



Application to amend licence

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

Licence number	L5850/1993/11
Applicant	Yilgarn Iron Pty Ltd
ACN	626 035 078
DWER file number	2012/002671
Premises	Koolyanobbing Iron Ore Project KOOLYANOBING WA 6427 Being part Tenements L77/319, M77/606-I, M77/607-I, M77/611-I, L77/988-I, M77/989-I, M77/990-I, and M77/1278-1, and Crown Lease N466339 as depicted in Schedule 1.
Date of report	3 November 2020
Decision	Amended licence granted

Lauren Fox

A/MANAGER RESOURCE INDUSTRIES

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

1. Definitions

Key terms relevant to this decision report and their associated definitions are listed in Table 1.

Table 1: Definitions

Term	Definition
AHD	Australian Height Datum
Category / categories	Categories of prescribed premises as set out in Schedule 1 of the EP Regulations.
Decision Report	refers to this document.
Delegated Officer	An officer delegated under section 20 of the EP Act.
Department	The department established under section 35 of the <i>Public Sector Management Act 1994</i> and designated as responsible for the administration of Part V Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation As of 1 July 2017, the Department of Environment Regulation (DER), the Office of the Environmental Protection Authority (OEPA) and the Department of Water (DoW) amalgamated to form the Department of Water and Environmental Regulation (DWER). DWER was established under section 35 of the <i>Public Sector Management Act 1994</i> and is responsible for the administration of the <i>Environmental Protection Act 1986</i> along with other legislation.
Emission	has the same meaning given to that term under the EP Act.
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EP Regulations	<i>Environmental Protection Regulations 1987 (WA)</i>
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of, and during this assessment.
Licence Holder	Yilgarn Iron Pty Ltd (YIPL)
Minister	the Minister responsible for the EP Act and associated regulations
MS	Ministerial Statement
NAF	Non-acid forming
Noise Regulations	<i>Environmental Protection (Noise) Regulations 1997 (WA)</i>
Occupier	has the same meaning given to that term under the EP Act.
Prescribed premises	This has the same meaning given to that term under the EP Act.

Term	Definition
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
Revised Licence	the amended Licence issued under Part V, Division 3 of the EP Act following the finalisation of this assessment.
Risk Event	As described in <i>Guidance Statement: Risk Assessment</i>
UDR	<i>Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA)</i>
USEPA	United State's Environmental Protection Agency
U.S. EPA LEAF methods	Leaching environmental assessment framework as developed by the USEPA

2. Overview of premises

2.1 Koolyanobbing Iron Ore Project background

The Koolyanobbing Iron Ore Project (Koolyanobbing) has been in operation since 1993 as a series of open pit mines extracting iron ore from the banded ironstone formations in the area. Yilgarn Iron Pty Ltd (YIPL), a wholly owned subsidiary of Mineral Resource Limited (MRL), purchased the project in 2018.

The primary prescribed activity at Koolyanobbing is crushing and screening of iron ore. With the pits that required large volumes of dewatering no longer being mined, dewatering discharge to Lake K has ceased. Crushing and screening is still being carried out as iron ore is sourced from other pits within Koolyanobbing; Deception; Windarling; and Mt Jackson mining operations.

The crushed and screened ore is loaded onto freight trains and transported from Koolyanobbing siding to Esperance Port. An amendment to the licence in October 2019 included conditions to develop the infrastructure to improve the loading of ore.

There are 6 putrescible landfill areas on the premises that are authorised to accept domestic and inert waste including tyres. Domestic waste is deposited in a trench approximately 5m deep and 10m wide. The trench is currently located on the K deposit waste dump. Waste is covered regularly and the trench is surrounded by tall earth bunds to minimise windblown rubbish. Tyres are transported to a designated area of D Pit where they are stacked and periodically buried.

An onsite wastewater treatment plant (WWTP) has the capacity to treat approximately 300 cubic metres per day (m³/day) of wastewater from the accommodation village each day although it typically operates to treat 150 m³/day. It utilises a solids settling tank, open biological treatment dam (Pond 1) and an evaporation/infiltration dam (Pond 2). All treated wastewater is discharged and contained within the Pond 2 or reticulated to an irrigation field.

2.2 Classification of Premises

Table 2: Classification of premises and assessed design capacity

Classification of Premises	Description	Approved production capacity or throughput	Premises or design capacity
Category 5 (the category covering the activities authorised under this amendment)	Processing or beneficiation of metallic or non-metallic ore: premises on which — (c) tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam.	560,000 tonnes per annual period	
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.	12,500,000 tonnes per annual period	
Category 12	Screening etc. of materials	500,000 tonnes per annual period	

Category 54	Sewage facility	300 cubic metres per day
Category 64	Class II putrescible landfill site	4,000 tonnes per annual period

Table 3: Works approval and licence history since October 2007

Instrument	Issued	Nature and extent of works approval, licence or amendment
L5850/1993/9	19/10/2007	Licence re-issue
L5850/1993/10	17/09/2010	Licence re-issue
L5850/1993/11	25/10/2013	Licence re-issue (REFIRE format)
L5850/1993/11	26/03/2015	Licence amendment for pit-to-pit dewatering and Licence format conversion
L5850/1993/11	14/05/2015	Amendment to improvement condition IR1(a)
L5850/1993/11	19/11/2015	Increase in throughput and removal of improvement condition
L5850/1993/11	1/9/2016	Licence amendment to incorporate A Deposit Mine Pit as an emission point
L5850/1993/11	24/04/2017	Amendment Notice 1 to include Range F deposit, update the premises boundary and maps, include Category 12 and include waste locations to reflect current site operations.
L5850/1993/11	28/09/2017	Amendment Notice 2 to amend table 2.4.1 to include emission point L2, remove MBH1 & MBH2 from condition 3.5.1 table 3.5.1 and replace premises map, map of emission points for waste water treatment plant (WWTP).
L5850/1993/11	21/10/2019	Amendment Notice 3 to transfer licence from 'Cliffs Asia Pacific Iron Ore Pty Ltd' to 'Yilgarn Iron Pty Ltd'. Reduce category 64 production design capacity from 6,000 to 4,000 tonnes per annum and include 'C pit', remove category 6 & 57 from the licence including the removal of approved discharge points at Lake K and remove monitoring of vegetation, water quality, sediment and dewater pipeline inspections.
L5850/1993/11	03/11/2020	Amendment of licence to add conditions to provide for the development and operation of an in-pit tailings storage facility (TSF) to dispose of lithium refinery tailings from Albemarle Kemerton Plant. Previous amendment notices are consolidated at this time.

