Application for Licence

Division 3, Part V *Environmental Protection Act 1986*

Licence Number	L9037/2017/1
Applicant	Process Minerals International Pty Ltd
ACN	063 988 894
File Number	DER2017/000308
Premises	Mount Marion Lithium Project Shire of Coolgardie Mining Tenements M15/1000 and M15/717
Date of Report	27 June 2017
Status of Report	Final

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1. Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
Applicant	Process Minerals International Pty Ltd
Approved Policy	has the same meaning given to that term under the EP Act.
BOD	biochemical oxygen demand
Category/ Categories/ Cat.	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CS Act	*Contaminated Sites Act 2003* (WA)
DER	Department of Environment Regulation
Decision Report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
DMP	Department of Mines and Petroleum
DMS	Dense media separation
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
m^3	cubic metres
mtpa	million tonnes per annum
NEPM	National Environmental Protection Measure
Noise Regulations	*Environmental Protection (Noise) Regulations 1997* (WA)
Occupier	has the same meaning given to that term under the EP Act.

OEPA	Office of the Environment Protection Authority
PECs	Priority Ecological Communities (PECs)
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Primary Activities	as defined in Schedule 2 of the Licence
Risk Event	As described in *Guidance Statement: Risk Assessment*
RO	Reverse osmosis
SAF	Submerged Aerated Filter
TDS	Total Dissolved Solids
TECs	Threatened Ecological Communities
UDR	*Environmental Protection (Unauthorised Discharges) Regulations 2004* (WA)
WWTP	Wastewater Treatment Plant

2. Purpose and scope of assessment

The Department of Environment Regulation (DER) received an ***application*** for a licence under Part V, Division 3 of the *Environmental Protection Act 1986* (***EP Act***) by the ***Applicant,*** Process Minerals International Pty Ltd, on 21 February 2017. The application was seeking approval to operate a lithium processing plant and associated infrastructure (landfilling, constructing and operating a wastewater treatment plant including discharging of treated wastewater to land).

This document details the assessment of this application.

2.1 Application details

Table 2 lists the documents submitted during the assessment process. Documents previously submitted for Works Approval W5734/2014/1 were also considered as part of the assessment; a list of references is included in Appendix 1.

Table 2: Documents and information submitted during the assessment process

Document/information description	Date received
Process Mineral International Pty Ltd (2017) *Mt Marion Lithium Project Licence M15/717 – M15/1000 Licence Application – Supporting Document*, February 2017	21 February 2017
DER Application form V4 for the Mt Marion Lithium Project	21 February 2017
Native Vegetation Solutions (2016) *Level 1 Flora and Vegetation Survey for the Mt Marion Project Area,* unpublished report prepared for Mineral Resources Limited, January 2016.	23 March 2017

3. Background

Table 3 lists the prescribed premises categories that have been applied for.

Table 3: Prescribed Premises Categories in the Proposed Licence

Classification of Premises	Description	*Approved Premises production or design capacity or throughput*
Category 5	Processing or beneficiation of metallic or non-metallic ore: premises on which — (a) metallic or non-metallic ore is crushed, ground, milled or otherwise processed; or (b) tailings from metallic or non-metallic ore are reprocessed; or (c) tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam.	2.4 million tonnes per annual period
Category 57	Used tyre storage (general)	1000 used tyres
Category 64	Class II putrescible landfill	750 tonnes per annual period
Category 85	Sewage facility: premises (a) on which sewage is treated (excluding septic tanks); or	35m^3 per day

	(b) from which treated sewage is discharged onto land or into waters.	

Due to the volumes of bulk fuels to be stored on site, DER has recommended adding category 73, storage of bulk chemicals, as an additional prescribed premises category to the licence.

4. Overview of Premises

4.1 Operational aspects

The Mount Marion Lithium Project comprises the mining of spodumene (lithium bearing) ore from open cut pits, with trucks transferring the ore to the run of mine (ROM) pad for processing. Processing of the ore occurs approximately 2km away from the mining activities and consists of crushing, wet beneficiation (including flotation) circuits. Tailings (waste) from the processing plant are to be discharged to Ghost Crab Pit, a previously mined open pit, which also supported an underlying underground mining operation.

Water for the processing plant will be sourced from recovered tailings supernatant water, which will be treated in a reverse osmosis plant prior to use. Brine from the reverse osmosis plant will be discharged to Ghost Crab Pit with the tailings.

Authorisation to construct and operate a wastewater treatment plant at the Premises is also sought at this time by the Applicant. Treated effluent will be discharged to an irrigation /spray field adjacent to the accommodation camp.

A diesel and LPG fuelled power station is located on the Premises, of a capacity below 10MW per annum, therefore not requiring licensing under Part V of the EP Act.

The expected mine life is 18 years. The tailings disposal method selected for the operation, discharging to Ghost Crab Pit, will be exhausted at approximately year 6 to year 7, necessitating an additional tailings disposal option at that time.

The site layout is shown in Figures 1 and 2 following.

4.2 Infrastructure

The Mt Marion Lithium Project facility infrastructure, as it relates to Categories 5, 57, 64, 73 and 85 activities, is detailed in Table 4 and with reference to the Site Plan (attached in the Issued Licence and also attached as Figure 1 and Figure 2).

Table 4 lists infrastructure associated with each prescribed premises category.

Table 4: Mount Marion Lithium facility: Multi-category infrastructure

	Infrastructure	**Site Plan Reference**
	Prescribed Activity Category 5	
Crushing (Dry) Plant (Stage 1 of the Processing Plant)		As shown in Figure 2
1	Primary Crusher	Detail not shown but overall location of plant shown in Figure 2
2	Secondary Crusher	
3	Conveyors (CV1 - CV11), Product stacker	
4	Drive in sumps	
5	Dust suppression system	

	Infrastructure	Site Plan Reference
6	Rod Mill	
Wet Beneficiation Plant (Stage 2 of the Processing Plant)		As shown in Figure 2
7	Grinding circuit (ball mill), primary and secondary cyclone circuits, rejects hopper, conveyor and tailings pump	Detail not shown but overall location of plant shown in Figure 2
8	Process and raw water tanks	
9	Dense Media Separation (DMS) plant	
10	Classification cyclone and classifiers	
11	Thickener	
12	Flotation circuit	
13	FLOC line, tailings pipeline, decant pumps and pipeline from Ghost Crab Pit to RO plant	Pipelines as shown in Figure 2
14	Reverse osmosis (RO) plant	As shown in Figure 2
15	In –pit Tailings Storage facility at Ghost Crab Pit	As shown in Figure 2
16	Turkey's Nest (Processing)	As shown in Figure 2
	Prescribed Activity Category 57	
Used tyre storage		
17	1000 used tyres in total, stored at two waste disposal facility locations and at the workshop	Not shown
	Prescribed Activity Category 64	
Class II putrescible landfill		
18	Class II putrescible landfill located in the Ghost Crab Waste Rock Landform	As shown in Figure 1 and Figure 2.
19	Tyres and rubber disposal in mining waste dump on M15/1000	As shown in Figure 1
	Prescribed Activity Category 73	
20	Fuel supply: 3 x 57 000L diesel tanks and 1 x 53 000L tank. LNG: 4 x 60 000 L tanks	LNG Plant and Fuel Farm shown in Figure 2
	Prescribed Activity Category 85	
Submerged Aerated Filter Wastewater Treatment Plant sufficient to treat wastewater to class C level (ANZECC 1997) prior to discharge		
For the Submerged Aerated Filter Wastewater Treatment Plant:		To be located in area set aside for camp infrastructure as shown in Figure 1
21A	Balance Tank	Indicative infrastructure layout as

	Infrastructure	Site Plan Reference
21B	Primary Tanks x 2	shown in Figure 4
21C	Anoxic Tank	
21D	Aerobic Tank	
21E	Clarifier Tank	
21F	Chlorine Contact Tank	
21G	Irrigation Tank	
22	Irrigation Spray Field	Indicative location as shown in Figure 1
	Other activities	
23	Biofarm (bioremediation pad) within Ghost Crab waste rock landform	As shown in Figure 2
24	Workers accommodation camp for 143 people	Indicative location as shown in Figure 1
25	Motor Control Centres within Processing Plant	Not shown
26	Control rooms/administration offices/workshops	As shown in Figure 2
27	Final product stockyard, weighbridge	As shown in Figure 2

