Amendment Report

Application for Licence Amendment

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

Licence Number	L9056/2017/1
Licence Holder	Pilgangoora Operations Pty Ltd
ACN	616 560 395
File Number	DER2017/000318
Premises	Pilgangoora Lithium – Tantalum Project Mining Tenements M45/1256 and L45/417 MARBLE BAR WA 6760
Date of Report	7 April 2022
Decision	Revised licence granted

Michael Greenslade

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MANAGER, RESOURCE INDUSTRIES
REGULATORY SERVICES

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

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1. Decision summary

Licence L9056/2017/1 is held by Pilgangoora Operations Pty Ltd (Licence Holder) for the Pilgangoora Lithium – Tantalum Project, also known as the Pilgan Project (the Premises), located at Mining Tenements M45/1256 and L45/417, approximately 88 km south-southeast of the town of Port Hedland and 30 km north-east of the Wodgina mine, in the Shire of East Pilbara, Western Australia

Pilgangoora Operations Pty Ltd is a 100% subsidiary of Pilbara Minerals Limited (PLS) which operates the Pilgangoora Project in the north-eastern Pilbara region of Western Australia. The Pilgangoora Project comprises Lithium-Tantalum mining from several pits across two adjacent project areas, namely:

- Pilgangoora Lithium – Tantalum Project (The Pilgan Project) (Licence L9056/2017/1) which commenced mining in March 2018, and
- The Ngungaju Project (Licence L9036/2017/1), which commenced mining in early 2019, and was acquired from Altura Mining Limited in January 2021.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during the operation of the Premises. As a result of this assessment, Revised Licence L9056/2017/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this Amendment Report, the department has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary

On 25 August 2021, the Licence Holder applied to the department to amend Licence L9056/2017/1 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

- Increase the design capacity under *Category 64: Putrescible landfill* from 5,000 tonnes/year to 10,000 tonnes/year. Increase the size of the landfill area and include the acceptance of waste from the Ngungaju Project. Refer to section 2.2.1 for further detail.
- Increase the design capacity reported under *Category 54: Sewage facility*, from 125 m^3/day to 150 m^3/day. Refer to section 2.2.2 for further detail.
- Condition 5, Table 6 - Exempt the Tailing Thickener from the requirements of having a concrete bund with 110% capacity of the tank, and drainage to the process water pond. Refer to section 2.2.3 for further detail.
- Condition 12 - Modify the SWL trigger and limit of PWB005, TMFMB04 and TMFMB05. Refer to section 2.2.4 for further detail.
- Condition 14 - Modify the timeframe to notify exceedances of Gross Alpha and Gross Beta. Refer to section 2.2.5 for further detail.
- Condition 12, Table 8 - Replace Monitoring Bore PMB002 of the Monitoring Schedule, with Monitoring Bore PWE033. Refer to section 2.2.6 for further detail.

- Condition 15, Table 9 - remove duplicated references to either "*Sulfate, SO4"* or "*Sulphate, SO4"*. Refer to section 3.5 for further detail.

This amendment is limited to changes to Category 5, 54 and 64 activities from the Existing Licence. No changes to the aspects of the existing Licence relating to Category 52 or 73 have been requested by the Licence Holder.

Table 1 below outlines the proposed changes to the existing Licence.

Table 1: Proposed throughput capacity changes

Category	Current throughput capacity	Proposed throughput capacity	Description of proposed amendment
Category 5: Processing or beneficiation of metallic or non-metallic ore	2,000,000 tonnes per annum processed ore 1,680,000 tonnes tailings produced.	No change to production capacity	Exempt the Tailing Thickener from the requirements of having a concrete bund with 110% capacity of the largest tank, and drainage to the process water pond.
Category 52: Electric power generation	15.7 MW	No change	N/A
Category 54: Sewage facility	125 $m^{3/}$day	150 m^3/day	The occupancy of the Carlindi Camp needs to increase, as does the wastewater treatment plant (WWTP) treatment capacity.
Category 64: Class II Putrescible landfill	Increase from 5,000 tonnes per annum	10,000 tonnes per annum.	Increase the size of the landfill area by 1 ha, and include the acceptance of waste from the Ngungaju Project (L9036/2017/1)
Category 73: Bulk storage of chemicals	1,036 m^3 in aggregate	No change	N/A

2.2.1 Increase the design capacity reported under *Category 54: Sewage facility*, from 125m^3/day to 150m^3/day.

The Licence Holder has proposed to increase the treatment capacity of the premises wastewater treatment plant (WWTP), based on increased capacity of the Carlindi Camp. Based on a revised average output of 327 litres per person per day (from the previous 250 L/person/day) and assuming full capacity of the camp (458 people), the required treatment capacity of the plant will increase from 125 m^3/day to 150 m^3/day.

The WWTP is a Moving Bed Bioreactor (MBBR) sewage treatment plant that came to the Premises fully assembled and factory tested. The WWTP has previously undergone staged upgrades and increases to operating capacity as the need for wastewater treatment has grown, from a capacity limit of 50 m^3/day (28/09/2017) to 125 m^3/day (27/06/2018). These changes to Category 54 were assessed and authorised through previous amendments to Works Approval W6051/2017/1.

The Licence Holder notes that the proposed additional capacity to 150m^3 per day is still within the original treatment design capacity of the WWTP, and no alteration to the onsite WWTP is required.

As the per the calculation provided the Licence Holder in Table 2 below, the current spray field area of 3.04 ha is adequate for the proposed discharge volume, and that no additional disturbance is required.

Table 2: WWTP irrigation field size calculation

Wastwater Treatment Plant - Irrigation Field Size Calculator	
Number of people in Camp	458
WWTP Phosporus output manufacturer spec (mg/L)	5
WWTP Nitrogen output manufacturer spec (mg/L)	20
Eutrophication Risk from Table 1 - page 9 of WQPN22 (A, B, C, D)	d
Average water use (L/person/day)	327
Volume of wastewater (kL/day)	149.766
Allowable P application rate (kg/ha/yr) from WQPN22	120
Allowable N application rate (kg/ha/yr) from WQPN22	480
Suggested Irrigation Area (ha) (min area +10%)	**2.51**

The Delegated Officer notes that water sample analysis provided to the department through annual environment reporting for the period 2020/21 for WWTP effluent indicate that total dissolved solids (TDS) were recorded between 1,900 to 3,500 mg/L, within the limit of 4,000 mg/L.