2.3 Description of proposed in-pit tailings storage facility

Background

YIPL are proposing the establishment of an in-pit tailings storage facility (TSF) within C Pit at Koolyanobbing to contain lithium refinery tailings from the Albemarle Kemerton Plant. A licence amendment was applied for on 1 April 2020 to establish the TSF.

MRL are joint venture partners (40%) with Albemarle Lithium Pty Ltd (60%) in the Albemarle Kemerton Plant which is under construction authorised by the works approval W6154/2018/1.

Commissioning and operation of the plant is expected to commence in early 2021. The approvals for the construction and operation of the Kemerton Plant do not include a tailings storage facility and an interim solution is required for tailings management and storage whilst measures to minimise the generation of waste and provide an alternative solution are explored.

Lithium processing tailings are comprised of alumina-silicates, approximately 15% gypsum, residual salts, trace elements and oxides from spodumene ore, and approximately 24% water. They are suitable for dry stacking and can be handled using earthmoving equipment.

Mining at C Pit was completed in 2017, dewatering ceased in 2016 and a pit lake developed. In 2019 the C Pit began to be back filled with waste rock from E Pit and an amendment to the Existing Licence in that year included it as a putrescible landfill site for future disposal of waste. To date there has been no disposal of waste to this area and YIPL have advised that they will not be considering it as a putrescible landfill site as it is to be developed as a TSF.

The production of tailings will be staged as per the table below as the Kemerton facility commissions each processing train.

Expected production schedule for tailings deposition

Year	2021	2022	2023	2024
Approximate Tonnage (kt)	150	400	500	560
Approximate Volume (m ³)	100,000	250,000	300,000	350,000

Design

Stage 1

The pit is to be prepared for accepting tailings by backfilling the base of the pit to 340m AHD using waste rock from E Pit and track rolling to create a stable platform. The depth of 340m AHD is approximately 3m above the maximum height of the post mining groundwater table based on information provided by the applicant. The permeability of the waste rock base will be higher than the compacted tailings.

Tailings are to be side tipped along the edge of the pit and pushed in by dozer until 364m AHD is reached. The tailings will be compacted every 500mm between 360m and 364m. The tailings surface will be sloped to divert water away from the tailings deposition to the pit walls for infiltration. (MRL, April 2020)

Stage 2

A 2m foundation layer of inert waste material will be placed to form a stable base for further tailings deposition. Tailings material will be pushed by dozers and stacked in 500mm layers to allow for compaction by dozer track rolling. An infiltration basin will be established at the 364m AHD level by placing a windrow of waste rock at the base of the new surface.

There will be three separate benches in stage 2 – at 370m, 376m and 382m AHD. The outer slopes of the tailings (batters) will be capped when 370m and 376m AHD levels are reached. At 382m AHD the tailings deposition will be complete.

If needed, to allow for trafficability during wet weather, the tipping floor may be sheeted with coarse competent waste material to ensure a stable floor is maintained for equipment movements.

Summary of TSF preparation and tailings deposition methodology:

- Waste rock will be pushed into the pit until 340m AHD is achieved in the base of the pit. The base of the pit will be track rolled to create a trafficable surface prior to tailings deposition(MRL, April 2020);
- Tailings will be side tipped near the edge of the basin and pushed in by dozer,
- Tailings will be deposited in 500mm layers and compacted (track rolled) to 364m AHD
- A 2m thick layer of compacted waste rock will be placed at 364m, forming a foundation layer for further deposition above 366m AHD;
- An infiltration basin infiltration basin will be constructed at 364m AHD by placing a windrow (3.5m high, base width 9.0m wide) of waste rock at the base of the new surface;
- Tailings will be deposited in 500mm layers and compacted (track rolled) until tailings deposition is completed at 382m AHD;
- The tailings will be deposited so that 3 benches of 6m will be formed.
- 1m thick capping of outer edges of the tailings will be undertaken upon completion of the final lift for each 6m bench;
- At 382m AHD the entire tailings mound will be capped with waste rock;
- The top surface of the tails will be graded to a slope of less than 5 degrees; all outer batter slopes will be less than 18 degrees to prevent erosion.
- The final capping will be compacted and will be at approximately 383m AHD.

The infrastructure and equipment are outlined in the table below and the site layout is shown in Figure 1 and Figure 2.

Table 4

Ref	Infrastructure or Equipment	Site Layout Plan reference (Figure 1)
1	Side tipping haul trucks and dozers	Not displayed
2	Water cart	Not displayed.
3	Infiltration basin	Infiltration basin

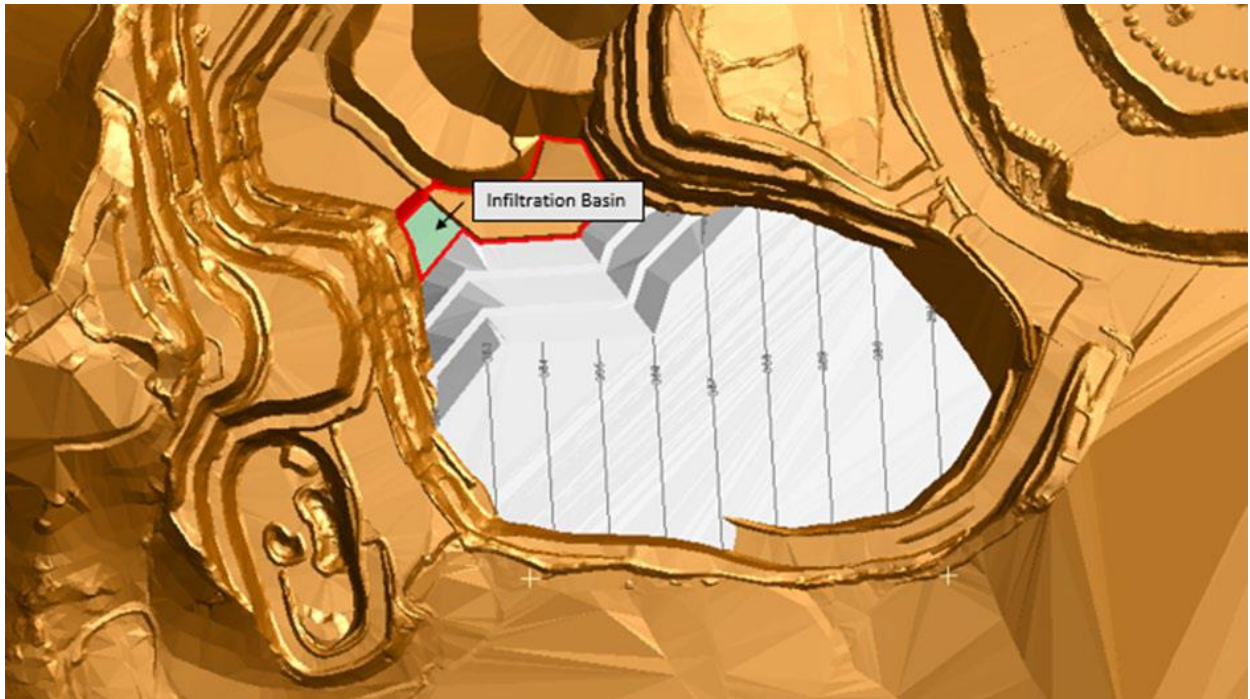


Figure 1: Site Layout Plan – completed tailings deposition in C Pit with surface contours (figure provided as part of the amendment application)