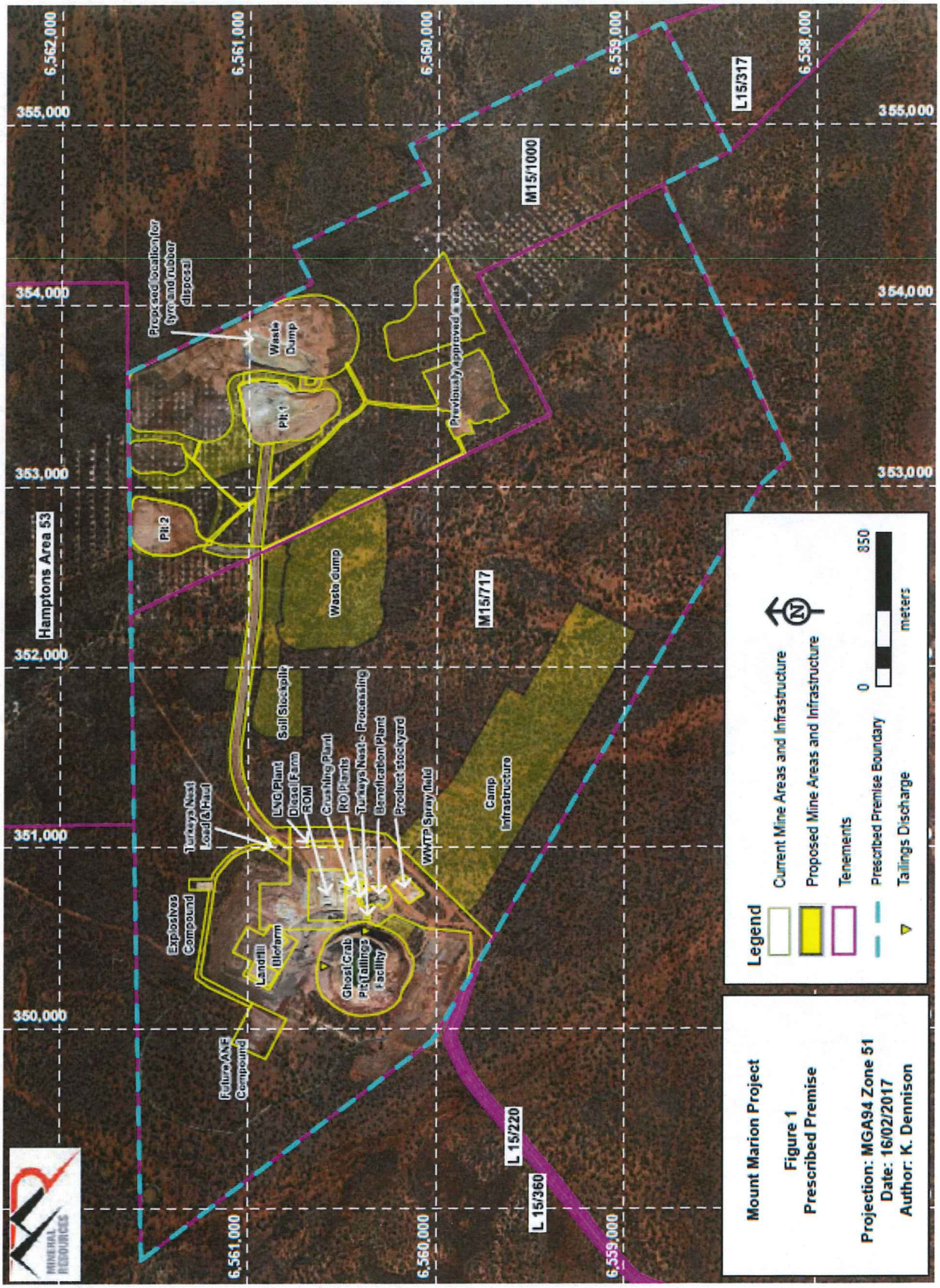

Figure 1: Mt Marion Lithium Project Prescribed Premises with site layout

Figure 2: Map showing location of the Mt Marion Processing Plant key infrastructure and Tailings Facility

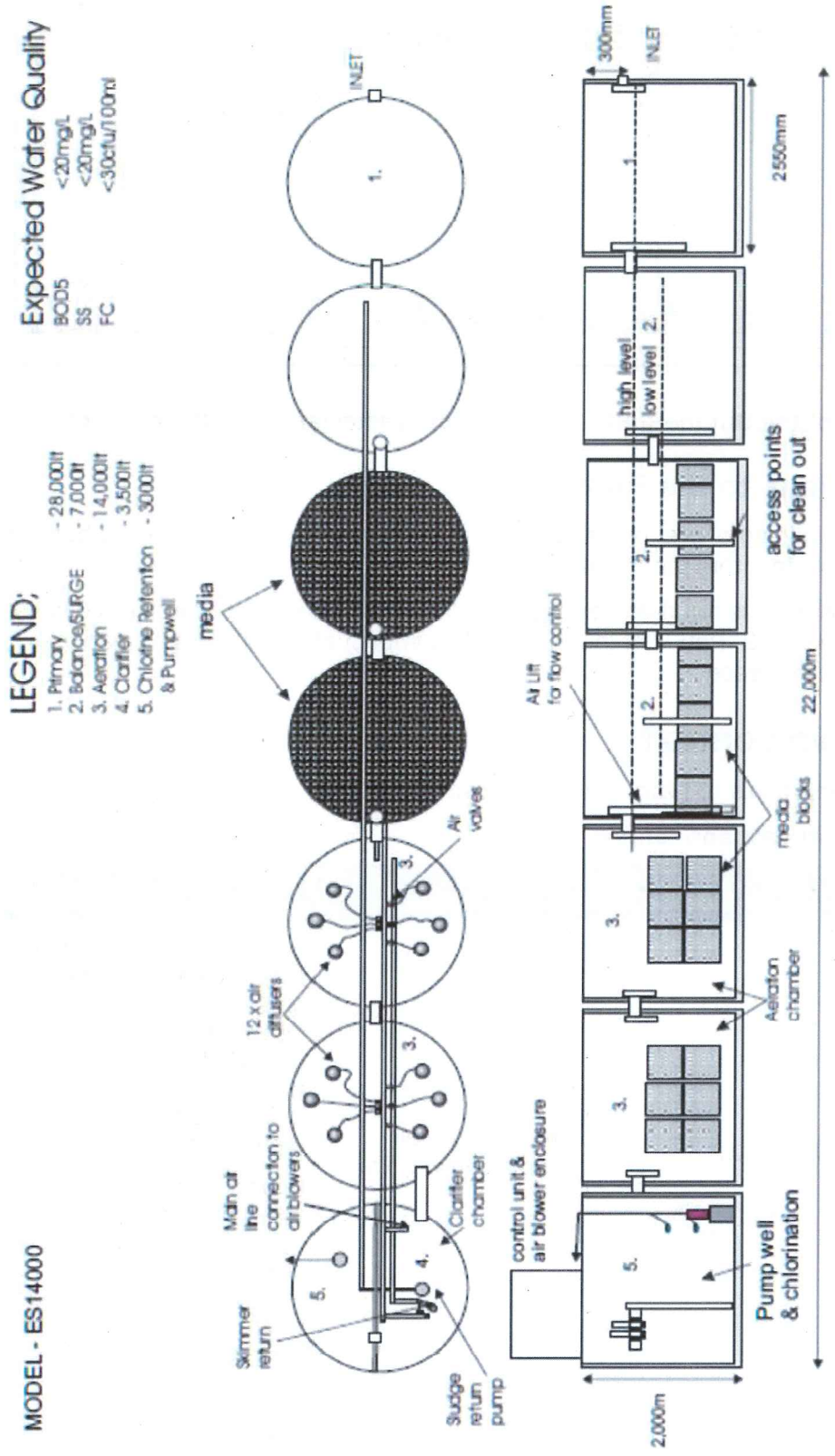

Figure 3: Schematic of the Aerobic Treatment Unit Wastewater Treatment Plant

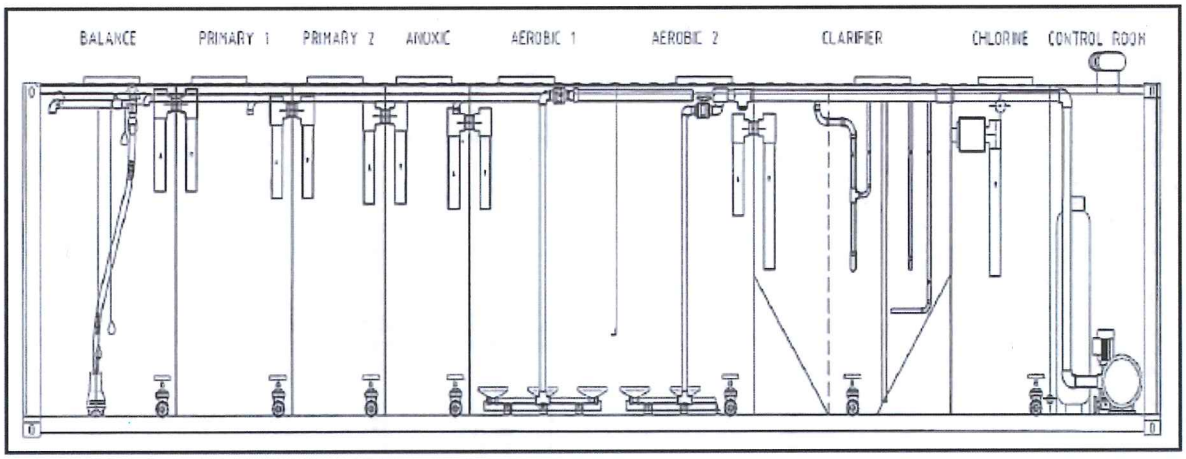

Figure 4: Schematic of the Submerged Aerated Filter Wastewater Treatment Plant

4.3 Exclusions to the Premises

Activities related to the mining of ore, placement of waste rock/overburden, materials handling and stockpiling are excluded from the Premises.

Clearing of native vegetation is regulated by the Department of Mines and Petroleum (DMP) under delegation of Division 2, Part V of the EP Act. The impact of unauthorised clearing is outside the scope of this Licence.

5. Legislative context

Table 5 summarises approvals relevant to the assessment.

Table 5: Relevant approvals and tenure

Legislation	Number	Subsidiary	Approval
Environmental Protection Act 1986, Division 2, Part V (Clearing of Native Vegetation)	CPS #6770/2	Process Minerals International Pty Ltd	Approval to clear 450 ha of native vegetation within M15/717, M15/1000, ML15/220, lot 105 on deposited plan 40396, Karramindie and the Coolgardie-Esperance Highway road reserve. Condition imposed that additional approval from the CEO must be sought to clear critical habitat for the malleefowl (*Leipoa ocellata*), where identified through a fauna survey.
Environmental Protection Act 1986, Division 3, Part V (Works Approval)	W5734/2014/1 as amended	Process Minerals International Pty Ltd	Approval to construct the following: Category 5: Wet and dry beneficiation plant, reverse osmosis plant, tailings storage facility infrastructure at Ghost Crab Pit (pipelines, pumps,

Legislation	Number	Subsidiary	Approval
			return water ponds); Category 57: used tyre storage area; and Category 64: putrescible landfill by trenches in waste rock landforms.
Environmental Protection Act 1986, Division 3, Part V (Registration)	R2434/2016/1	Process Minerals International Pty Ltd	Category 89 registration to operate a putrescible landfill to a capacity of 750 tpa

5.1 Contaminated sites

Mining tenement M15/717, comprising part of the Premises, has been reported as possibly contaminated under the *Contaminated Sites Act 2003.* The report was made by a previous owner, South Kal Mines Pty Ltd. The tenement is awaiting classification.

5.2 Other relevant approvals

5.2.1 Department of Mines and Petroleum

A mining proposal (Reg ID: 63646) for authorisation of development of a camp and wastewater treatment plant under the Mining Act has been submitted to the Department of Mines and Petroleum for further approval to the existing approved project (PMI 2017a).