While trigger and limits are not set in the Licence for total nitrogen (TN) or total phosphorous (TP), the WWTP is operated to meet emission standards of total nitrogen <30 mg/L and total phosphorous <7.5 mg/L. Water sample analysis of WWTP effluent, reported in the Annual Environmental Report for 2020/2021, show that TN was between 2.8 and 4.6 mg/L and TP was between zero (0 mg/L) and 1.2 mg/L.

2.2.2 Increase the landfill design capacity from 5,000 tonnes/year to 10,000 tonnes/year.

The Ngungaju Project mine site, acquired by the Licence Holder in January 2021, does not have a landfill. The Licence Holder has proposed to use the existing landfill at the Pilgan Project to dispose of putrescible waste, inert waste, and waste tyres from the Ngungaju Project. As part of this amendment, the Licence Holder has proposed to;

- increase the design capacity for Category 54 from 5,000 tonnes/year to 10,000 tonnes/year; and
- increase the footprint of the existing landfill on the premises by one hectare as per Figure 1 below.

The Licence Holder has proposed a maximum of 10,000 tonnes of putrescible, inert waste types 1 and 2 and contaminated solid wastes to be disposed of into the west waste dump per annum. Putrescible, inert and contaminated solid waste is to be placed in separate trenches within the landfill. More trenches will be implemented as required.

The Licence Holder has proposed to maintain the existing operational controls on the landfill as per Licence L9056/2017/1. Figure 1 below shows the proposed location of the landfill extension, which remains outside flood levels of a 1 in 100-year rain event.

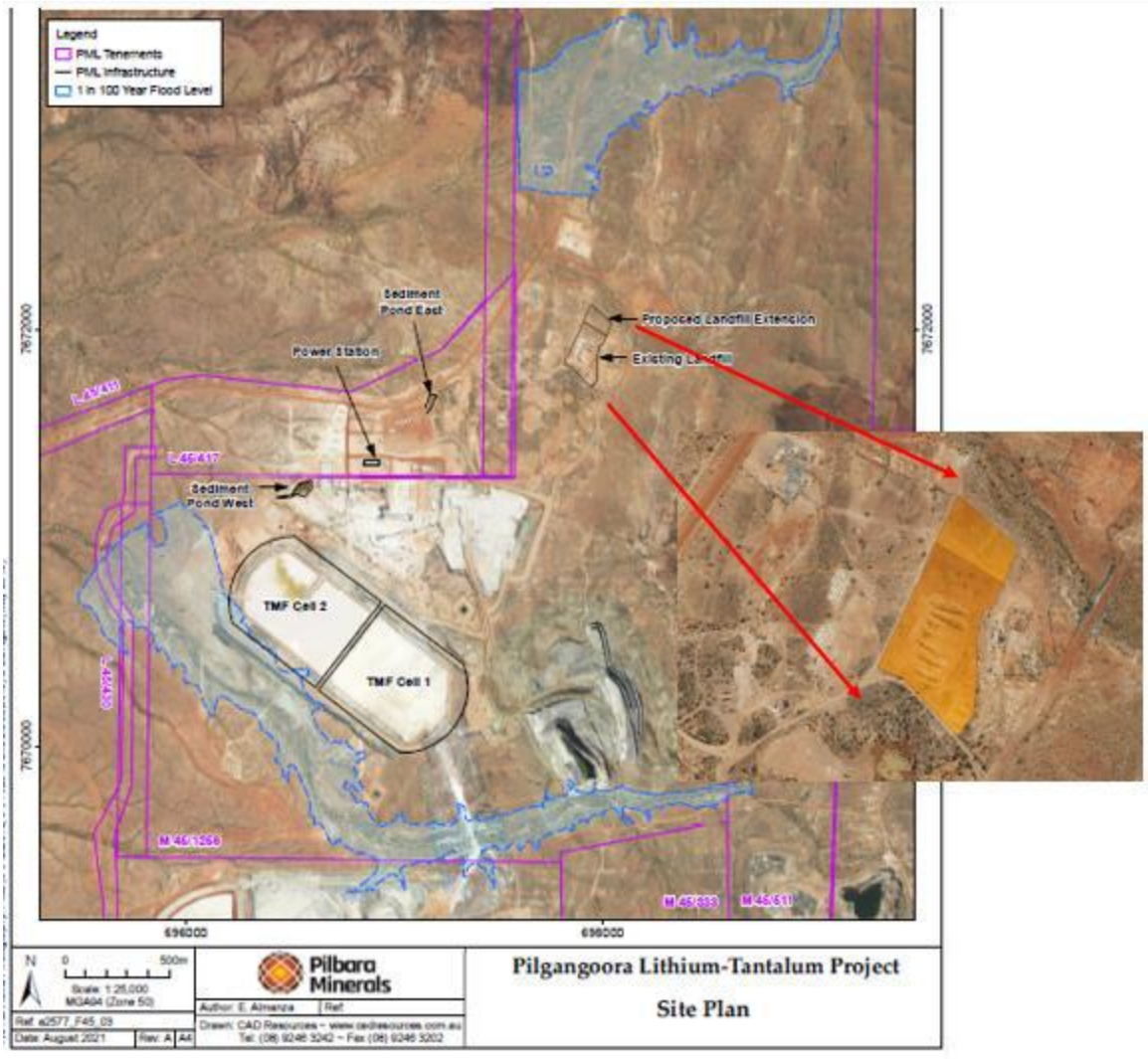

Figure 1: Landfill location

2.2.3 Change to Condition 5, Table 6 - Exempt the Tailing Thickener from the requirements of having a concrete bund with 110% capacity of the tank and drainage to the process water pond.

The Licence Holder has requested that tailings thickener of the Pilgan Plant be exempt from the requirements of having a concrete bund with 110% capacity of the tank, and drainage to the process water pond.

The Licence Holder states that given the location of the thickener and the existing drainage lines in the area, any spill from the thickener would drain into the sediment pond (west) as shown in Figure 2 below.