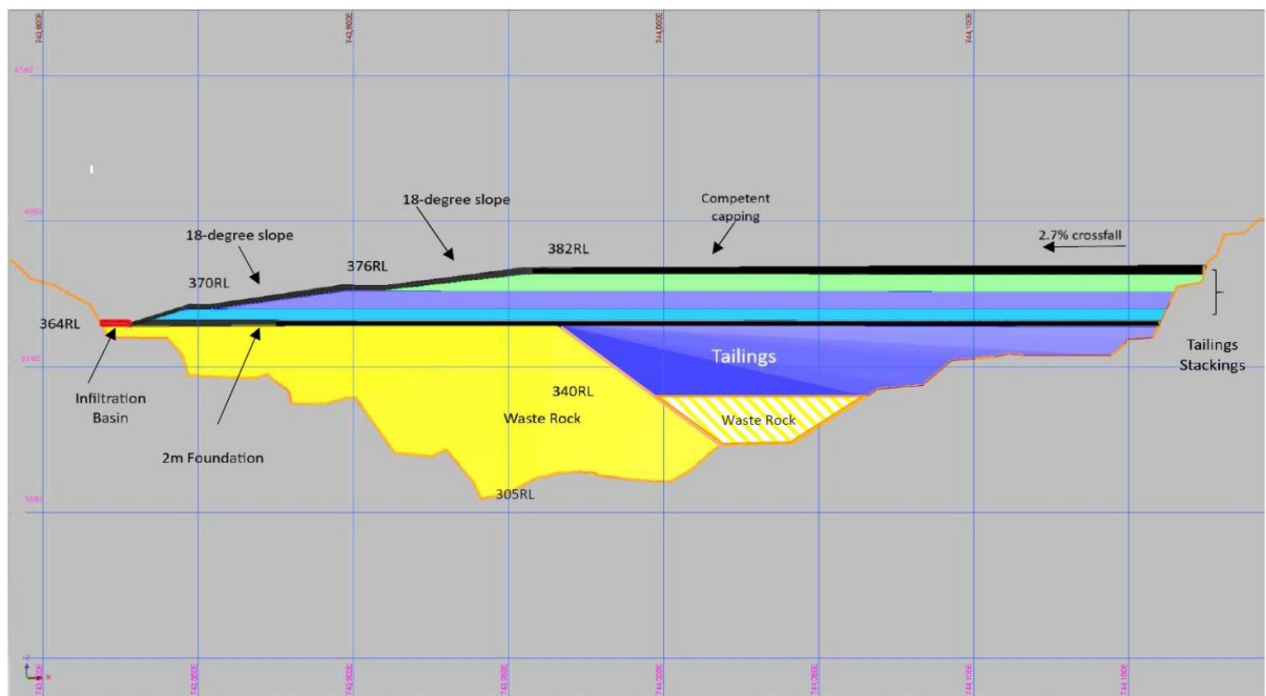


Figure 2: Cross section of final TSF (figure provided as part of the amendment application and updated during consultation)

3. Legislative context and other approvals

The legislative framework for this assessment is the *Environmental Protection Act 1986* (EP Act) and *Environmental Protection Regulations 1987* (EP Regulations).

Relevant guidance documents are outlined in Appendix 1. Approvals relevant to the premises

are outlined in the table below.

Table 5

Legislation	Number	Approval
Part IV of the EP Act	Ministerial statement 1054	Approval ' <i>to mine iron ore and construct mine infrastructure at the F Deposit area, located on the southern Koolyanobbing Range, approximately 50 kilometres north-east of the town of Southern Cross.</i> ' The area covered by MS1054 is within the Koolyanobbing licence L5850/1993/11 boundary but does not overlap the proposed C Pit TSF area of activity.
<i>Mining Act 1978</i>	Mining Tenement M77/607	Commencement: 22/09/1993 Expiry: 21/09/2035 Please note that approval under the <i>Mining Act 1978</i> for the TSF is currently under assessment.

4. Emission sources, pathways, receptors and controls

4.1 Emissions

The potential for emissions to impact on sensitive receptors has been assessed in accordance with the Department's Risk Framework. The key emissions during preparation of the pit for deposition which have been considered in this report are dust and noise from earthmoving including vehicle movements.

The Applicant has proposed measures to assist in controlling these emissions, where necessary. The control measures are outlined in Section 4.4 below and have been considered when undertaking the risk assessment detailed in Section 5.

This amendment is required to authorise emissions associated with the operation of the tailings disposal activities. The key emissions considered during tailings disposal are dust, noise and leachate from dry stacking of tailings and the seepage of moisture from the tailings once they are in place.

Emissions during construction of the TSF

The construction required for the TSF is minimal as it involves moving waste rock already in place within the pit to raise the base to the appropriate place and install piezometers and a monitoring bore. The emissions of dust and noise are the emissions produced by these activities.

Emissions during operation of the TSF

Dust

Dust will be produced during the transport, deposition and storage of the tailings. The trucks transporting the tailings will be covered to reduce tailings dust during transport. Ambient dust during transportation will be due to truck movements creating dust from the roads rather than tailings dust.

Tailings dust is expected during the deposition of tailings using side tipping trucks and pushing of material into position using dozers. The tailings particles are mostly fine with particle distribution of the tailings approximately 95% < 150µm and approximately 25-30% < 10µm.

Noise

Noise is expected to be generated through vehicle movements and tipping of waste rock during establishment of the TSF, including reversing alarms. Transport of tailings to site and tipping of tailings with dozer movements will be the main sources of noise during operation of the TSF.

Tailings

There is potential for tailings to be spilt outside of the C Pit TSF during transport via truck. Spills may be due to incidents such as vehicles rolling or colliding.