5.2.2 Department of Water

Due to the change in use of Ghost Crab Pit, from groundwater source to active Tailings Storage Facility, the Applicant has surrendered their licence to take water GWL182397(1) issued under 5C of the *Rights in Irrigation and Water Act 1914.*

Water for the project is being sourced from recycled decant from the Tailings Facility and also Water Corporation scheme water.

5.3 Part V of the EP Act

5.3.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

Landfilling to be conducted consistent with the requirements of the *Environmental Protection (Rural Landfill) Regulations 2002*, with the exception of the 35 m buffer between the trench and the fenceline.

DER guidance statements which inform this assessment are:

- *Guidance Statement: Regulatory Principles (July 2015)*
- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Licence Duration (August 2016)*
- *Guidance Statement: Publication of Annual Audit Compliance Reports (May*

2016)

- *Guidance Statement: Decision Making (November 2016)*
- *Guidance Statement: Risk Assessments (November 2016)*
- *Guidance Statement: Environmental Siting (November 2016)*

5.3.2 Works approval and registration history

Table 6 summarises the works approval history for the premises.

Table 6: Works approval and licence history

Instrument	Issued	Nature and extent of works approval, licence or amendment
W4749/2010/1	11 October 2010 (Expired 10 October 2013)	Works approval to authorise works under prescribed premises categories 5 and 64. W4749 expired 10 October 2013before any construction works had been completed.
W5734/2014/1	18 December 2014	New works approval to authorise an lithium ore processing plant of category 5 capacity of 1.2 Mtpa and landfill under category 64 of 500 tpa. No tailings deposition on the Premises.
W5734/2014/1	26 November 2015	Amendment to relocate the beneficiation plant to adjacent to Ghost Crab Pit, include used tyre storage and construct a putrescible landfill within the Ghost Crab waste rock landform.
W5734/2014/1 Amendment	19 May 2016	Amendment to assess the proposal to dispose of tailing to Ghost Crab Pit and to extend throughput volumes for the beneficiation plant to 2.4 Mtpa.
W5734/2014/1 Amendment Notice 1	11 August 2016	Amendment to extend the commissioning period from four to nine months.
R2434/2016/1	1 December 2016	Permit operation of the Class II landfill under category 89, within the Ghost Crab Pit waste rock landform.
W5734/2014/1 Amendment Notice 2	13 April 2017	Amendment to extend the commissioning period from nine to eleven months.
W5734/2014/1 Amendment Notice 3	26 May 2017	DER initiated amendment to extend the commissioning period from eleven to twelve months to allow sufficient time for consultation with applicant on the draft licence and its finalisation.

5.3.3 Categories Authorised by Works Approval

As summarised above, works approval W5734/2014/1 authorised construction of the following infrastructure under category 5:

- Wet and dry beneficiation plants, processing up to 2.4 Mtpa.
- Tailings disposal to Ghost Crab Pit.

Under category 57:

- Used tyre storage for up to 1000 tyres.

Under category 64:

- Putrescible landfill, up to 750 tpa.

Compliance documents have been received for the Crushing (dry) plant and Beneficiation (wet) plant (PMI 2016a; PMI 2016b). The tailings infrastructure has been built to take tailings from the beneficiation plant. A compliance document for the Landfill has also been submitted and accepted by DER (PMI 2016c). The Flotation circuit is still undergoing construction at time of licence issue. Consequently operation of the Flotation circuit is pending completion of the construction and commissioning and subsequent submission of compliance documents.

Tailings from the flotation circuit will be transferred to the tailings disposal hopper for mixing with the beneficiation tails, from where the combined tail will be pumped to Ghost Crab Pit for disposal. This is an alteration from the design authorised by W5734/2014/1, from which a coarse tails fraction and fines tails fraction were to be discharged to the pit separately. DER considers the change to not be material, however. Refer to section 8 for further detail of DER's risk assessment.

6. Consultation

On acceptance of the application the Department of Mines and Petroleum and the Shire of Coolgardie were notified and invited to provide comment. No comments were received.

7. Location and siting

7.1 Siting context

The Mount Marion Lithium Project Prescribed Premises is located on mining tenements M15/717 and M15/1000. The Premises is located approximately 36km south of Kalgoorlie, on the Woolibar pastoral station in the Shire of Coolgardie.

Mining of gold ore was previously conducted on M15/717 and gold mining also occurred on M15/1000. Ghost Crab Pit, located on M15/717 is the site of a previously mined out open pit and underground operation at the base of the Pit (PSM 2016). Other mining and minerals processing operations are located within the local area including nickel smelting, and nickel and gold ore mining.

Vegetation in the Mount Marion area comprises various eucalypt woodlands with some shrublands consisting of acacia, casuarina and melaleucas (Native Vegetation Solutions 2016). The greenstone hills in the region (of which Mount Marion is one) are associated with ultramafic and basalt geology and atypical eucalypt woodland community assemblages on the greenstone hills. The local region has been associated with use of the woodlands for mining, pastoralism, timber harvesting for use as firewood, supports in underground mining and source of fuel in steam boilers (Keally 1991 in Meissner and Coppen, 2014).

The flora and vegetation survey conducted in 2016 recorded the vegetation condition as either very good or good, with areas affected by grazing or past mining activities either good or degraded.

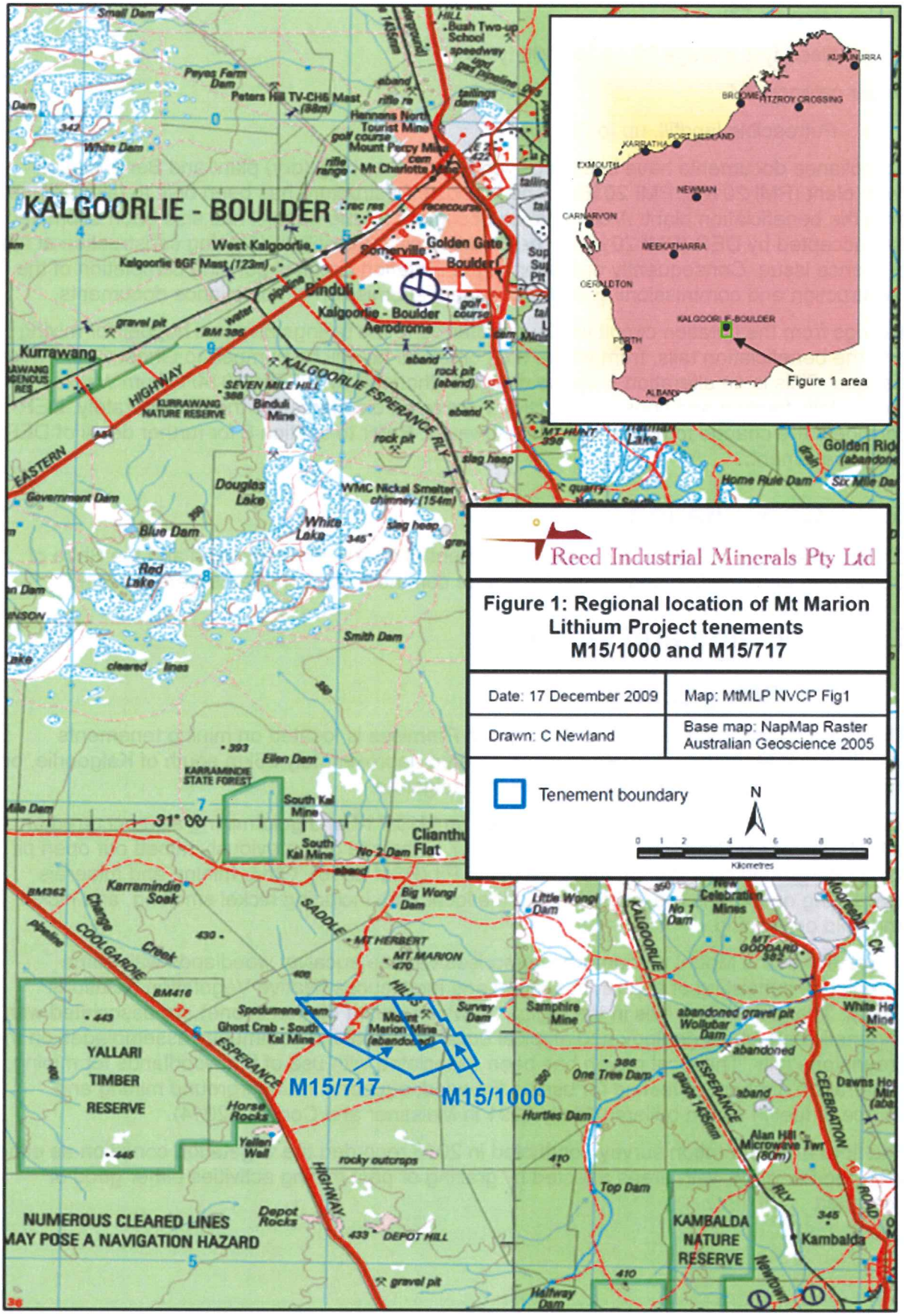

Figure 5: Regional siting of Mt Marion Lithium Project tenements

7.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 7.

Table 7: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Residential Premises: Woolibar station homestead	15km east of the Premises.
Town of Kambalda	23km south east of Premises.

7.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are shown in Table 8. Table 8 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem.