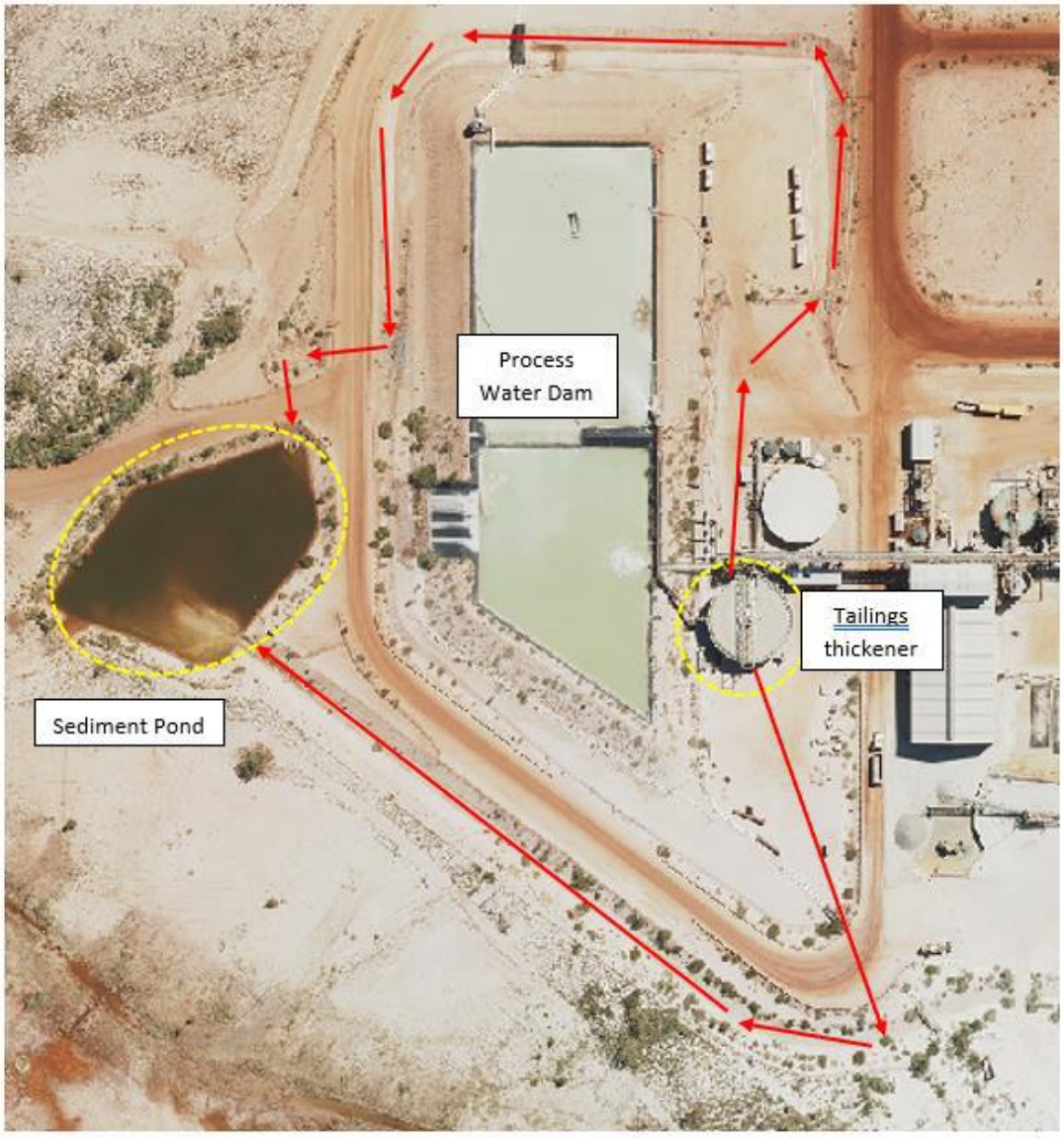

Figure 2: Estimated drainage from tailings thickener into sediment pond

2.2.4 Modify the SWL trigger and limit of PWB005, TMFMB04 and TMFMB05.

Following rising groundwater levels surrounding the Pilgan tailing management facility (TMF), Pilbara Minerals Limited commissioned consultancy Groundwater Resource Management Pty Ltd (GRM) to complete an assessment into the possible causes (GRM 2021).

The GRM study detailed that groundwater level data from six of the ten installed groundwater monitoring bores surrounding the Pilgan TMF have exceeded one or both Standing Water Level (SWL) trigger and limit levels imposed by Licence L9056/2017/1. The monitoring bores which exceeded the SWL trigger level are PWB005, PWBMB004, TMFMB01, TMFMB02, TMFMB04 and TMFMB05.

- Production bore PWB005 has formed one of the primary water supply bores for the duration of the project (GRM, 2021). SWL monitoring data from PWB005 has tended to be to uniform throughout the reporting period with only one exceedance in the SWL nominated trigger level for a brief period in June 2020. Given that the bore is located approximately 1.5 km north of the TMF, the GRM report indicates this is more likely that this rise is due to seasonal fluctuation, than to seepage from the TMF.
- Monitoring bore PWBMB004 is located adjacent to water supply bore PWB004, which has been in operation for the duration of the project. The monitoring bore is also located adjacent to Pilgangoora Creek and shows seasonal fluctuation. The bore is approximately 150 m south of the TMF, which is up-hydraulic gradient from the TMF. SWL in this bore exceeded the trigger value intermittently in March 2020, January 2021 and May 2021. Water quality data (pH, TDS, and lithium) for this bore does not indicate any significant trends. GRM suggest that the data indicates that the bore is responsive to rainfall recharge, and that there is no clear evidence of seepage from the TMF.
- Monitoring bore TMFMB01 is located approximately 300 m to the north-west of the TMF, which is directly down-hydraulic gradient of the TMF. The monitoring bore is over 1 km from the nearest water supply bore and is therefore not likely to be significantly impacted by drawdown from groundwater abstraction. The bore exceeded the SWL trigger level in April 2020, with groundwater levels continuing to rise, exceeding the limit level in January 2021. The water level monitoring data indicates rising groundwater levels immediately following high rainfall events, however, SWL does not fall during the dry winter periods, which would be the usual pattern of seasonal variation. This trend is either considered to be the result of above average rainfall in recent years or indicative of groundwater seepage from the TMF. Groundwater quality data shows a rising trend in lithium, which may be indicative of seepage from the TMF.
- Monitoring bore TMFMB02 is located approximately 300 m to the northeast of the TMF. The bore exceeded the SWL trigger value in November 2019, with groundwater levels continuing to rise, exceeding the limit level in February 2020. The groundwater level shows a similar trend to the groundwater levels observed in TMFMB01, which may be the result of above average rainfall in recent years or may indicate groundwater seepage from the TMF. The groundwater quality data shows a rising trend in lithium and TDS, which may be indicative of seepage from the TMF.
- Monitoring bore TMFMB04 is located approximately 300 m to the south of the TMF, within 150 m from water supply bore PWB004. The bore is located on the southern bank of the Pilgangoora Creek, which is the opposite side of the creek to the TMF and PWB004 and is up-hydraulic gradient from the TMF. The groundwater level trend is very similar to that of TMFMB01 and TMFMB02. However, there are no clear trends in the groundwater quality data. The bore exceeded the SWL trigger value in November 2019 and has continued to exceed either the trigger value or limit value since this time. The location of the bore (i.e. up-hydraulic gradient) of the TMF, and groundwater quality data suggest that the rising groundwater level in this bore may be the result of

natural seasonal variability.