Leachate/contaminated rainwater

Leachate will be produced as the moisture in the tailings leaches into the waste rock base of the TSF. Rainfall also has the potential to infiltrate through the tailings leaching contaminants into the waste rock base. The tailings from Kemerton Plant have an expected moisture content of approximately 31 – 44% based on analysis of tailings from the Albemarle plant in China. This makes the potential for the release of leachate far less than the seepage from tailings disposed of as a slurry. The permeability of the compacted tails has been estimated to be 1.4×10^{-6} to 4.2×10^{-8} m/s. (MRL, August 2020)

From analysis of the tailings using USEPA LEAF methods, lithium concentrations increase in solubility on either acidic or alkali conditions and antimony concentrations remained consistent under circum-neutral to alkaline conditions (pH 6.1 to 9.5) at between 26 and 33 µg/L across both samples. Lithium is of note as it can be used to indicate the source of potential groundwater mounding as leachate from the tailings. The antimony is of note as it has the potential for accumulation in the environment if roots of vegetation should be in contact with it.

4.2 Pathways

4.2.1 Pathway - air/wind dispersion

Wind is recognised as the pathway for spreading of the emissions of dust and noise. These are emissions expected from the construction of the TSF base and the operation of the TSF. The position of the TSF within the pit, including the truck tipping area, reduces the exposure of the activities to wind and the potential for the emissions to spread beyond the pit into the immediate surrounds. Prior to deposition in the pit the tailings will be transported by truck over roads where wind has the potential to spread tailings dust and road dust. Using climate data from the Bureau of Meteorology's Southern Cross Airfield (site number 012320), the 9am prevailing wind direction is predominantly north, north-east and easterly. The 3pm prevailing wind direction at this weather station is westerly. These are depicted in Figures 3 and 4 below.

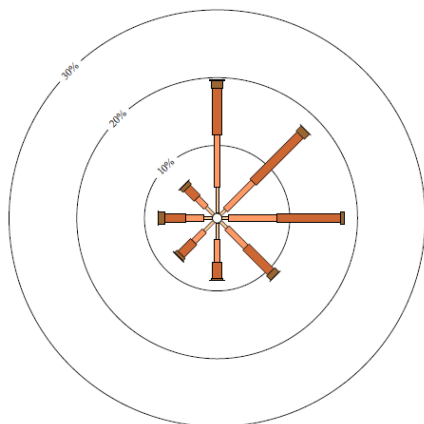
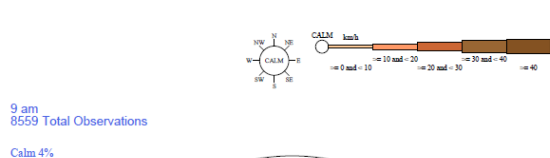


Figure 3: 9am prevailing wind direction

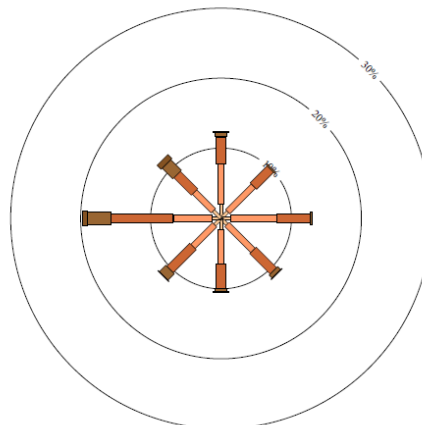
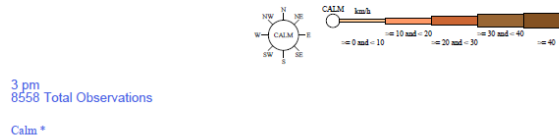


Figure 4: 3pm prevailing wind direction

4.2.2 Pathway - direct contact

Direct contact with soil and vegetation is a pathway for tailings to impact the vegetation and seasonal surface water. In the event of tailings spilling from a truck transporting the material vegetation may be smothered or soil contaminated such that vegetation dies. This pathway has a very limited extent however as the tailings are a solid material and will not be expected to flow away from the point of a spill. The haul roads in the Koolyanobbing Iron Ore Project do not cross any recognised surface water drainage lines but some level overland flow or dispersion of surface water in a storm event is to be expected.

4.2.3 Pathway - seepage

Leachate is also a potential emission from the tailings after deposition with the pathway being surrounding ground surfaces and groundwater. The surrounding base rock and the track rolled waste rock that is the TSF base have a far higher estimated permeability than that observed from the compressed tailings. The design of the TSF is based on all tailings liquor and any surface water being encouraged to infiltrate into the hypersaline groundwater beneath the C Pit. YIPL consider the low levels of moisture in the tailings and the low rainfall levels of the region will result in a low volume of seepage entering the ground (MRL, August 2020).

The aquifer in the area of the pit is a fractured rock aquifer that has been drawn down to a lower level than the natural background by mine dewatering during the life of C Pit mine and other surrounding pits. It is estimated by the applicant that the groundwater will recover to 337mAHD, 1m below the proposed tailings disposal. Groundwater in the region moves from elevated areas to low lying drainages and lakes where evaporative losses occur. For C Pit this will mean it flows toward Lake Deborah with B and A pits between. The B and A pits being groundwater sinks, due to evaporation from pit lakes drawing down the groundwater in a localised area, seepage from the C Pit TSF is most likely to be drawn to these pit lakes. (MRL, April 2020). Historic water levels from the bore present within C Pit give measures as high as 342.61m AHD (Cliffs, 2017).

The quality of the water in the aquifer is highly saline to hypersaline and the surrounding vegetation around the pits is not groundwater dependant. However the bore present in the C Pit between June 2014 and October 2016 showed highly variable results for the TDS with the lowest reading 8,515 mg/L and the highest 77800mg/L. There has been no confirmation of the current status of the groundwater as there are no bores remaining within the vicinity of C Pit. It is also mentioned in Cliffs 2013.

DWER considers that the estimation of the groundwater height by the applicant is not conservative enough to sufficiently reduce the potential for interaction with the deposited tailings. DWER consider that potentially the groundwater could raise more than 1 -2 m higher than the applicants estimate. The quality of the groundwater also needs to be confirmed as the variability of the records provided by the C Pit bore were not explained in this application. Given the potential for the groundwater to come into contact with the tailings the pH of the groundwater should also be determined as the potential for contaminants to be mobilised from the tailings increases with increased acidic or alkaline conditions.

Advice from the DWER hydrogeologist indicated that though the risk of seepage to groundwater is low there is potential for the water level to rise higher than the base of the tailings and that the groundwater may be acidic given the presence of massive pyrite identified in the bore log of the bore within C Pit. These pathways have been considered in the risk assessment table in Section 5.

4.3 Receptors

Risk is assessed as a combination of emission sources, the proximity and sensitivity of receptors to those emission sources and any pathways that can allow the emission to reach and potentially harm the receptor. Figures 5, 5a and 6 and the table below provides a summary of human and environmental receptors in proximity to the premises which have a potential to be impacted from site activities, and the risk assessment in Section 5 considers these receptors in the context of emissions and potential pathways.