Table 8: Environmental values

Specified ecosystems	Distance from the Premises
Ramsar Sites in Western Australia	No Ramsar sites are within a 100km radius of the Premises.
Important wetlands – Western Australia	The nearest important wetland listed in the Directory of Important Wetlands is at Lake Ballard, near the town of Menzies, approximately 170 km north of the Premises.
Parks and Wildlife Managed Lands and Waters	• "Class C" Yallari Timber Reserve, 2.3km southwest of the Premises (Native Vegetation Solutions 2016). • Karamindie State Forest, 6km northwest of Premises • Kambalda Nature Reserve, 5km southeast of Premises
Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs)	No TECs or PECs have been identified within the Premises (Native Vegetation Solutions 2016).
Biological component	**Distance from the Premises**
Threatened/Priority Flora	The 2016 survey recorded a listed Priority 3 flora species under the *Wildlife Conservation Act 1950*, *Diocirea acutifolia*. It was recorded at 28 locations in the survey area. This species is widespread and in large numbers in the local and regional area (Native Vegetation Solutions 2016). A 2009 survey recorded 3 x Priority 3 flora species (*Diocirea acuitifolia*, *Austrostipa blackii* and *Allocasuarina eriochlamys subsp grossa*) within the Premises (Recon Environment 2009 in DER 2010).
Threatened/Priority Fauna	Malleefowl (*Leipoa ocellata*) habitat is present within the boundaries of the Prescribed Premises. A survey in 2010 identified two extinct malleefowl mounds within the Premises boundary (DER 2016). Malleefowl is listed as vulnerable under the EPBC Act and is on

	schedule 1 of the *Wildlife Conservation Act 1950*, that is, fauna that is rare or is likely to become extinct. A condition has been added to the Clearing Permit CPS#6770/2 to require a fauna survey for Malleefowl and additional approval prior to clearing of its habitat.
Threatened Ecological Communities (TECs)/ Priority Ecological Communities (PECs)	No TECs or PECs are present or within a 20km radius of the Premises (Native Vegetation Solutions 2016).

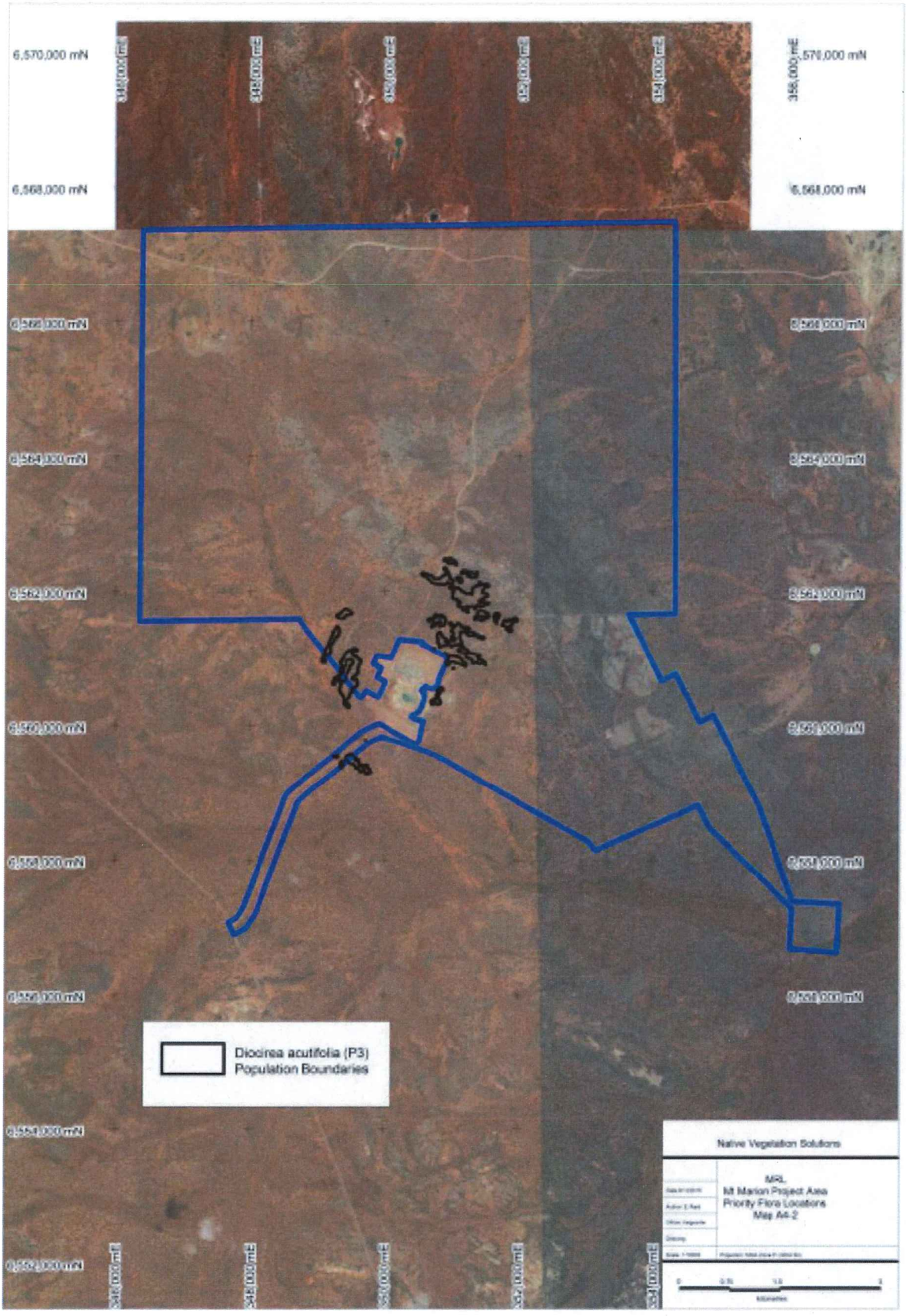

Figure 6: Location of priority 3 flora *Diocirea acutiflolia* populations (Native Vegetation Solutions 2016)

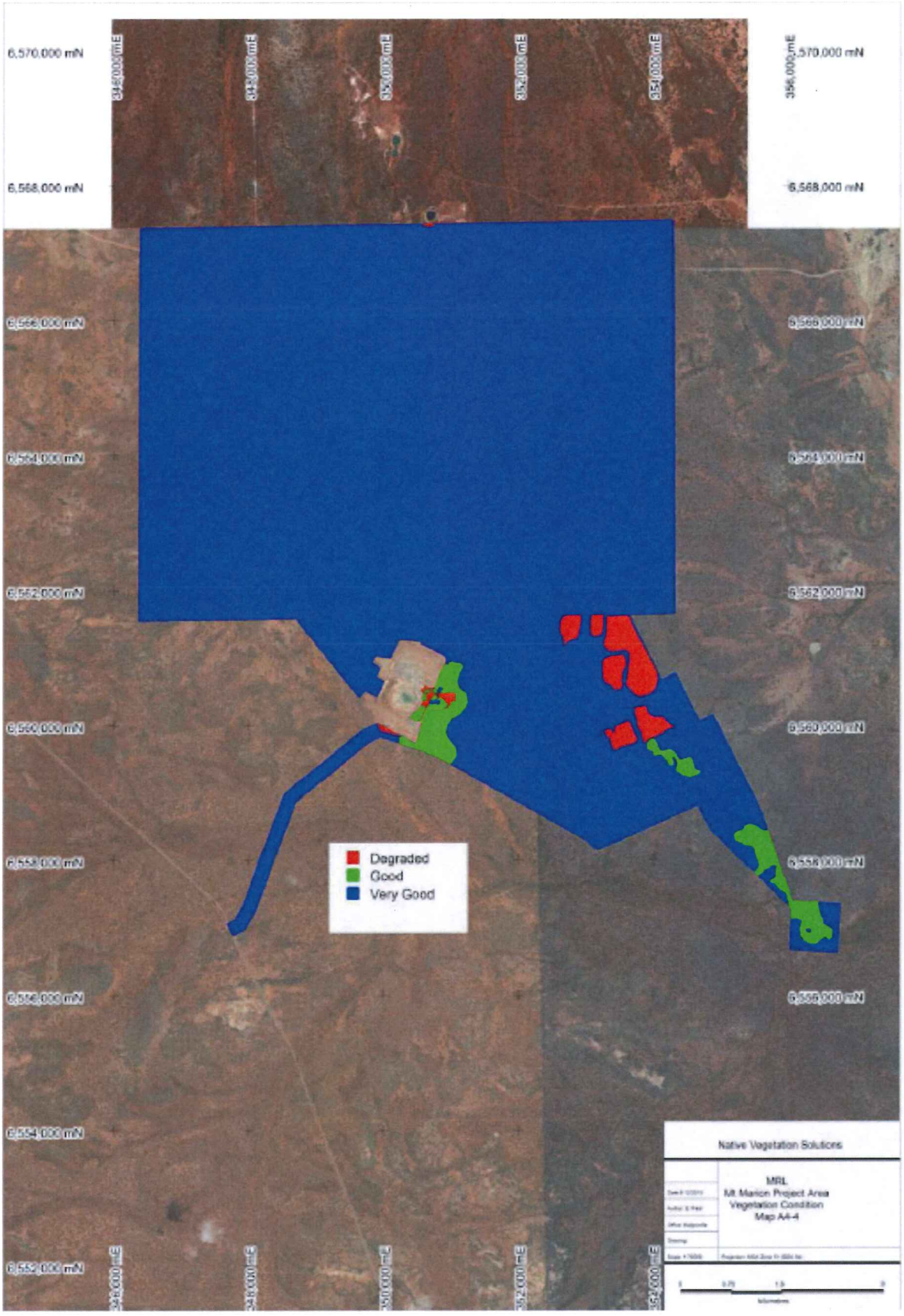

Figure 7: Vegetation condition of the Premises (Native Vegetation Solutions 2016).

7.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 9.

Table 9: Groundwater and water sources

Groundwater and water sources	Distance from Premises	Environmental value
Public drinking water source areas	No public drinking water source areas are located with a 100km radius of the Premises	N/A
Major watercourses/waterbodies	No major surface watercourses are located on or adjacent to the Premises. The nearest surface water receptor is Lake Lefroy, a saline lake located 24 km to the south east of the Premises. Lake Lefroy is also the groundwater receptor, from where the Wollubar/Lefroy palaeochannel discharges.	Lake Lefroy is a regionally significant salt lake, with peak biological productivity during large rainfall events, wherein dormant invertebrate species are able to reproduce, providing the playa (salt surface) is flushed with lower salinity rainfall.
Groundwater	Three groundwater systems are present on the Premises: • Surficial alluvium, silts and sandy material located less than 5m below ground level with an average thickness of between 5 – 15m. • Palaeochannel sediments: channel of fine to coarse quartz sand. A tributary of the Wollubar Palaeochannel intersects the Ghost Crab Pit, at approximately 345m RL to 333m RL (between approximately 35 m and 47m below ground level), travelling to from the south west to the south east through the pit. Inflow to the pit estimated at 190L/s during previous mining of gold at Ghost Crab Pit in 1998 (PSM 2016). • Weathered/fractured bedrock, groundwater located in sheared and fractured rock zones (PSM 2016).	The palaeochannel tributary passing through the pit is hypersaline with a TDS of between 32 000 and 40 000 mg/L and pH of 6.4 (PSM 2016) and therefore not considered of environmental value. Groundwater samples taken from pegmatite intrusive stratigraphy at the Project (2km east of Ghost Crab Pit) recorded low salinity water (TDS 4 500 – 5 200 mg/L and alkaline pH (7.9 – 8.3) (PSM 2016). Previous gold mining operations have dewatered around the pit. The dewatering program consisted of six bores installed in the 1990s which attempted to access the palaeochannel aquifer but only recorded very low groundwater yields of less than 1 L/s (compared to recorded inflows of up to 190 L/s into the pit) (PSM 2016). Both groundwater sources are used for the purposes of mining or industrial applications. Adjacent towns are serviced by scheme water (PSM 2016).