- Monitoring bore TMFMB05 is located approximately 300 m to the southwest of the TMF, adjacent to the Pilgangoora Creek and at least 900 m from the nearest water supply bore (PWB004). The bore is not likely to be impacted by groundwater abstraction. The groundwater level data demonstrates a typical seasonal variation, with groundwater levels rising following high rainfall events and falling during the dry winter periods. The water quality data does not show any obvious trends in lithium, TDS or pH. However, the bore has reported exceedances of both the trigger and limit values since May 2020. The data suggests that the rising groundwater levels reported in this bore are likely to be due to natural seasonal variation.

The GRM 2021 report references long term rainfall data from the Bureau of Meteorology's (BoM's) Indee Station. This rainfall data indicates that the long-term average rainfall for the region is in the order of 335 mm per year.

Previous groundwater monitoring reports for the project (GRM 20211, GRM 20202, GRM 20193) indicate that the annual rainfall from the site rain gauge has been above average for the past two years, with over double the annual rainfall reported during 2020.

According to the GRM report (GRM 2021), groundwater quality data suggests that the rising groundwater levels in PWB005, TMFMB04 and TMFMB05 are not likely to be the result of seepage from the TMF and are instead likely to be the result of natural seasonal variation.

As a result, the Licence Holder propose to amend Condition 12, Table 8 of L9056/2017, and change the SWL trigger (7 mbgl) and limit (5 mbgl) of PWB005, TMFMB04 and TMFMB05, to 5 mbgl and 3 mbgl respectively.

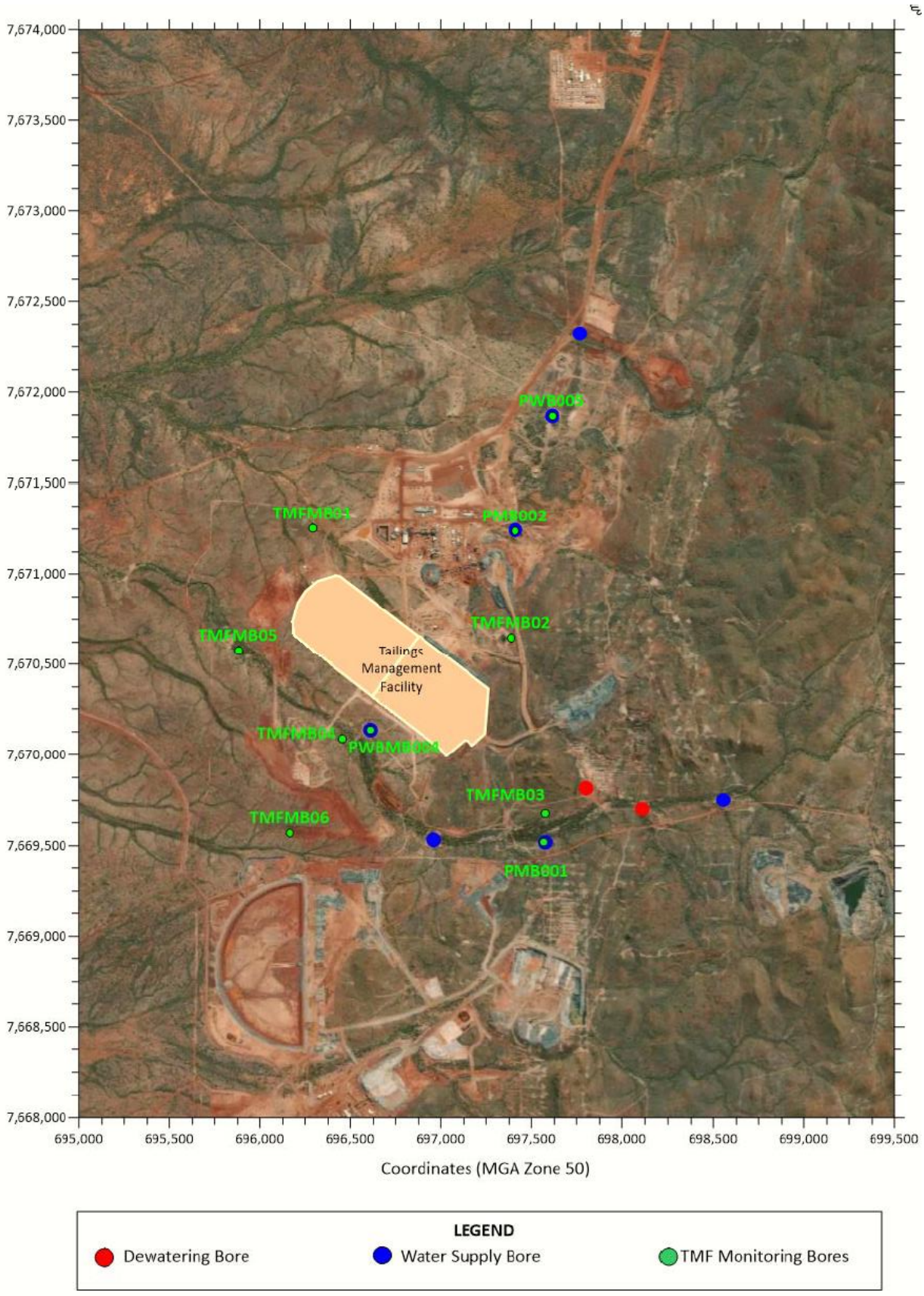

Figure 3: Monitoring bore locations

2.2.5 Modify notification requirements for exceedances of Gross Alpha and Gross Beta.

Under Condition 14 of L9056/2017, any exceedance of a trigger and/or limit shall be immediately notified to the CEO. This includes trigger levels of Gross Alpha and Gross Beta, which under Table 8 of Condition 12 are used to prompt sampling of Radium 226 and Radium 228.

The Licence Holder proposes to exempt elevated results of Gross Alpha and/or Gross Beta of the requirement to be immediately notified, and defer that notification when/if required, to the Annual Environmental Report.

2.2.6 Condition 12, Table 8 - Replace Monitoring Bore PMB002 from the Monitoring Schedule, with Monitoring Bore PWE033.

Monitoring Bore PMB002 is located at the base of the ROM of the Project, but the Licence Holder has indicated that the volume of traffic in this area has increased significantly in the past few months, and this will increase in the future. The current bore location restricts the efficient operation of the ROM. Due to operational requirements and an increased use of the ROM at the Pilgan Project, the Licence Holder has requested that Groundwater Monitoring Bore PMB002 be decommissioned, and an alternative groundwater monitoring bore be used for reporting purposes. Refer to Figure 4.