Table 6

Human receptors	Distance from activity
Residential premises – Farming residences	27 - 28km south west from C Pit. The Delegated Officer considers it unlikely a risk event for dust or noise emissions will occur given the minimum distance of 27 km between the premises boundary and the closest resident receptor. As such, the Delegated Officer does not consider the risk to be significant enough to warrant further assessment.
Town of Southern Cross	Approximately 50 km from Koolyanobbing. The Delegated Officer considers it unlikely a risk event for dust or noise emissions will occur given the minimum distance of 50 km between the premises boundary and the closest resident receptor. As such, the Delegated Officer does not consider the risk to be significant enough to warrant further assessment.
Environmental receptors	Distance from activity
Groundwater	The aquifer intersected by C Pit is saline to brine (hypersaline) in quality (8,515 mg/L - 77800mg/L) with an estimated pre-mining standing level of 338m AHD according to pre-mining reports provided by the applicant. The measurement of standing water levels as recorded in 2014 and 2015 from the monitoring bore within C Pit were 342m RL and 339m RL respectively. (MRL 01/2020) 342mRL is 3m higher than the proposed level of the base of the TSF. The groundwater was extracted for pit dewatering during the mining of C Pit and the current pit lake level is estimated at 324m AHD. It is not certain that the 342mRL level will be restored once the TSF is established as the groundwater flow is toward A and B Pits which are expected to remain as groundwater sinks, drawing groundwater levels to a lower point than pre-mining levels.

Lake Deborah	Approximately 7km from C Pit down the hydraulic gradient.
Koolyanobbing vegetation complex (banded ironstone formation)	The C Pit is within the banded ironstone formation. The deposition of the tailings material is within an already highly disturbed footprint and will not be increasing the area of impact already created by the mine void and associated infrastructure.
Priority Flora : <ul style="list-style-type: none"> • <i>Beyeria rostellata</i> – Priority 1; • <i>Hibbertia lepidocalyx subsp. tuberculata</i> – Priority 3; • <i>Lepidosperma ferricola</i> – now Priority 3; • <i>Stenanthemum newbeyi</i> – Priority 3. • <i>Banksia arborea</i> – Priority 4 	Located close to the C Pit with closest specimens less than 100m from the edge of the pit. Roads accessing the C Pit traverse the areas where these species are located.
Priority Fauna: <i>Aganippe castellun</i> , Tree-stem Trapdoor Spider - Priority 4	Located close to the C Pit with closest specimens less than 100m from the edge of the pit. The roads accessing C Pit traverse areas where this species has been identified. Surveys have found that <i>A. castellum</i> is able to live in close proximity to operational areas, with burrows recorded within 25 m of A Pit and adjacent to the D Pit haul road.

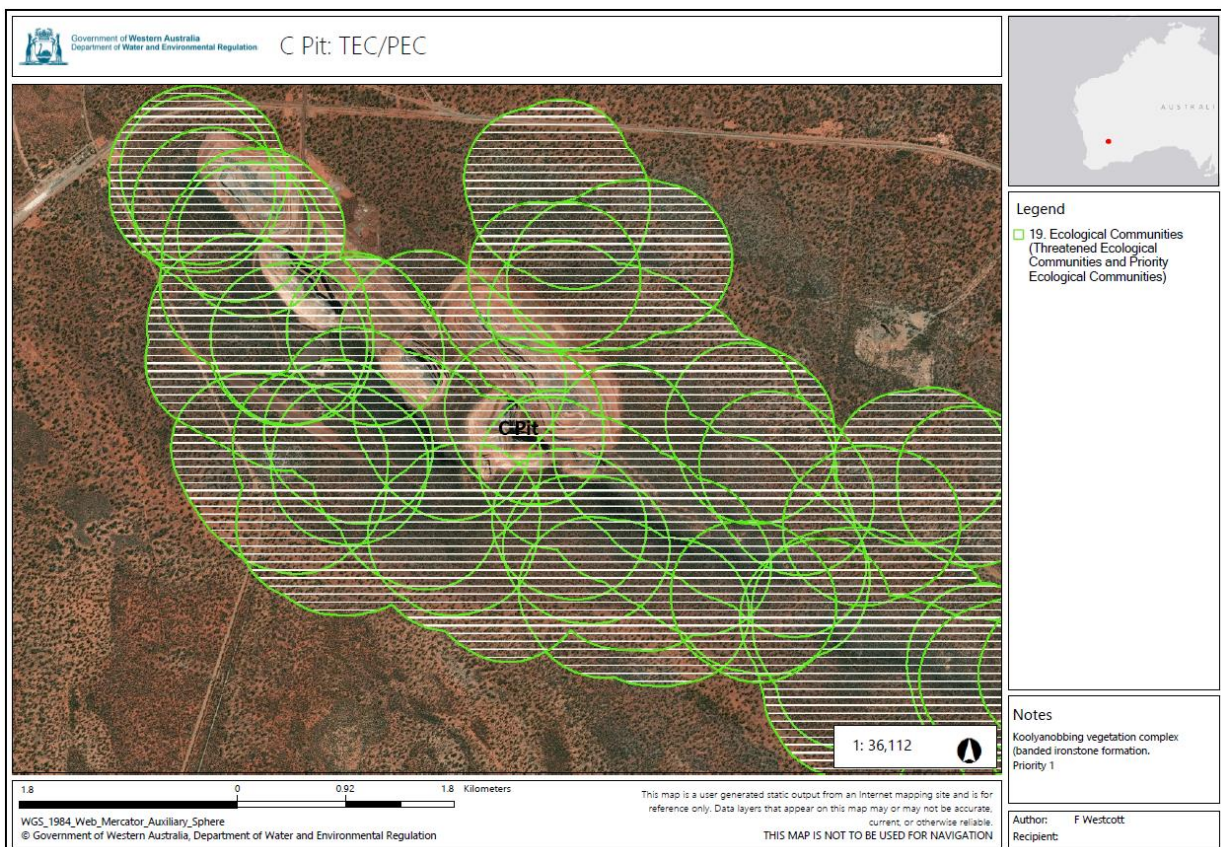


Figure 5: Distance to sensitive receptors – Threatened and priority ecological communities