7.5 Meteorology

7.5.1 Rainfall and temperature

Climate data from the nearby Bureau of Meteorology (BOM) station in Coolgardie (20 km from the Premises) has been used as a surrogate for Mount Marion.

The Coolgardie area is semi –arid, with cool winters and hot dry summers. The annual rainfall is 270 mm, with the evaporation rates estimated at 2 700 mm per annum. Large episodic rainfall events may occur in the summer months through to early autumn, associated with ex-cyclones and tropical lows (PSM 2016).

8. Risk assessment

8.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

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. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 11.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Table 10 and Table 11 below.

Table 10. Identification of emissions, pathway and receptors: Construction of Wastewater Treatment Plant

Risk Events						Continue to detailed Risk Assessment	Reasoning
Sources/Activities		Potential Emissions	Potential Receptors	Potential Pathway	Potential Adverse Impacts		
Construction, mobilisation and positioning of infrastructure	Construction of wastewater treatment plant infrastructure (pipelines, tanks)	Noise	No residences or other sensitive human receptors in proximity.	Air / wind dispersion	None	No	No human receptor present.
		Dust			None	No	No sensitive human receptors are present.

Table 11. Identification of emissions, pathway and receptors: Operation

Risk Events	Continue to	Reasoning

Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts	detailed risk assessment	
Category 5 In-pit Tailings Disposal at Ghost Crab Pit	Tailings surface	Dust	No residences in proximity, vegetation including vegetation adjacent to mine areas	Air / wind dispersion	Potential suppression of photosynthetic and respiratory functions	No	Wet tailings during operation will not generate dust. Tailings disposal at end of life remains 6m below the pit rim. Inflow of local palaeochannel will create a lake at closure. Impacts arising from environmental discharges at closure regulated by DMP the *Mining Act 1978* and DER under the *Contaminated Sites Act 2003*, where appropriate.
	Tailings or return pipeline failure	Tailings or tailings supernatant	Vegetation adjacent to pipeline alignment	Discharge to land	Salinisation of soil, leading to poor vegetation health or death	Yes – refer to section 8.4.	Pipelines traverse or are located next to a small area of native vegetation which may be impacted from a spill.
	Tailings seepage	Seepage	Adjacent native vegetation	Localised groundwater mounding	Inundation of vegetation rootzones within mounding zone	Yes – refer to section 8.5.	Potential exists for impact if the freeboard is not adequately managed within the receiving Pit
					Groundwater contamination	No	Groundwater is hypersaline, and is not used except for mining/industrial applications (PSM 2016) Not considered a receptor in terms of water quality.
	Treatment of tailings return water via reverse osmosis	Brine discharge	Adjacent native vegetation	Via groundwater	Inundation of vegetation rootzones within mounding zone	No	The brine is mixed with the tailings discharge prior to being pumped via pipeline to Ghost Crab Pit. Considered in risk assessment for seepage above.
Category 5 Beneficiation	Movement of ore through crushing (dry) plant	Dust	Vegetation adjacent to processing plant (crushing plant).	Air / wind dispersion	Poor vegetation health	Yes – refer to section 8.6.	Potential for impact to receptor.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	Stockpiling on ROM (run of mine) pad	Noise	No residences in proximity.		None	No	No receptor present
	Wet beneficiation	Dust	No residences in proximity, vegetation adjacent to mine areas		None	No	Wet process; no dust emissions expected.
Category 64 **Operation of Class II (putrescible) Landfill**	Landfilling	Leachate	Groundwater	Via soil to groundwater	Groundwater contamination	No	Groundwater not considered a receptor given its hypersalinity.
		Emissions to air Liquid residue from burnt tyres	No residences in proximity.	Via air Via soil	Soil contamination Toxic air pollutants	No	May cause a local impact to workers; however this is considered under the Regulation as per Part 6 of the EP Regulations
	Poor management of landfill operations	Windblown rubbish	Soil and fauna. No native vegetation is adjacent to the landfill; landfill is within a waste rock landform and surrounded by cleared areas.	Direct discharge/ movement by surface water following rainfall	Soil contamination May attract vermin/ feral animals which may predate on local fauna (e.g. Malleefowl)	Yes –refer to section 8.7	Potential for impact to receptor
Category 73 **Bulk storage of chemicals**	Bulk fuel storage – Breach of containment diesel storage	Hydrocarbons	Discharge to soil; potential to migrate to groundwater	Direct discharge	Soil and groundwater contamination.	No	Storage and handling requirements of bulk fuel (diesel and LPG) managed under the *Dangerous Goods Safety Act 1994*, and regulations administered by Department of Mines and Petroleum.
Category 85 **Waste Water Treatment**	Treatment of sewage	Odour	No residences or other sensitive receptors in proximity	Air / wind dispersion	None	No	No receptor present

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Plant Operation and Disposal of Treated Water via Land Irrigation	Rupture of pipes / overtopping of holding tanks	Sewage	Soil and vegetation adjacent to discharge area	Direct discharge	Soil contamination causing poor native vegetation health or death; vigorous weed growth	Yes – refer to section 8.8.	Potential for impact to receptor.
	Irrigation of poorly treated effluent	Poorly treated effluent				Yes – refer to section 8.9.	Potential for impact to receptor.
	Irrigation of treated effluent	Leachate from Irrigated Effluent Discharge	Groundwater	Soil to groundwater	Groundwater contamination with nutrients	No	Groundwater not considered a receptor given its hypersalinity.

8.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 12 below.

Table 12: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 13 below.

Table 13: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	• **onsite impacts**: catastrophic • **offsite impacts local scale**: high level or above • **offsite impacts wider scale:** mid-level or above • Mid to long-term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • **Adverse health effects:** high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • **Local scale impacts:** permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	• **onsite impacts**: high level • **offsite impacts local scale**: mid-level • **offsite impacts wider scale**: low level • Short-term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• **Adverse health effects:** mid-level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • **Local scale impacts**: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	• **onsite impacts**: mid-level • **offsite impacts local scale**: low level • **offsite impacts wider scale**: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• **Adverse health effects:** low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • **Local scale impacts:** mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	• **onsite impacts**: low level • **offsite impacts local scale**: minimal • **offsite impacts wider scale**: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • **Local scale impacts:** low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	• **onsite impact**: minimal • Specific Consequence Criteria (for environment) met	• **Local scale**: minimal to amenity • Specific Consequence Criteria (for public health) met

^ Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting.*

* In applying public health criteria, DER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines.*
"onsite" means within the Prescribed Premises boundary.

8.3 Acceptability and treatment of Risk Event

DER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment Table 14 below:

Table 14: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

8.4 Risk Assessment – Failure of Tailings or Return Water Pipelines

8.4.1 Description of Failure of Tailings or Return Water Pipelines

Failure of pipelines carrying alkaline, saline tailings or hypersaline tailings decant water may result in death or poor health of adjacent vegetation.

8.4.2 Identification and general characterisation of emission

Laboratory testing of the fines tailings filtrate indicated brackish salinity (TDS of ~5 700 mg/L) and alkaline (pH 8.4). This tailings stream is mixed with the coarse tailings and brine from the RO plant before being discharged via pipeline to Ghost Crab Pit. Notable metal/metalloids in the tailings are lithium (2.4mg/L), uranium (0.49 mg/L) and boron (2.3mg/L). It is likely that the tailings will be more saline given the mixing with brine (high in salts) from the RO plant prior to discharge. The return water (tailings decant) is expected to be hypersaline (TDS ~33 000 mg/L) (PSM 2016).

8.4.3 Description of potential adverse impact from the emission

Hypersaline discharges contacting vegetation will result in vegetation death or poor health due to the excessive salt loading.

Figure 2 in this document shows an indicative route for the pipelines from the beneficiation plant to the pit. The discharge lines are shown in black, and may traverse through a small area of vegetation. This remnant vegetation does not have any priority flora (priority flora populations shown in Figure 6) and is of good to degraded condition (refer Figure 7).

8.4.4 Criteria for assessment

There are no direct criteria applicable; however the ANZECC guidelines for 80% protection of species in marine environments have been adopted as a conservative trigger level where available; however this is not applicable for assessing impacts to vegetation.

8.4.5 Applicant controls

This assessment has reviewed the controls set out in Table 15 below.

Table 15: Applicant's proposed controls for failure of tailings or return water pipelines

Site infrastructure	Proposed control	Reference
Pipelines carrying saline materials	Daily inspections of pipelines	Refer to Figure 2 of this document
	Decant line share a catchment swale with the tailings line when over the top of the pit crest, so that any spillage from a pipeline failure would drain back into the pit	Indicative pipeline route shown in Figure 2 (swale not shown).
	Pipes carrying saline water are located within V-drains to act as secondary containment	

8.4.6 Key findings

The Delegated Officer has reviewed the information regarding failure of tailings or return water pipelines and has found:

1. A discharge from the pipelines carrying saline tailings or hypersaline return water may impact on vegetation if the discharge is released to land.
2. The condition of immediately adjacent vegetation is degraded to good, does not have priority flora, and represents a very small area compared to the vegetation within the Premises boundary.

8.4.7 Consequence

If a pipeline failure of tailings line or return water line occurs, then the Delegated Officer has determined that the consequence of the impact of the discharge on vegetation will be **minor**.