Figure 4: Location of PMB002 and proposed monitoring bore PWE033, overlaid with geological formations.

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 operation which have been considered in this Amendment Report are detailed in Table 3 below. Table 3 also details the proposed control measures the Licence Holder has proposed to assist in controlling these emissions, where necessary.

Table 2: Licence Holder controls

Emission	Sources	Potential pathways	Proposed controls
Dust	Category 64: Class II *Putrescible and inert landfill*. Construction of the additional landfill cells	Air/windborne pathway	No additional controls specified. No residence or sensitive land uses within 20 km of the Premises.
Noise	Category 64: Class II *Putrescible and inert landfill*. Construction of the additional landfill cells	Air/windborne pathway	No additional controls specified. No residence or sensitive land uses within 20 km of the Premises.
Leachate	Category 64: Class II *Putrescible and inert landfill*. Increase design capacity from 5,000 tonnes to 10,000 tonnes per annum. Include acceptance of putrescible water, inert waste and tyres from Ngungaju Lithium Operations	Seepage to soils and groundwater	The Licence Holder propose to continue the monitoring regime under the existing Licence conditions and routine inspections.
Windblown waste	Category 64: Class II putrescible and inert landfill. Increase design capacity from 5,000 tonnes to 10,000 tonnes per annum. Include acceptance of waste from Ngungaju Lithium Operations	Air/windborne pathway creating litter and attracting fauna	No additional controls specified.

Emission	Sources	Potential pathways	Proposed controls
Tailings	Category 5: significant failure or overflow event from tailings thickener.	Tailings overland flow, or through the soil	The Licence Holder has installed drainage systems around the Tailings Thickener, as per Figure 2. Any discharge from the Tailings Thickener will report to a site sediment pond. To ensure sufficient containment capacity for the Tailings Thickener, freeboard markers are to be installed at the sediment pond. Freeboard markers will be included and checked in the daily visual inspections.
	Category 5 Overtopping of the tailings thickener	Local, direct discharge to land	No additional controls specified. Engineering controls already in place have been developed in line with regulatory approvals and requirements.
Liquid waste spills and leaks	Category 54: Sewage facility increase from 125m^3/day to 150m^3/day Operation of the WWTP including discharge to irrigation spray	Direct discharge to land	No additional controls specified.
Irrigated wastewater (containing P and N)		Direct discharge to land (irrigation field)	No additional controls specified.
Excess irrigated wastewater		Waterlogging of soils causing overland flow	No additional controls specified.

3.1.2 Receptors

In accordance with the *Guideline: Risk assessments* (DWER 2020), the Delegated Officer has excluded employees, visitors, and contractors of the Licence Holder's 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 below provides a summary of potential human and environmental receptors that may be impacted because of activities upon or emission and discharges from the prescribed premises *(Guideline: Environmental siting* (DWER 2020)).

Table 4: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Residential Premises	Wallareenya Homestead more than 30 km north of the Premises. Indee Station more than 30 km northwest of the Premises. South Hedland more than 75 km north of the Premises.

Altura Lithium Operations Pty Ltd Accommodation Camp (ex-Roy Hill Infrastructure Rail Construction Camp 2)	More than 20 km from the Premises.
Wodgina Mine Camp	More than 30 km southwest of the Premises.
Industrial receptors	Altura Pilgangoora Project adjacent tenements (M45/1230 and M45/1231). Wodgina Mine 60 km southwest of the Premises. Altura Lithium Operation (under construction) approximately 3 km southwest of the Premises.
Environmental receptors	**Distance from prescribed activity**
Threatened/Priority Flora	No threatened or priority flora has been identified using publicly available GIS datasets. A study conducted by M & M Walter Consulting – Environmental (MMWC) has identified the presence of "one species listed as Threatened Flora under the Wildlife Conservation Act 1050 (WA) is considered as possible to occur in the survey area: *Pityrodia* sp. Marble Bar" (MMWC, July 2016).
Threatened/Priority Fauna	Conservation significant species have been recorded in the survey area. These include the Rainbow Bee-eater listed under the EPBC Act, the Pilbara Leafnosed bat listed under the EPBC Act, and the Western Pebble-mouse listed under the Wildlife Conservation Act 1950 (WA) (360 Environmental, 2016).
Threatened Ecological Communities and Priority Ecological Communities	There are no Threatened Ecological Communities or Priority Ecological Communities within or in a 30 km radius of the Premises.
Department of Biodiversity, Conservation and Attractions - Managed Lands and Waters	Mungaroona Range Nature Reserve boundary is located approximately 82 km south-west of the Premises.
Public Drinking Water Sources Area (PDWSA)	There are no PDWSA within the Premises.
RAMSAR wetland	No RAMSAR wetlands within 30 km radius of the Premises.
Surface water and groundwater resources	There are two freshwater creeks within the Premises boundary (Houston and Pilgangoora Creeks) that flow during high rainfall events, and there is a creek line identified 120 m to the west of the WWTP irrigation area. The depth to groundwater within the vicinity of the WWTP area and spray field is approximately 15 m.

3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for those emission sources which are proposed to change and considers potential source-pathway and receptor linkages as identified in section 3.1.2. Where linkages are incomplete they have not been considered further in the risk assessment.

Where the Licence Holder has proposed mitigation measures/controls (as detailed in section 3.1.1), these have been considered when determining the final risk rating. Where the Delegated Officer considers the Licence Holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

Additional regulatory controls may be imposed where the Licence Holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 5.

The Revised Licence L9056/2017/1 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises i.e., Category 5: Thickener container requirements, Category 54: Sewage facility, and Category 64: Class II putrescible and inert landfill operations.