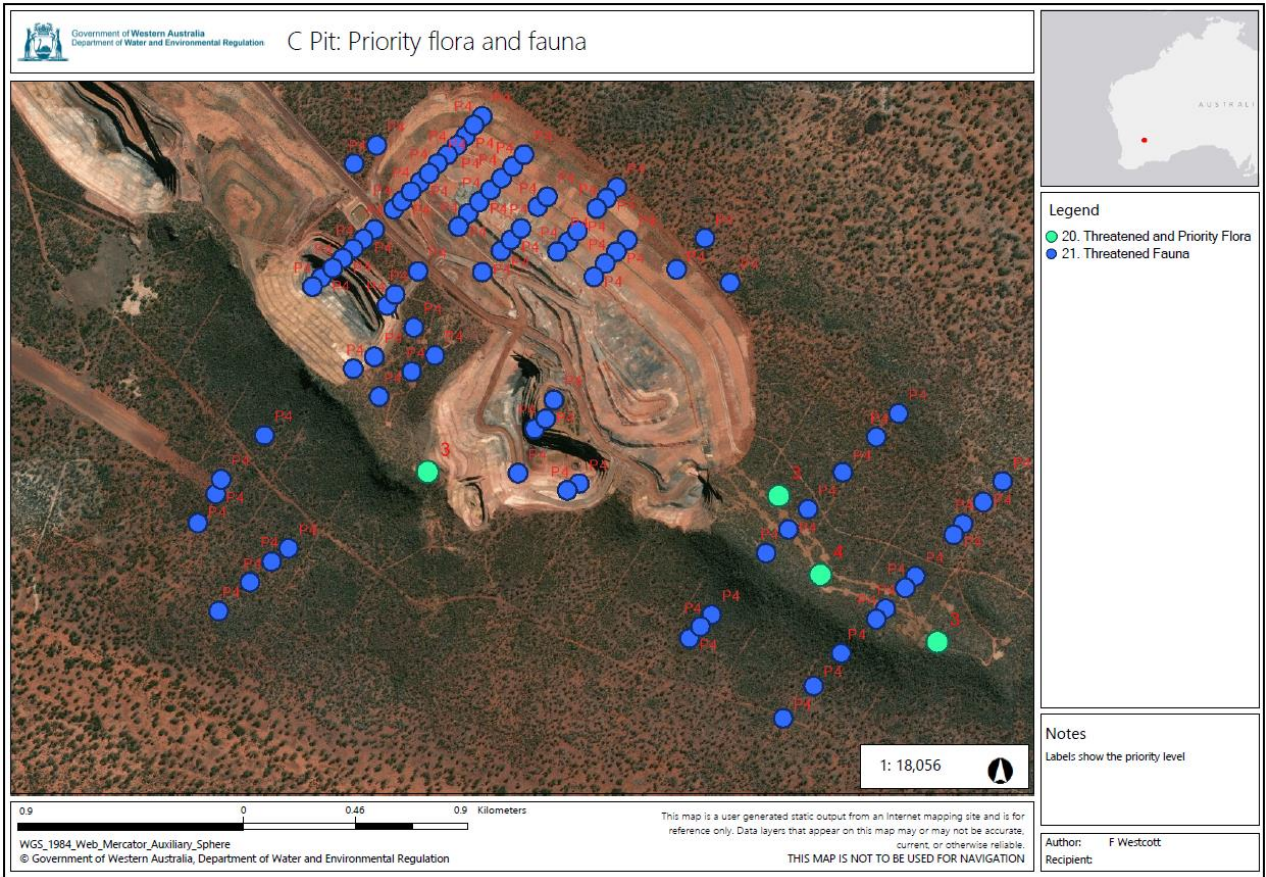


Figure 5a: Distance to sensitive receptors – Threatened and priority ecological

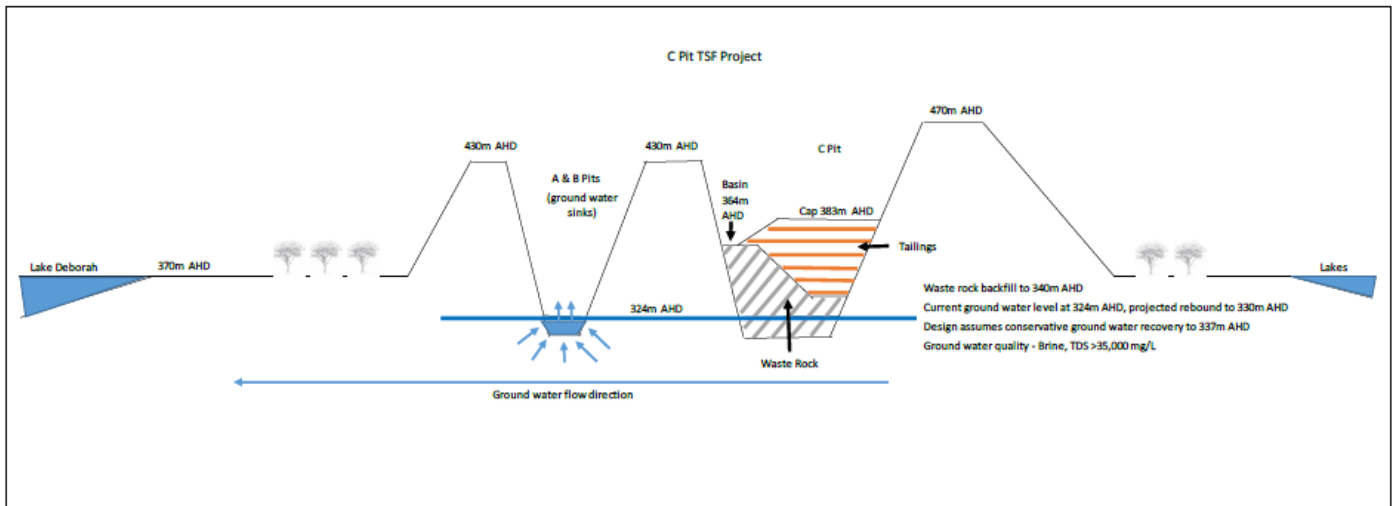


Figure 6: Conceptual diagram of groundwater in relation to the proposed tailings position (figure provided as part of the amendment application and updated during consultation)

4.4 Applicant controls

The Applicant has proposed the following management measures/controls as part of the application:

Table 7

Emission (as identified above)	Source	Proposed controls
Dust	The tailings are composed of fine particles and dust may raise from the surface as they dry. Handling of the tailings in transport and deposition into the TSF can also potentially raise tailings dust.	<ul style="list-style-type: none"> • Use of water trucks and/or water sprays to control emissions when visible dust is being generated and/or visible dust is reported by site personnel; • Reducing activities which cause visible dust emissions during periods of high winds if dust cannot be controlled through water sprays; and • Use of defined haul routes for mobile equipment travelling on unsealed surfaces or unformed roads. • The tailings will be capped as soon as practicable on completion of deposition, with 1m thick layer of NAF waste rock; • The <i>YIPL Dust Management Plan and Yilgarn Operations Koolyanobbing C Pit TSF Dust Management Procedure 242-EN-PRO-00XX_00</i> will be implemented to minimise tailings dust impact on personnel and the surrounding environment. These include the following controls: <ul style="list-style-type: none"> ○ When visible dust is being generated and/or visible dust is reported by site personnel, the primary method of fugitive dust suppression on open areas will be by water carts or water sprays. However, where fugitive dust cannot be effectively controlled, additional options will be investigated on a case-by-case basis; ○ During periods of high winds, if dust cannot be controlled through water sprays, activities that cause visible dust emissions will be reduced or stopped (where reduced activity controls are ineffective); ○ Defined haul routes for heavy vehicles and mobile equipment travelling on unsealed surfaces or unformed roads will be used; ○ Vehicles will adhere to designated speed limits throughout the Yilgarn Operations; ○ The tailings dump area will be clearly delineated to avoid double-handling material as far as practicable; ○ Overspray of saline water for mine road dust suppression will be prevented by spray bar and nozzle design and management of spray pressure; ○ Any complaints relating to dust emissions will be recorded and investigated. and • Visual monitoring of tailings dust impact on surrounding vegetation will be undertaken, and dust control measures increased or modified as required.

Emission (as identified above)	Source	Proposed controls
Noise	Noise will be generated from vehicle movement	The position of the activity within the pit will reduce any impact on surrounding sensitive fauna receptors.
Tailings	The tailings being transported spilling onto the ground due to insecure loading or vehicle incidents such as rollovers and collisions.	<ul style="list-style-type: none"> • The trucks transporting the tailings are to be covered. • Normal road and mine safety practices associated with bulk material will be adhered to.
Leachate	Leachate from the tailings could generate from the moisture content of the material being deposited and from percolation of rain through the material. There is also a risk of the groundwater rising after the capping of the pit lake by waste rock.	<ul style="list-style-type: none"> • Tailings deposition within the C Pit will be at 338m AHD, i.e. above the pre-mining groundwater level as estimated by the applicant. • The tailings will be capped as soon as practicable on completion of deposition, with NAF waste rock. • The applicant has provided information to suggest that A and B Pits are groundwater sinks and any leachate will be drawn towards and contained within these pits.

5. Risk assessment

The identification of the sources, pathways and receptors to determine Risk Events are set out in Tables 8 and 9 below, consistent with the *Guidance Statement: Risk Assessments*. They have been identified from the information provided in the application to which they confirmed and acknowledged that the information contained in this application was true and correct. Risk ratings have been assessed for each key emission source and take into account potential source-pathway-receptor linkages.

The mitigation measures / controls proposed by the Applicant have been considered in determining the risk rating. Emissions during construction and operation have been assessed separately to allow clear delineation of activity phases.

The conditions in the issued Licence, as outlined in Table 8 and 9, have been determined in accordance with the *Guidance Statement: Setting Conditions*.

5.1 Risk assessment – preparation of pit for deposition of tailings

Table 8

Risk Event				Consequence rating	Likelihood rating	Risk	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/Activities	Potential emissions	Potential receptors, pathway and impact	Applicant controls					
Back filling of C Pit up to RL level 340m AHD and construction of infiltration pond	Dust	Air/windborne pathway causing impacts to health of fauna (noise and dust) and flora (dust).	Refer to Section 4.4, Table 7	Slight	Unlikely	Low	<p>The back filling will occur at the lowest levels of the pit making it unlikely that the dust or noise emissions will be extending beyond the pit itself.</p> <p>YIPL has an established dust management plan and additional proposed controls during construction activities.</p>	<p>Conditions 1.1.5 – 1.1.7 cover the construction, auditing and reporting of the works. As the construction of the TSF is not being authorised under a works approval the conditions covering the construction details are placed on the licence with this amendment.</p> <p>Licence condition 2.3.1 – is amended to capture the measures for control from the dust management plan relevant to the Koolyanobbing licence.</p>
	Noise		Refer to Section 4.4, Table 7					

5.2 Risk assessment – operation

Table 9

Risk Event				Consequence rating	Likelihood rating	Risk	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/ Activities	Potential emissions	Potential receptors, pathway and impact	Applicant controls					
Transportation of tailings by truck over haul roads	Tailings	Direct deposition on ground or vegetation	Refer to Section 4.4, Table 7	Slight	Unlikely	Low	The controls of covering the trucks transporting the material and normal traffic management procedures on a mine site reduce the potential for minor spills or major tipping of material to unlikely. The volume of tailings in any one truck is low, limiting the potential size of any spill.	Condition 1.2.8 table 1.2.4: This condition requires the covering of tailings during transport among other conditions regarding waste management of the tailings.
Unloading and positioning of tailings of material Vehicle movements	Dust	Air/windborne pathway causing impacts to priority flora and fauna. (Closest flora and fauna specimens noted less than 100m from the edge of the pit)	Refer to Section 4.4, Table 7	Moderate	Unlikely	Medium	The Applicant's proposed dust mitigation controls are likely to be sufficient at mitigating dust emissions however the current ambient dust condition will be updated to remove reference to the 'Yilgarn Operations – Dust Management Plan' and condition the dust management measures directly.	Licence condition 2.3.1 – is amended to capture the measures for control from the dust management plan relevant to the Koolyanobbing licence.

Deposition of tailings in pit	Leachate	<p>Raised ground water levels bringing saline water to the root zone of the vegetation.</p> <p>Estimated level prior to mining is approximately 338m below ground level in the plain alongside the ironstone ridge.</p> <p>Information provided with the application indicates a maximum groundwater level of 337 m AHD post mining.</p>	Refer to Section 4.4, Table 7	Moderate	Unlikely	Medium	<p>The assessment of the groundwater levels and quality by YIPL is through hydrogeological estimates made prior to the commencement of mining at C pit. There has been no data gathered to confirm these estimates other than a single bore that has been decommissioned since 2016. This bore provided fluctuating data on water quality and, as it was a production bore, could not be relied upon for providing accurate groundwater levels.</p> <p>Conditions to require the measurement of the groundwater levels immediately below the TSF will allow for the detection of groundwater level recovery or seepage outside of the estimated values.</p> <p>Conditions to require measurement of the groundwater levels and quality at the receiving environment, the aquifer flowing between the C Pit and B Pit, will confirm the conditions within this aquifer and detect if there is impact from seepage.</p> <p>The applicant has no controls in place to manage groundwater mounding, however the depth of the tailings deposition makes it unlikely to reach the root zones of the vegetation based on the estimated groundwater level being correct.</p>	<p>Condition 1.1.5 – This condition covers the construction of the TSF and includes details for the construction of piezometers for measuring groundwater levels and a bore for measuring groundwater level and quality in the receiving environment.</p> <p>Condition 1.1.8 requires tailing characterisations to be undertaken to verify the composition of the tailings against those assessed against in this application.</p> <p>Condition 1.2.3, table 1.2.1 provides the infrastructure requirements for the operation of the containment infrastructure which includes the requirement for piezometers and a bore within the TSF.</p> <p>Condition 1.2.6, table 1.2.3 – includes the quantity limits for waste acceptance at the TSF.</p> <p>Condition 1.2.8, table 1.2.4 – includes compaction requirements to minimise permeability of tailings reducing potential for rainwater to percolate through tailings and create contaminated seepage.</p> <p>Condition 3.1.8, Table 3.1.1 provides for the monitoring of the piezometers and bore as installed in the TSF under condition 1.1.5.</p> <p>Condition 3.2.1 provides for the monitoring of the characterisation of the tailings as deposited at the TSF.</p>
-------------------------------	----------	--	-------------------------------	----------	----------	--------	--	--