8.4.8 Likelihood of Risk Event

Whilst the pipelines are located within v-drains whilst located near vegetation, there remains that a spill of tailings or water from the pipeline under pressure may spray outside the bund. Hence the likelihood of failure of the pipeline occurring and impacting on vegetation has been determined as **possible.**

8.4.9 Overall rating of Failure of Tailings or Return Water Pipelines

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12: Risk rating matrix) and determined that the overall rating for is **medium**.

8.5 Risk Assessment – Tailings Seepage Impacting Vegetation

8.5.1 Description of Tailings Seepage Impacting Vegetation

Deposition of tailings to the existing open pit, Ghost Crab Pit (previously a gold mine) may result in seepage through the pit walls or underlying underground workings to adjacent groundwater with metals/metalloids being mobilised to adjacent groundwater systems.

8.5.2 Identification and general characterisation of emission

Tailings characterisation is as per section 8.4.2.

8.5.3 Description of potential adverse impact from the emission

The main groundwater system at the tailings facility, Ghost Crab Pit is a tributary of the Wollubar palaeochannel. The palaeochannel passes from the south west to south east of the pit at approximately RL 345 m; that is, 35 m below ground level. The groundwater is mildly acidic (pH 6.4) and hypersaline (~32,000 mg/L TDS in 1998) whilst the water in the pit lake has a higher salinity due to evaporation concentration (~42 000 - 44 000 mg/L TDS) (PSM 2016).

As such the groundwater itself is not considered a receptor (as it has no existing or likely future beneficial uses apart from industrial use), and hence the only potential impact from in-pit tailings deposition is from groundwater mounding around the pit leading to rising groundwater levels which may inundate the root zones of the surrounding vegetation, if the tailings deposition level is not managed appropriately.

The ultramafic geology of the pit and surrounds are not conducive to groundwater occurrence and flow. The palaeochannel is comprised of 5 m to 15 m of clayey fine to medium-grained sands and is underlain by low transmissivity saprolite clays. Production bores installed upstream of the pit during the 1990s were unable to produce much groundwater (~1L/s) due to the low transmissivity of the local intersections (PSM 2016).

8.5.4 Criteria for assessment

There are no direct criteria applicable; however the ANZECC guidelines for 80% protection of species in marine environments have been adopted as a conservative trigger level where available.

8.5.5 Applicant controls

This assessment has reviewed the controls set out in Table 16 below.

Table 16: Applicant's proposed controls for Tailings Seepage Impacting Vegetation

Site infrastructure	Description	Reference
Tailings freeboard	The applicant has proposed to limit tailings deposition to a maximum freeboard of 6m below ground level (to approximately RL 374 m) (PMI 2017b).	Refer to Figures 1 and 2.
Local Groundwater	Monthly monitoring of standing water levels from the existing groundwater monitoring bores and piezometers surrounding Ghost Crab Pit.	Monitoring bores and piezometers shown in Figure 2.

8.5.6 Key findings

The Delegated Officer has reviewed the information regarding tailings seepage impacting vegetation and has found:

1. The Applicant has made a commitment to limit the level of tailings deposition to a maximum level of 6 m below ground level. This should be sufficient to maintain the groundwater levels below the depth of roots of adjacent vegetation.

8.5.7 Consequence

The Delegated Officer considers the consequence of tailings seepage impacting vegetation to be **moderate**.

8.5.8 Likelihood of Risk Event

Modelling of the Ghost Crab Pit as an in-pit tailings storage facility has been assessed for the potential for seepage to impact the adjacent groundwater system. During operations it is expected that the pit will remain as it is currently, a groundwater sink, due to the high rate of evaporation and the constant pumping for return water for the processing plant, as compared to tailings and groundwater inflows. For the majority of its life as an active tailings facility, tailings freeboard levels will remain below the level of the palaeochannel and hence the evaporation rates will maintain the pit as a sink (PSM 2016).

At closure it is expected that the water table will recover over time and there is potential for throughflow of tailings seepage into groundwater downstream. Modelling of the a worst case scenario for groundwater throughflow and tailings solute transport over a 1000 year timeframe indicated that the tailings seepage would travel approximately 1 km south east downstream (along the palaeochannel) with tailings seepage at this distance comprising between 1 and 10 per cent of total groundwater flow (PSM 2016).

As noted in Table 11, Closure will be regulated by DMP and DER under the *Mining Act 1978* and *Contaminated Sites Act 2003*, respectively.

The Delegated Officer has determined that the likelihood of tailings seepage impacting vegetation during operations will be **rare**.

8.5.9 Overall rating of Tailings Seepage Impacting Vegetation

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk tailings seepage impacting vegetation is **medium**.

8.6 Risk Assessment – Fugitive Dust Impacts on Vegetation

8.6.1 Description of Fugitive Dust Impacts on Vegetation

8.6.2 Identification and general characterisation of emission

Fugitive dust may be generated from stockpiling activities and dry processing stages of the lithium ore processing plant. Road haulage and mining activities (including deposition of overburden) are outside the scope of the Licence.

8.6.3 Description of potential adverse impact from the emission

Dust may impede vegetation health by coating the leaves of vegetation. The crushing plant and feed to the wet beneficiation plants are surrounded by disturbed areas however, with only small areas of remnant vegetation located nearby.

8.6.4 Criteria for assessment

No standards directly apply. Criteria are available for assessing potential human health impacts but these criteria are not applicable for assessing vegetation impacts.

8.6.5 Applicant controls

This assessment has reviewed the controls set out in Table 17 below.

Table 17: Applicant's proposed controls for fugitive dust impacts on vegetation

Site infrastructure	Description	Reference
Crushing Plant	Water sprays fitted to conveyors (5-7 spray boxes along the length of the conveyor and atomising sprays fitted to the head chutes (as shown in Plate 1 below), transfer chutes and stackers	Crushing plant shown in Figure 2
Wet beneficiation plant	Water sprays on stacker 1 and associated conveyors leading to front end loader hopper	Wet beneficiation plant shown in Figure 2
	Atomising sprays in spray boxes in 5 to 7 locations along the Conveyor 13 (dry feed)	Wet beneficiation plant shown in Figure 2
General disturbed areas and haul roads	Regular use of water carts to wet down roads	N/A
All	Visual monitoring of crushing and dry section of processing plant for visible dust	N/A

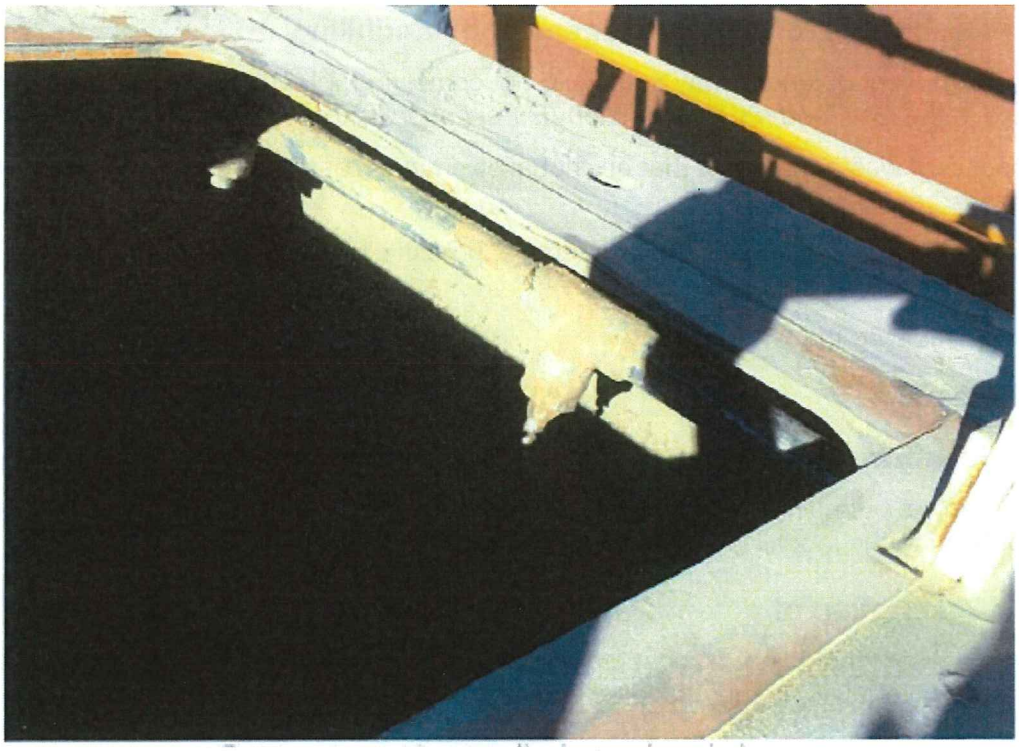

Plate 1: Dust suppression installed on the discharge head chute of a conveyor in the Crushing Plant

8.6.6 Key findings

The Delegated Officer has reviewed the information regarding fugitive dust impacts on vegetation and has found:

1. Only limited areas of vegetation are at risk of impact from dust emissions from the dry sections of the processing plant.
2. The Applicant has installed dust suppression systems on key materials handling items of plant within the dry sections of the processing plant.

8.6.7 Consequence

The Delegated Officer considers the consequence of dust emissions impacting on vegetation to be **slight.**

8.6.8 Likelihood of Risk Event

Given the location of the plant and the implementation of proponent controls, the Delegated Officer has determined that the likelihood of dust impacting on vegetation occurring will be **unlikely**.

8.6.9 Overall rating of fugitive dust impacts on vegetation

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk presented by dust emissions on vegetation is **low**.

8.7 Risk Assessment – Poor management of landfilling

8.7.1 Description of poor management of landfilling

Poor management of landfill may constitute not complying with internal procedures or the guidance in the *Environmental Protection (Rural Landfill) Regulations 2002.* Examples being:

- Disposal of waste materials that are not allowed in a class II landfill (for example waste hydrocarbons);
- Not covering the landfill at regular intervals, potentially allowing windblown waste to migrate from the landfill;
- Not maintaining the landfill fence;
- Burning waste.

8.7.2 Identification and general characterisation of emission

The emission is putrescible and inert waste (class II). Also may include incorrect waste types, if disposed of to the landfill (for example hydrocarbon waste)

8.7.3 Description of potential adverse impact from the emission

Putrescible waste that is not disposed of in accordance with the internal procedures and the Rural Landfill Regulations may become windblown and cause an amenity impact.