The conditions in the Revised Licence have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 5: Risk assessment of potential emissions and discharges from the Premises during construction, and operation

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
Construction								
Category 64: Class II *Putrescible and inert landfill*. Construction of the additional landfill cells	Dust	N/A	No receptors	Refer to section 3.1.1	C = Slight L = Rare **Low Risk**	Y	N/A	No residences or sensitive land uses within 20 km of the Premises. The Delegated Officer considers that the provisions of the *Environmental Protection (Noise) Regulations 1997* and section 49 of the EP Act are sufficient to regulate noise and dust emissions during operation of the landfill.
	Noise			Refer to section 3.1.1	C = Slight L = Rare **Low Risk**	Y	N/A	
Operation								
Category 64: Class II putrescible and inert landfill. Increase design capacity from 5,000 tonnes to 10,000 tonnes per annum. Include acceptance of waste from Ngungaju Lithium Operations	Leachate	Seepage into soils and groundwater from the base of the landfill cells	Groundwater dependent ecosystems or vegetation communities	Refer to section 3.1.1	C = Slight L = Possible **Low Risk**	Y	Condition 4, 5 (Table 6)	The Delegated Officer notes that groundwater monitoring bore PWB005 is 250 m west of the landfill. Standing water levels were measured during the 2020/2021 Annual Environmental Report period at between 8.7 to 17.01 mbgl (average depth of about 13 mbgl), and no exceedances were observed for ambient groundwater monitoring parameters during the 2020/2021 reporting period. The Delegated Officer considers that leachate emission from the expansion of the landfill is not occur in most circumstances. Based on the location and distance to the nearest sensitive receptors, and the small scale of the landfill, the Delegated Officer considers that the impact of waste disposal and leachate from the landfill will likely only result in minimal off-site impacts on a local scale. The controls on the existing licence are considered sufficient to manage the risks associated with increase in design capacity and waste acceptance.

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
	Windblown waste	Air/windborne pathway creating litter and attracting fauna	Vegetation and Fauna	Refer to section 3.1.1	C = Slight L = Possible **Low Risk**	Y	Condition 4, 5 (Table 6)	N/A
Category 5: significant failure or overflow event from tailings thickener	Tailings	Tailings overland flow, or through the soil	Vegetation and fauna	Refer to section 3.1.1	C = Moderate L = Unlikely **Medium Risk**	Y	Condition 5 (Table 6)	Refer to detailed assessment in section 3.3
Category 5 Overtopping of the Tailings Thickener		Direct discharge to land	Soil and/or vegetation	Refer to section 3.1.1	C = Minor L = Possible **Medium Risk**	N	Condition 5 (Table 6)	
Category 54: Sewage facility increase from 125m^3/day to 150m^3/day Operation of the WWTP including discharge to irrigation spray	Liquid waste spills and leaks from treatment and conveyance infrastructure	Direct discharge to land	Vegetation adjacent to discharge area and soil	Refer to section 3.1.1	C = Moderate L = Unlikely **Medium Risk**	Y	Condition 5 (Table 6)	In reviewing the operation of the existing WWTP, the Delegated Officer notes that to date, there have been no reported leaks from WWTP infrastructure or unauthorised discharges to the environment. The Delegated Officer also notes that the WWTP has a contingency storage capacity for up to 2 days of normal flow (at 150 m3/day) if discharge is suspended. The Delegated Officer also notes that given the distance, nearby sensitive receptors are unlikely to be impacted by an increase to daily throughput. The Delegated Officer considers the controls on the existing licence are sufficient to manage to the risk from direct spills or leaks from the WWTP.
	Irrigated wastewater (containing P and N)	Direct discharge to land (irrigation field)	Soil and/or vegetation	Refer to section 3.1.1	C = Minor L = Possible **Medium Risk**	Y	Condition 5 (Table 6)	

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
	Excess irrigated wastewater	Waterlogging of soils causing overland flow	Native vegetation	Refer to section 3.1.1	C = Minor L = Rare **Low Risk**	Y	Condition 5 (Table 6)	With the current spray field larger than the required 2.51 ha, the Delegated Officer considers the risk of on-site/local scale impacts to be low and agrees to the proposal to increase Category 54 from 125 m^3/day to 150 m^3/day

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

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

3.3 Detailed risk assessment – tailings thickener bunding

The Licence Holder has proposed that the tailings thickener be unbunded. This could potentially lead to discharges of tailings, tailings thickener decant water, and flocculent entering the terrestrial environment through leakage or rupture of the tailings thickener.

The Delegated Officer has determined that there are two separate risk events related to the proposal;

1) A significant failure of containment, or other some sequence of event where tailings were left to uncontrollably discharge from the tailings thickener for a significant amount of time,
2) Smaller discharge of tailings, decant water and/or flocculent due to overtopping of the tailings thickener.

3.3.1 Overview of failure of containment risk event

Leaks/spills of tailings may contaminate soils, smother vegetation, and have toxic effects on terrestrial and freshwater ecosystems (Pilgangoora Creek). Infiltration of significant quantities of tailings decant water may result in soluble contaminants leaching through the soil profile to affect local groundwater quality and may impact on the beneficial use of groundwater.

The Licence Holder proposes to use existing drainage lines to direct any major spills or leaks from the tailings thickener to the sediment pond downslope, 130 m to the west. This will act as containment facility in the event of a spill or overflow event. The Licence Holder has conducted a survey of the sediment pond and has confirmed that its containment capacity is 4,145 kL, which is more than the current 1,901 kL capacity of the tailings thickener.

The Licence Holder has proposed the controls listed in Table 3 and will continue to monitor and maintain the infrastructure as per conditions in Licence L9056/2017/1.

3.3.2 Premises process water ponds

Notwithstanding the controls and containment capacity of the sediment pond, the Delegated Officer is aware of a number of events in which the premises process water ponds have reached and exceeded 100% capacity, overflowing into the sediment pond. The Annual Environment Report for 2020/2021 notes two such occurrences in the 12-month reporting period (18 March 2021 and 21 April 2021). More recently the Licence Holder notified the department that overtopping of the process water pond and sediment pond occurred on 18 February 2022, with process water flowing into the adjacent creek line. The area affected by this most recent event was 0.4 ha, confined to the creek line.

Referring to infrastructure details in Licence L9056/2017/1, the Delegated Officer understands that the process water ponds include two cells. Cell 2 has a total capacity of 15 ML, while Cell 1 has a capacity of 9.2 ML. A freeboard of 300 mm is to be maintained in the pond, with visual markers and float cut-off system installed to prevent overflow. Runoff from the process water ponds into the sediment pond should only be occurring following a significant weather event.

3.3.3 Tailings and leachate characterisation

As part of the original licence application for L9056/2017/1, the Licence Holder conducted testing on the tailings leachate material. The conclusion of the report by Campbell and Associates Pty Ltd (September 2016) was that the waste materials are “inert with near-zero risk for water quality impacts when left in a free-draining state.” Furthermore, the report states that “in terms of drinking-water quality, the leachates are essentially potable”.

At the request of DWER additional testing was conducted and additional tailings leachate testing using the USEPA LEAF 1313 testing methodology was completed (February 2019). The results

of this testing were reviewed by the department, and it was confirmed that the tests were carried out appropriately and the tailing leachate is unlikely to cause significant environmental impacts.

