounding impacts will be reassessed at the licence amendment stage which may result in additional regulatory controls being conditioned within the licence to manage this risk.

## 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 20 August 2021	None received	N/A
Local Government Authority advised of proposal on 31 August 2021	02 September 2021 "Northampton Shire Council has no comment to make on the proposed works"	N/A
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal on 31 August 2021	24 September 2021 "The proposed solar drying ponds and bioremediation facility are consistent with the activities proposed in the mining proposal. The Mining Proposal is currently under assessment therefore DMIRS is unable to advise if it is acceptable under the <i>Mining Act 1978</i> at this time."	GMA Garnet Pty Ltd is required to obtain the relevant approval under the <i>Mining Act 1978</i> to commence any proposed work under this works approval application at the Port Gregory Garnet Mine.
Applicant was provided with draft documents on 30 November 2021	Comments received on 20 December 2021. Refer to Appendix 1	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. Email titled “GMA Port Gregory Garnet Hose Resource Works Approval Application 2021” dated 25/07/2021 authored by Steven Petts, available at DWER records (DWERDT482081).
2. Supporting documents shared via One Drive on 26/07/2021 available at DWER records (A2029473).
3. REC 2021, “Tailing Storage Facility Design Report” authored by Resource Engineering Consultants Pty Ltd available at DWER records (A2029473).
4. AECOM 2021, “Hose Mine and Lynton Borefields Groundwater Monitoring Summary - January to December 2020” authored by AECOM Australia Pty Ltd available at DWER records (A2029473).
5. Email titled “Response - GMA Garnet Works Approval Application clarifications requested” dated 17/08/2021 authored by Steven Petts, available at DWER records (A2035634).
6. DER 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
7. Department of Water and Environmental Regulation (DWER) 2019, *Guideline: Decision Making*, Joondalup, Western Australia.
8. DWER 2016, *Guideline: Environmental siting*, Joondalup, Western Australia.
9. DWER 2017, *Guideline: Risk assessments*, Joondalup, Western Australia.

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

Condition	Summary of applicant's comment	Department's response
Condition 1, Table 1	<p>DWER requested design details of decant return system if the applicant planning to construct one as a part of this project.</p> <p>Applicant notified DWER that a decant return system will not be implemented as part of the project.</p>	N/A
Condition 2	<p>"Proposed monitoring bore 4 represents a background monitoring bore. The proposed bore is located approximately 60 metres north of the existing monitoring bore HM08 and upgradient east of Pond 4. GMA request the department to consider removing the requirements regarding the installation of monitoring bore 4. In addition, GMA proposes monitoring HM08 per the requirements detailed in Table 3 of the draft Works Approval."</p>	<p>DWER has considered the applicant's request to remove the requirement of constructing proposed monitoring bore 4 which is in the proximity of monitoring bore HM08.</p> <p>Given the close proximity of the two bores, the location of HM08 being upgradient of the solar drying ponds and the applicant's commitment to monitor the water in HM08 in accordance with the DWER requirements, DWER will remove the requirement to construct proposed monitoring bore 4.</p>

## Appendix 2: Application validation summary

SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)	
<b>Application type</b>	
Works approval	<input checked="" type="checkbox"/>
Date application received	25/7/21
<b>Applicant and Premises details</b>	
Applicant name/s (full legal name/s)	GMA Garnet Pty Ltd
Premises name	Port Gregory Garnet Mine
Premises location	Mining tenements M70/856, M70/204, M70/259, M70/926, M70/927, M70/968, G70/171, M70/1330 and M70/1331.
Local Government Authority	Shire of Northampton
<b>Application documents</b>	
HPCM file reference number:	A2029473 (supporting documents); A2035634 updated application form and attachment 2.
Key application documents (additional to application form):	Attachments 1A,2,3A,3B, 6A, 7
<b>Scope of application/assessment</b>	
Summary of proposed activities or changes to existing operations.	<p>Works approval to:</p> <ul style="list-style-type: none"> <li>• Construct five additional solar drying ponds</li> <li>• Construct and operate bioremediation facility.</li> <li>• Commence use of a flocculant in the existing processing operations</li> </ul>
<b>Category number/s (activities that cause the premises to become prescribed premises)</b>	
<b>Table 1: Prescribed premises categories</b>	
<b>Prescribed premises category and description</b>	<b>Proposed/Assessed production or design capacity</b>
Category 8: Mineral sands mining or processing: premises on which mineral sands ore is mined, screened, separated or otherwise processed.	Assessed – 3,000,000 tonnes per annual period (no change in capacity proposed)
Category 61A: Solid waste facility: premises (other than premises within category 67A) on which solid waste produced on other premises is stored, reprocessed, treated, or discharged onto land.	Proposed - More than 10 000 but no more than 100 000 tonnes per year

**SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)**
**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 <input type="checkbox"/> No <input checked="" type="checkbox"/>	Referral decision No: Managed under Part V <input type="checkbox"/> Assessed under Part IV <input type="checkbox"/>
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Ministerial statement No: EPA Report No:
Has the proposal been referred and/or assessed under the EPBC Act?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Reference No:
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Confirmed by LO in Tenements online that all tenements are held in name of Garnet International Resources Pty Ltd. GMA Garnet Pty Ltd is listed as the contact so satisfied with proof of access. Applicant clarified that that GMA Garnet Pty Ltd is a wholly owned subsidiary of Garnet International Resources Pty Ltd.
Has the applicant obtained all relevant planning approvals?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/>	If N/A explain why? Mining tenure
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes <input type="checkbox"/> No <input type="checkbox"/>	No clearing is proposed.
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	No clearing is proposed.
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Licence/permit No: GWL62130]
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Is the Premises subject to any other Acts or subsidiary regulations (e.g. <i>Dangerous Goods Safety Act 2004</i> , <i>Environmental Protection (Controlled Waste) Regulations 2004</i> , <i>State Agreement Act xxxx</i> )	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Approval under the Mining Act 1978 is required. An updated mining proposal for the proposed activities has been submitted to DMIRS

**SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)**

Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Is the Premises subject to any EPP requirements?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Is the Premises a known or suspected contaminated site under the <i>Contaminated Sites Act 2003</i> ?	Yes <input type="checkbox"/> No <input type="checkbox"/>	Not relevant for this application