8.7.4 Criteria for assessment

Requirements as per the *Environmental Protection (Rural Landfill) Regulations 2002*, with the exception of the requirement for a 35m buffer from the fence to the edge of the landfill trench.

8.7.5 Applicant controls

This assessment has reviewed the controls set out in Table 18 below.

Table 18: Applicant's proposed controls for landfilling

Site infrastructure/ management	Description	Reference
Landfill construction	Landfill has been fenced, with appropriate stormwater controls to restrict surface water inflow. Signage has been erected at the landfill entrance to show which wastes may be accepted by the landfill, consistent with accepting class II for disposal.	PMI 2016c
Landfill management	Waste management procedures are covered in a site induction and refresher training is provided to employees and contractors as required.	Appendix 2 of PMI 2016c
	Tyre disposal in accord with internal procedure. Follows the requirements of the EP Regulations.	Appendix 2 of PMI 2016c
	Weekly landfill inspection to be conducted in accord with Applicant's internal procedure; checks integrity of fence, weekly landfill coverage, signage, presence of windblown rubbish correct waste types disposed of, maximum 30m size for the tip face, odour and stormwater management.	Appendix 3 of PMI 2016c
	Records to be kept of controlled waste tracking, tyre disposal, landfill register, incident reports, copies of relevant legislation and licence(s).	Appendix 2 of PMI 2016c

8.7.6 Key findings

The Delegated Officer has reviewed the information regarding landfill management and has found:

1. Comprehensive internal procedures have been put in place by the Applicant, including training in good waste management practice. This is supported by appropriately constructed and maintained facilities, compliant with regulations.

8.7.7 Consequence

The Delegated Officer considers the consequence of poor landfill management to be **minor**, given the area surrounding the landfill is largely disturbed.

8.7.8 Likelihood of Risk Event

Given the internal proponent controls already adopted, the Delegated Officer has determined that the likelihood of poor landfill management occurring will be **rare.**

8.7.9 Overall rating of poor management of landfilling

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk of poor management of landfilling to be **low.**

8.8 Risk Assessment – Sewage pipeline failures or overtopping WWTP tanks

8.8.1 Description of sewage pipeline failures or overtopping WWTP tanks

Sewage pipelines feeding the WWTP or transferring treated effluent from the WWTP to the irrigation field may fail due to a mechanical problem with the pipeline as constructed or due to damage incurred from either large rainfall events dislodging pipelines or from damage from mobile mechanical plant.

Process control errors or faults, or blocked screens due to poor maintenance may result in overtopping of individual tanks within the WWTP. The tanks of the Submerged Aerated Filter WWTP are part of a containerised system with an auto shut off on flow (level control) if they become full. Balance tanks are also available to provide extra capacity where there are spikes in water use.

8.8.2 Identification and general characterisation of emission

Sewage from the camp facilities and office ablutions will be treated in the WWTP. The capacity of the WWTP is 35 m^3 /day, based on a camp accommodation of 143 persons with an approximate water usage of 240 L per day for the camp.

8.8.3 Description of potential adverse impact from the emission

Partially or completely untreated sewage that may be released from the overtopping WWTP tanks may cause localised soil contamination, and potentially a short term amenity impact to adjacent workers.

Pipeline failures may also release untreated or treated sewage to land, inundating the soil. As native vegetation has adapted to thrive in low nutrient environments, the impact of a discharge would likely be negative due to the excess nutrients. Potential amenity impacts to adjacent workers, if not cleaned up quickly.

8.8.4 Criteria for assessment

No specific criteria has been applied for this assessment.

8.8.5 Applicant controls

This assessment has reviewed the controls set out in Table 19 below.

Table 19: Applicant's proposed controls for sewage pipeline failures or overtopping WWTP tanks

Site infrastructure	Description
WWTP tanks	All tanks in the SAF process are located within a sea container providing some internal secondary containment. The balance tank will be located externally to this in a bunded area adjacent to the containerised facility.
	Process control of tank levels are interlocked to the feed pumps; if flow is above the high level the feed is stopped and a high level alarm sounds.

8.8.6 Key findings

The Delegated Officer has reviewed the information regarding sewage pipeline

failures or overtopping WWTP tanks and has found:

1. SAF tanks are located within a sea container, providing some bunding capacity.
2. In the event of high flows into the SAF system and filling of the SAF tanks, level controls will sound and feed will cease. The balance tank also provides additional capacity in the event of surges or spikes in water use.

8.8.7 Consequence

If release of partially or untreated effluent to land occurs, native vegetation may be impacted with possible impacts to birds or other fauna if they come into contact with the effluent. The Delegated Officer has determined that the impact of the discharge will be **moderate**.

8.8.8 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of discharge of untreated, partially treated or treated effluent to land occurring will be **unlikely**.

8.8.9 Overall rating of sewage pipeline failures or overtopping WWTP tanks

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk posed by failure of sewage pipelines and overtopping from the WWTP is **medium risk**.

8.9 Risk Assessment – Irrigation of poorly treated effluent

8.9.1 Description of irrigation of poorly treated effluent

Approximately 1.5 ha of land has been set aside to dispose of treated effluent via irrigation.

8.9.2 Identification and general characterisation of emission

At this time two options are proposed for treating the effluent. The expected water quality of the treated effluent from each process is shown in Table 20 following.

However if the WWTP is not operated and maintained correctly, the discharge of effluent may not meet the expected water quality criteria.

8.9.3 Description of potential adverse impact from the emission

Potential eutrophication of the irrigation area and adjacent vegetation, if effluent is discharged above the nutrient loading levels. The irrigation site has been assessed by the Applicant as class D, meaning it is a fine grained soil (loam, clay or peat) according to the DoW's *Water Quality Protection Note 22 – Irrigation with nutrient-rich wastewater,* which states that the eutrophication risk is low, based on the type of soil that receives the treated effluent. However this risk must be managed by limiting the amount of nutrients discharged to the irrigation per hectare per year, in order not to overload the irrigation area with excess nutrients.

No surface waters are located within 500m of the proposed irrigation area.

Due to the hypersalinity of the underlying groundwater (in the palaeochannel), groundwater is not considered a receptor.

8.9.4 Criteria for assessment

Criteria for effluent quality has been adopted from Table 3 of the *Australian Guidelines for Sewerage Systems – Effluent Management* (ANZECC 1997) which recommends for irrigation

of treated effluent a minimum level of treatment as being secondary treatment (class C which removes most solids and BOD) whereas a common required level of treatment adds disinfection via chlorination, lagooning or ultraviolet treatment in addition to secondary treatment (class C and E).

Comparison of the expected treated effluent quality as compared to the class C criteria for both of the proposed treatment plants is shown below in Table 20.

Table 20: Expected treated effluent quality as compared to Australian Guidelines for secondary treatment

Parameter	Submerged Aerated Filter Unit WWTP	Australian Guidelines Secondary Treatment 'C' (ANZECC 1997)
BOD	< 20 mg/L	20 – 30 mg/L
Total Suspended Solids	<30 mg/L	25 – 40 mg/L
Total Nitrogen	<30 mg/L	20 – 50 mg/L
Total Phosphorus	<8 mg/L	6- 12 mg/L
Chlorine Residual	0.2 – 2 mg/L	2 mg/L
pH	6.5 -8.5	6.5 -8.5
Thermo-tolerant Coliforms *(E.Coli)*	<1000 cfu/100ml	10^5 – 10^6 mg/L

The Department of Water's Water Quality Protection Note 22 (WQPN 22) has been utilised to size the irrigation field based on Table 2 of that document, which recommends a nutrient application criteria based on application of nitrogen and phosphorus in terms of kg/ha/year. At a proposed discharge rate of 35 m^3 per day, onto an area of 0.9 ha the treated effluent from the Submerged Aerated Filter would meet the requirements as listed in Table 2 of WQPN 22 for nitrogen and phosphorus.

8.9.5 Applicant controls

This assessment has reviewed the controls set out in Table 21 below.

Table 21: Applicant's proposed controls for irrigation of poorly treated effluent

Site infrastructure	Description	Reference
Effluent Quality	Meets class C (secondary treatment)of Australian Guidelines for Sewerage Systems – Effluent Management	ANZECC 1997
WWTP	Maintain the plant through: • removal of inorganic waste from filters as required • removal of sludge every two months • refilling chlorine and aluminium sludge pumps	PMI 2017a

Site infrastructure	Description	Reference
	as required • calibrating WWTP cycles	
	Waste sludge to fully contained and transported off-site by a licensed controlled waste contractor and disposed of at a licenced landfill facility	
	Monitor effluent quality on a quarterly basis	
Irrigation Field	Installed and maintained as per *Water Quality Protection Note 70 – Wastewater treatment and disposal –domestic systems* (DoW 2016) Note this protection note is for domestic systems such as septic systems for single dwellings within public drinking water source protection areas, and is not directly assessable for the current application of a larger scale WWTP.	DoW 2016
	Sized to comply with the recommended nutrient applicant rate for risk category D soils (fine grained soils e.g loam, clays or peat) (DoW 2008).	DoW 2008

8.9.6 Key findings

The Delegated Officer has reviewed the information regarding irrigation of poorly treated effluent and has found:

1. The WWTP produces treated effluent which is capable of meeting class C (secondary treatment), which is minimum standard recommended for disposal to land via evapo-transpiration (irrigation).
2. Effluent quality will be monitored on a quarterly basis to ensure the quality continues to meet class C at point of discharge.

8.9.7 Consequence

If poorly treated effluent is discharged to land, then the Delegated Officer has determined that the impact of the effluent discharge may increase the risk of eutrophication. For the soil type D, and given the small area of the irrigation area, the Delegated Officer considers the consequence to be low level onsite, and hence **moderate**.

8.9.8 Likelihood of Risk Event

As the WWTP will be new and commissioned in accord with application commitments .The Delegated Officer has determined that the likelihood of discharging poorly treated effluent occurring will be **unlikely**.

8.9.9 Overall rating of irrigation of poorly treated effluent

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 10) and determined that the overall rating for the risk of discharging poorly treated effluent is **medium**.