Details from the licence application and decision report for L9056 (DWER, July 2019) indicate that about 3 tonnes of *Magnafloc 333* flocculation agent are used per month during the tailing thickening process. A review of the safety data sheet indicates that while absorption to soil is expected, *Magnafloc 333* (chemical nature: polyacrylamide) is not readily biodegradable and bioaccumulation is not expected.

3.3.4 DWER determination – risk associated with failure of containment

While it is noted that the sediment pond has overtopped on a number of occasions in the last 12-month reporting period, the Delegated Officer understands that an investigation of the latest overtopping event is currently underway by the Licence Holder. The Delegated Officer understands that previous overflow events were also investigated by the departments Compliance and Enforcement directorate. The Delegated Officer considers that the onsite management of process water to be outside the scope of this assessment and that this issue is being managed separately. The Delegated Officer understands that various remediation measure have already been implemented to address the overflow events from the process water ponds.

Given the relatively inert nature of the tailings leachate material, the Delegated Officer considers the consequences from associated with the risk event to be Moderate.

In considering the likelihood of a significant failure or discharge from the tailings thickener, and the capacity of the sediment pond during normal operations to act as containment facility, the Delegated Officer considers the likelihood of this risk event to be unlikely. The Delegated Officer therefore considers that the proposed controls to manage the risk of significant failure or discharge from the tailings thickener are sufficient and has amended the infrastructure requirements on the licence for the tailings thickener.

3.3.5 Overview of overtopping of tailings thickener risk event

Infiltration of significant quantities of tailings decant water may result in soluble contaminants leaching through the soil profile to affect local groundwater quality and may impact on the beneficial use of groundwater.

The Delegated Officer notes that the Licence Holder has not proposed any additional controls to manage leaks or overflow events from the tailings thickener (aside from existing engineering controls are already in place). The Delegated Officer also notes that the Licence Holder has not detailed any additional controls for the cleanup of more localised spills.

3.3.6 DWER determination – risk of thickener overtopping

While the Delegated Officer considers a significant spill of tailings from the tailings thickener to be unlikely, the likelihood of risk events associated with smaller scale process failures, spills or overtopping from the tailings thickener is possible. As the Licence Holder has not provided any additional controls to mitigate this event occurring, the Delegated Officer has included controls to mitigate overflow flow events (level alarms be installed on the tailings thickener to manage flow, and prevent localised spill events), and for spill cleanup and recovery.

3.4 Risk assessment – remaining proposed amendments

The Delegated Officers has considered the remaining requested amendments as below:

Condition 12 - Modify the SWL trigger and limit of PWB005, TMFMB04 and TMFMB05.

The Delegated Officer notes the above detail in section 2.2.4. While seepage management from the TMF is currently under investigation by department, the Delegated Officer considers that there is enough evidence to support the Licence Holder's assessment of seasonal SWL

variation in the respective monitoring bores. The proposed changes to SWL trigger and limit of PWB005, TMFMB04 and TMFMB05 have been included in the revised Licence. It is noted that issues regarding seepage management from the TSF are likely to be considered in future TSF embankment raises.

Condition 14 - Modify the timeframe to notify exceedances of Gross Alpha and Gross Beta.

The Delegated Officer notes that in accordance with Licence condition 12, the Licence Holder is already required to conduct six monthly sampling of Radium 226 and Radium 228 and must continue to do so independently of future results of Gross Alpha and Gross Beta.

The Delegated Officer agrees that this 'double reporting' puts an unnecessary regulatory burden on the Licence Holder. The department's Principal Hydrologist advised using the existing measurements of Gross Alpha, Gross Beta and radium isotope measurements to characterise the potential risks to ecological receptors in the creek downstream of the TMF, and that it was not considered to be necessary to undertake any further speciation of the gross radiological indicators. The Delegated Officer considers the proposed amendment to the wording of Condition 14 acceptable and the licence condition updated accordingly.

Condition 15, Table 9 - remove duplicated references to either "*Sulfate, SO4"* or "*Sulphate, SO4".*

The Delegated Officer considers this a typographic change that does not alter risk and agrees to this change. While 'sulphate' is traditionally used in British English, 'sulfate' is the spelling recommended by the International Union of Pure and Applied Chemistry (IUPAC), so 'sulfate' will remain referenced in the Revised Licence.

Condition 12, Table 8 - Replace Monitoring Bore PMB002 of the Monitoring Schedule, with Monitoring Bore PWE033.

The Licence Holder engaged GRM (GRM August 2021) to assess the suitability of nearby bores as a replacement for Monitoring Bore PMB002. GRM determined resource drill-holes PWE032 and PWE033 to be suitable replacement locations, in terms of achieving monitoring of standing groundwater levels.

The Licence Holder propose Monitoring Bore PWE033 be used as an alternative to replace Monitoring Bore PMB002. PWE033 is located outside the ROM and about 300 m to the north, situated along similar regional geological formations and GRM and the Licence Holder indicate that as per GRM Technical Memorandum, the proposed bore is considered a suitable replacement.

The Delegated Officer considers the proposed replacement of PMB002 with PWE033 to be acceptable and has updated the monitoring schedule of Licence L9056/2017/1.

4. Consultation

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

Table 6: Consultation

Consultation method	Comments received	Department response
Licence Holder was provided with draft amendment on 31 March 2022.	A comment was received from the Licence Holder on the 1 April 2022 and the remainder of the consultation period was waived. Regarding the condition for the tailing thickener to be fitted with a level alarm, the Licence Holder does not believe this would be practical, as the tailings thickener operates at 100% capacity and the overflow from the tailings thickener is decanted to the process	Considering the risk of overtopping is managed by directing overflow to the process water ponds, the Delegated Officer considers that the additional controls proposed be the

	water pond. The alternative controls in place, that would detect spills/leaks, include: - tailings thickener has bed level alarm linked to the control system, which indicate if there was a leak in the tailings thickener; - constant monitoring via digital CCTV cameras; and - visual inspection of the area at least twice a day (once per shift).	Licence Holder are acceptable. These controls have been added to the revised Licence.

5. Conclusion

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a Revised Licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

5.1 Summary of amendments

Table 7 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Revised Licence as part of the amendment process.

Table 7: Summary of licence amendments

Condition no.	Proposed amendments
Cover page	Increase assessed production / design capacity of Category 54 to 150 m^3/day and Category 64 to 10,000 tonnes per annum.
4 Waste acceptance	Reworded to allow the acceptance of waste proceeding from Ngungaju mine site.
5, Table 6 Processing plant	Reworded Tailing Thickener section on Processing Plant of Table 6 of Condition 5 to remove bunding requirements. Premises sediment pond to contain material in the evet of ta spill. Insert condition requiring the Tailing Thickener to be fitted with a bed level alarm, CCTV monitoring and regular visual inspections. Inclusion of requirements for clean up and removal of spilled tailings material.
5, Table 6 WWTP	Increase treatment capacity from 125 m^3/day to 150 m^3/day.
5, Table 6 Landfill	Increase capacity from 5,000 tpa to 10,000 tpa.
12, Table 8	Remove reference to monitoring bore PMB002, and add monitoring bore PWE033
	Amend Condition 12, Table 8 of L9056/2017, and change the SWL trigger (7 mbgl) and limit (5 mbgl) of PWB005, TMFMB04 and TMFMB05, to 5 mbgl and 3 mbgl respectively.
14	Amend Condition 14 to remove Gross Alpha and Gross Beta from the requirement to immediately notify the CEO when trigger level and/or limit has been exceeded.
15, Table 9	Remove reference to “Sulphate, SO_4”

Schedule 1: Maps	Replace Figure 1: Site Plan with updated version, showing larger landfill area. Removed unnecessary Figure 2 and adjusted Licence numbering.
Schedule 1: Maps Figure 5: Location of bores	Replace Figure 5: Location of bores.
Schedule 2: Primary Activities Table 13	Increase Premises production or design capacity of Category 54 to 150 m^3/day and Category 64 to 10,000 tonnes per annum.

References

1. Pilbara Minerals 2021, Pilgangoora Lithium-Tantalum Project, L9056/2017/1 Licence amendment application and supporting information, West Perth, Western Australia.
2. Pilbara Minerals 2021, Pilgangoora Operation Pty Ltd *Annual Environmental Report L9056/2014/1 Reporting Period 07/07/2020 - 30/06/2021*, West Perth, Western Australia.
3. Groundwater Resource Management (GRM) June 2021, *Pilgan TMF Groundwater Levels* Technical Memorandum, Wembley, Western Australia.
4. Groundwater Resource Management (GRM) August 2021, *Pilgangoora Project Monitoring Bore PMB002 Replacement* Technical Memorandum, Wembley, Western Australia.
5. MAK Water 2018, Budget Quotation *Pilbara Minerals Pilgangoora Stage 2 – Sewage Treatment Plant (Option 3)*, Malaga, Western Australia.
6. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
7. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Joondalup, Western Australia.
8. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Risk Assessments*, Joondalup, Western Australia.

Appendix 1: Application validation summary

SECTION 1: APPLICATION SUMMARY					
Application type					
Amendment to licence	☒	Current licence number:	L9056/2017/1		
		Relevant works approval number:	W6051/2017	N/A	☒
Date application received		25/08/2021			
Applicant and Premises details					
Applicant name/s (full legal name/s)		Pilgangoora Operations Pty Ltd			
Premises name		Pilgangoora Lithium-Tantalum Project (ACN:616560395)			
Premises location		Mining Tenement M45/1256 and L45/417 and L45/411 MARBLE BAR WA 6760			
Local Government Authority		Shire of East Pilbara			
Application documents					
HPCM file reference number:		DER2017/000318			
Key application documents (additional to application form):		Supporting Information Appendix 1 = SWL Assessment Appendix 2 – Replacement of Monitoring Bore Appendix 3 – WWTP Design Capacity Proposed site layout map			
Scope of application/assessment					

Summary of proposed activities or changes to existing operations.	Licence amendment for the landfill to be extended one additional hectare. Proposed increase to design capacities of categories 54 and 64. Proposed construction 1 to 10 October 2021. i) Increase the design capacity reported under *Category 54: Sewage facility*, from 125m^3/day to 150m^3/day. ii) Increase the design capacity under *Category 64: Putrescible landfill* from 5,000 tonnes/year to 10,000 tonnes/year. Increase the size of the landfill area and include the acceptance of waste from the Ngungaju Lithium Operation (L9036/2017). iii) Condition 5, Table 6 - Exempt the Tailing Thickener from the requirements of having a concrete bund with 110% capacity of the tank, and drainage to the process water pond. iv) Condition 12 - Modify the SWL trigger and limit of PWB005, TMFMB04 and TMFMB05. v) Condition 14 - Modify the timeframe to notify exceedances of Gross Alpha and Gross Beta. vi) Condition 15, Table 9 - remove duplicated references to either "*Sulfate, SO4"* or "*Sulphate, SO4"*. vii) Condition 12, Table 8 - Replace Monitoring Bore PMB002 of the Monitoring Schedule, with Monitoring Bore PWE033.

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

Table 1: Prescribed premises categories

Prescribed premises category and description	**Proposed production or design capacity**	**Proposed changes to the production or design capacity (amendments or**
Category 5: Processing or beneficiation of metallic or non-metallic ore	2,000,000 tonnes per annum processed ore 1,680,000 tonnes tailings produced.	*No change to production capacity*
Category 54: Sewage facility	150 m^3/day	Increase from 125m^3/day
Category 64: Class II Putrescible landfill	10,000 tonnes per annum. Increase the size of the landfill area and include the acceptance of waste from the Ngungaju Lithium Operation (L9036/2017	Increase from 5,000 tonnes per annum

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: EPA Report No:	
Has the proposal been referred and/or assessed under the EPBC Act?	Yes ☐ No ☒	Reference No:	
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes ☒ No ☐	Certificate of title ☐ General lease ☐ Expiry: Mining lease / tenement ☒ Expiry: 15/12/2037 and 22/01/2038 Other evidence ☐ Expiry:	
Has the applicant obtained all relevant planning approvals?	Yes ☒ No ☐ N/A ☐	Approval: Expiry date: If N/A explain why?	
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes ☒ No ☐	CPS No: CPS8175/1	
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes ☐ No ☒	Application reference No: N/A Licence/permit No: N/A	
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes ☒ No ☐	Application reference No: Licence/permit No: GWL183354 and GWK182856 (being transferred) and SWL202597	
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 Type: Proclaimed Groundwater Area and Surface Water Area Has Regulatory Services (Water) been consulted? Yes ☐ No ☒ N/A ☐ Regional office: North West	
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes ☐ No ☒	Name: N/A Priority: P1 / P2 / P3 / 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 ☐	*Radiation Safety Act 1975* and subsidiary legislation Transport of radioactive material in Western Australia is legislated by the *Radiation Safety (Transport of Radioactive Substances) Regulations 2002* *Dangerous Goods Safety Act 2004* *Dangerous Goods Safety (Storage and Handling of Non-explosives)* Regulations 2007 Environmental Protection (Controlled Waste) Regulations 2004	
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 ☐	Classification: N/A Date of classification: N/A	