9. Summary of acceptability and treatment of Risk Events, with Regulatory Controls

A summary of the risk assessment and the acceptability or unacceptability of the risk events set out above, with the appropriate treatment and control, are set out in Table 22 below. Controls are described further in section 10.

Table 22: Risk assessment summary

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)	Resulting Regulatory Controls
	Emission	Source	Pathway/ Receptor				
1.	Saline tailings or saline tailings return (decant) water	Pipeline failure	Vegetation	Pipelines located in v-drains (secondary containment). Pipelines located on the rim of the pit with containment swale to direct any potential spillage back to the pit.	Minor consequence Possible likelihood **Medium risk**	Acceptable subject to proponent controls conditioned.	No additional regulatory controls. Proponent controls to be conditioned in the Licence
2.	Tailings seepage	Tailings disposal to Ghost Crab Pit	Via groundwater to vegetation (rootzone inundation from groundwater mounding)	Freeboard limit to tailings deposition to 6m below ground level. Proponent to complete monthly monitoring of standing water level in existing (upstream) surrounding groundwater bores. Modelling of groundwater fate and solute transport indicate that the pit should remain a sink during operation.	Moderate consequence Rare likelihood **Medium risk**	Acceptable subject to proponent controls conditioned.	No additional regulatory controls. Proponent controls to be conditioned in the Licence

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)	Resulting Regulatory Controls
	Emission	Source	Pathway/ Receptor				
3.	Fugitive dust	Crushing plant, dry processing of lithium ore, stockpiling	Via air to vegetation	Sprays on conveyors in crushing plant and feed conveyor to wet beneficiation plant	Slight consequence Possible likelihood **Low risk**	Acceptable subject to proponent controls conditioned.	No additional regulatory controls. Proponent controls to be conditioned in the Licence
4.	Windblown putrescible or inert waste	Poor management of landfilling operation	Wind to land	Fencing, weekly coverage of landfill, weekly inspections, training for employees and contractors, internal procedures.	Minor consequence Rare likelihood **Low risk**	Acceptable subject to proponent controls conditioned.	No additional regulatory controls. Proponent controls to be conditioned in the Licence
5.	Untreated, partially treated or treated effluent	Failure of sewage pipelines or overtopped WWTP tanks	Land/soil	Process control on tanks. Secondary containment. Quarterly monitoring of effluent quality.	Moderate consequence Unlikely likelihood **Medium risk**	Acceptable subject to proponent and regulatory controls conditioned.	Proponent controls to be conditioned in the Licence. Emission limits on effluent quality prescribed in the Licence.
6.	Poorly treated effluent	Discharged to irrigation	Via air to land	Build the WWTP so as effluent is capable of meeting class C quality Monitor effluent quality on a quarterly basis	Moderate consequence Unlikely likelihood **Medium risk**	Acceptable subject to proponent controls conditioned.	No additional regulatory controls. Proponent controls to be conditioned in the Licence

10. Regulatory controls

A summary of regulatory controls determined to be appropriate for the Risk Events follows in this section. Controls are set with regard to the adequacy of controls proposed by the ***Applicant.*** The conditions of the Licence will be set to give effect to the determined regulatory controls.

10.1 Licence controls

10.1.1 Dust infrastructure and equipment

The following environmental controls, infrastructure and equipment should be maintained and operated onsite for dust management:

- Crushing plant and wet beneficiation feed dust suppression systems as specified in Table 17.
- Proactive usage of water carts to suppress dust on haul roads and disturbed areas adjacent to the processing plant.

10.1.2 Tailings and Tailings Return Pipelines

The following environmental controls, infrastructure and equipment should be maintained and operated onsite for tailings and decant pipeline management:

- V-drains pipeline bunding to be maintained;
- Where pipelines are located at the top of the crest of the Ghost Crab Pit, they will be located within the catchment swale so that spills fall back into the pit; and
- Daily inspections of the pipelines' integrity.

10.1.3 Wastewater Treatment Plant Construction

Construction of the WWTP will be specified in accord with the infrastructure required by Table 4 of this Decision Report for Category 85 for the SAF system WWTP. The WWTP shall be located in the indicative camp accommodation area as shown in Figure 1 of this Decision Report.

The WWTP shall treat effluent so as to be capable of meeting class C (secondary treatment) quality as specified in Appendix 6 of the *Australian Guidelines for Sewerage Systems – Effluent Management* as shown in Table 20 of this Decision Report.

Upon completion of construction, a construction and compliance document shall be submitted to DER detailing compliance with the relevant Licence condition(s).

10.1.4 Wastewater Treatment Plant Operation

The WWTP shall be operated and maintained so as to meet the class C quality for treated effluent as specified in Appendix 6 of the *Australian Guidelines for Sewerage Systems – Effluent Management* (ANZECC 1997) as shown in Table 20 of this Decision Report.

10.1.5 Landfill Operation

Landfill operation will be conditioned to require:

- Maintenance of the fence and signage;
- Weekly coverage of the landfill trench(es);
- Maximum 30 m size for the tip face; and

- Weekly inspections to ensure that correct wastes are being disposed of, coverage of trench (es) is occurring, no windblown waste and no waste runoff after rainfall events.

10.1.6 Tailings Deposition

Total tailings deposition into Ghost Crab Pit is limited to a total freeboard of 6 mbgl (~RL 374m).

10.1.7 Monitoring requirements – Tailings Deposition

Monitoring of the standing water levels in the upstream bores shall be conducted on a quarterly basis.

An annual survey of the freeboard available within the Ghost Crab Pit shall be conducted.

10.1.8 Monitoring requirements – Treated Effluent

Treated effluent from the WWTP shall be sampled quarterly at a location after the discharge point and prior to irrigation and analysed at a NATA registered laboratory for water quality parameters as listed in Table 20 of this Decision Report.

11. Applicant's comments

The Applicant was provided with the draft Decision Report and draft issued Licence on 9 June 2017. The Applicant provided comments which are summarised, along with DER's response, in Appendix 2.

12. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

Based on this assessment, it has been determined that the Issued Licence will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Tim Gentle
Manager Licensing (Resource Industries)
Delegated Officer
under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text ref	Availability
1.	Australia and New Zealand Environment and Conservation Council (1997) *National Water Quality Management Strategy: Australian Guidelines for Sewerage Systems – Effluent Management*	ANZECC 1997	http://www.environment.gov.au/system/files/resources/e52e452b-a821-4abe-9987-23988790e353/files/sewerage-systems-effluent-man-paper11.pdf
2.	DER Works Approval W4749/2010/1 Issued 10 October 2010	W4749/2010/1	DER internal; document record A339308
3.	DER Works Approval W5734/2014/1 Issued 18 December 2014	W5734/2014/1	DER internal; document record A1100773
4.	DER (2015) *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth, July 2015.	DER 2015a	Accessed at www.der.wa.gov.au
5.	DER (2015) *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth October 2015.	DER 2015b	
6.	DER (2016) *Guidance Statement: Licence duration.* Department of Environment Regulation, Perth, August 2016.	DER 2016a	
7.	DER (2016) *Guidance Statement: Risk Assessments.* Department of Environment Regulation, Perth, November 2016.	DER 2016b	
8.	DER (2016) *Guidance Statement: Decision Making.* Department of Environment Regulation, Perth, November 2016.	DER 2016c	
9.	Department of Water (2008) *Water Quality Protection Note #22 Irrigation with nutrient-rich wastewater*, July 2008	DoW 2008	Accessed at: http://www.water.wa.gov.au/__data/assets/pdf_file/0013/4045/82324.pdf

10.	Department of Water (2016) *Water Quality Protection Note no. 70 Wastewater treatment and disposal – domestic systems*,	DoW 2016	Accessed at: http://www.water.wa.gov.au/__data/assets/pdf_file/0003/4845/93698.pdf
11.	Native Vegetation Solutions (2016) *Level 1 Flora and Vegetation Survey for the Mt Marion Project Area,* unpublished report prepared for Mineral Resources Limited, January 2016.	Native Vegetation Solutions 2016	DER internal; document record A1430306
12.	Meissner, R., & Coppen, R.,(2014) Flora and vegetation of the greenstone ranges of the Yilgarn Craton: Kangaroo Hills and surrounding area in *Conservation Science W.Aust.* 9(2): pp 169 – 179.	Meissner & Coppen 2014	Accessed at: https://www.dpaw.wa.gov.au/images/documents/conservation-management/forests/forest-produce/KANGAROO_FINAL_LOW.pdf
13.	Letter from PMI to DER Commencement of Commissioning – Mt Marion Lithium Project – Works Approval (W5734/2014/1), dated 16 June 2016	PMI 2016a	DER internal; document record A1439287
14.	Letter from PMI to DER Beneficiation Plant Compliance Report – Mt Marion Lithium Project – Works Approval (W5734/2014/1), dated 5 September 2016	PMI 2016b	DER internal; document record A1167068
15.	Letter from PMI to DER Mt Marion Lithium Project – Works Approval (W5734/2014/1) Landfill Compliance Document, dated 3 November 2016	PMI 2016c	DER internal; document record A1333959
16.	Process Mineral International Pty Ltd (2017) *Mt Marion Lithium Project Licence M15/717 – M15/1000 Licence Application – Supporting Document*, February 2017	PMI 2017a	DER internal; document record A1380895
17.	Email from Matthew Blacklow, PMI to DER "Licensing Query – Mt Marion Lithium (L9037/2017/1)" dated 23 March 2017	PMI 2017b	DER internal; document record A1430306
18.	Pells Sullivan Meynink (2016) *Mineral Resources Limited. Mt Marion Lithium Project. Strategy for Tailing into Ghost Crab Pit,* unpublished report for	PSM 2016	DER internal; document record A1093383

	Mineral Resources Limited, April 2016		

Appendix 2: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of Licence Holder comment	DER response
Condition 2, Table 3	Applicant clarified the capacity of WWTP and the design. Also made a correction to the size of the irrigation spray field.	DER accepted edits.
Condition 18	Applicant queried due date of Compliance Report.	DER discussed with Applicant. No change to the condition.
Schedule 2, Table 7	Corrections made to the design capacities.	DER accepted edits.
Schedule 2, Table 8	Correction made to WWTP description.	DER accepted edits.

Attachment 1: Issued Licence L9037/2017/1