Risk Event				Consequence rating	Likelihood rating	Risk	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/ Activities	Potential emissions	Potential receptors, pathway and impact	Applicant controls					
Deposition of tailings in pit	Leachate	Contamination of groundwater flowing toward Lake Deborah – impacts to surface water quality.	Refer to Section 4.4, Table 7	Moderate	Unlikely	Medium	<p>The applicant has raised the base of the TSF to 340m AHD will compact the tailings through track rolling to manage seepage. Although the likelihood rating is unlikely, there has been no confirmation of the current groundwater conditions, and the level and quality of the seepage from the tailings can only be estimated until the Albemarle Kemerton Plant is in production and the tailings from there tested.</p> <p>Advice from DWER's Principal Hydrogeologist is that the worst case scenario has the groundwater rising more than 1 - 2 m higher than the maximum level of the base of the TSF. There is potential for the seepage to interact with groundwater and be carried by the groundwater toward Lake Deborah.</p> <p>In the near and medium term It is unlikely to reach that far as B Pit and A Pit are situated in the path of the groundwater flow and these pits act as groundwater sinks by the action of evaporation from the pit lakes. These pit lakes may develop a level of contamination from the seepage but the water is sufficiently hypersaline that it is not a potential water source for fauna or flora.</p>	<p>Condition 1.1.5 – This condition covers the construction of the TSF and includes details for the construction of piezometers for measuring groundwater levels and a bore for measuring groundwater quality.</p> <p>Condition 3.1.8, Table 3.1.1 provides for the monitoring of the piezometers and bore as installed in the TSF under condition 1.1.5.</p>

6. Consultation

Table 10

Method	Comments received	DWER response
Application advertised on DWER website (17/04/2020)	None received	N/A
Local Government Authority advised of proposal (17/04/2020)	See Appendix 2	See Appendix 2
DMIRS advised of proposal (17/04/2020)	See Appendix 2	See Appendix 2
Albemarle advised of proposal (17/04/2020)	See Appendix 2	See Appendix 2
Applicant referred draft documents (8/10/2020)	See Appendix 2	See Appendix 2

7. Conclusion

Based on the assessment in this decision report, the Delegated Officer has determined that the application to amend licence L5850/1993/11 will be granted, subject to conditions.

These conditions reflect the controls determined to be necessary for emissions management, administration and reporting requirements during the construction and operation of the TSF.

Appendix 1: Key documents

Document title	Availability
Cliffs, 2017. Yilgarn Operations annual groundwater monitoring report, GWL No. 154459: 1 January 2016 – 31 December 2016	DWER records REPORT17/246
MRL, August 2020a & b. Response to request for further information; and Laboratory results supporting response to request for further information.	DWER records DWERDT323235 and DWERDT325075
MRL, April 2020. Licence (L5850/1993/11) amendment application form and supporting documentation	DWER records (DWERDT268864)
MRL, January 2020. GWL 154459: annual groundwater monitoring report	DWER records (DWERDT247805)
DER, July 2015. <i>Guidance Statement: Regulatory principles</i> . Department of Environment Regulation, Perth.	accessed at www.dwer.wa.gov.au
DER, October 2015. <i>Guidance Statement: Setting conditions</i> . Department of Environment Regulation, Perth.	
DER, February 2017 <i>Guidance Statement: Risk Assessments</i> . Department of Environment Regulation, Perth.	
DWER, June 2019 <i>Guideline: Decision Making</i> . Department of Water and Environmental Regulation	

Appendix 2: Consultation

Method	Comments received	DWER response
Local Government Authority advised of proposal (17/04/2020)	<p>DWER received comments from the Shire of Yilgarn on 23/04/2020 which outlined the following:</p> <ol style="list-style-type: none"> 1. YIPL has not consulted the Shire of Yilgarn. 2. Recommend that the tailings be stored at Kemerton or Greenbushes as they are considerably closer than Koolyanobbing operations. 3. Transportation of tailings will adversely affect communities between Kemerton and Southern Cross/Koolyanobbing. 4. YIPL should be instructed to liaise with the Sire of Yilgarn. 5. A higher level of assessment needs to be undertaken on the project i.e.: Public Environmental Review (PER) 6. At the time of the Kemerton Refinery being granted a works approval what measures/processes were given for the storage of the tailings? 7. What is the timeframe of the disposal to C Pit? 8. What dust monitoring is proposed at the Koolyanobbing Operations. 	<ol style="list-style-type: none"> 1. Noted however this is not a requirement under the works approval assessment. DWER consulted with the Shire and other key stakeholders as part of the assessment public consultation period. 2. This is outside the scope of the assessment for the licence amendment application. 3. The assessment of transport along public roads is not within the scope of this assessment. Main Roads was identified as a stakeholder for consultation. 4. DWER has no authority over the level of consultation between the applicant and a third party. 5. A referral to the EPA would be required to trigger a higher level of assessment. Under section 31(1) of the EP Act, any person may refer a significant proposal to the EPA for assessment under Part IV of the EP Act. The Delegated Officer does not consider this application to be a significant proposal for the purposes of Part IV. 6. The relevant information is in the Decision Document for Works Approval W6154/2018/1 which is publicly available on DWER's website. 7. The applicant estimated 4 -5 years however the TSF will be constrained by the volume of tailings authorised to be deposited rather than the estimated timeframes of the deposition.

		<p>8. Given the position of the main dust generating activities being within the C-Pit and being limited in extent, dust is not expected to impact vegetation surrounding the pit and therefore monitoring is not proposed. Please refer to section 4.2.1 in regards to dust emissions.</p>
<p>DMIRS advised of proposal (17/04/2020)</p>	<p>DWER received comments from DMIRS on 07/05/2020 which outlined the following:</p> <ol style="list-style-type: none"> 1. Discrepancies noted between the lifespan of the TSF between the supporting documentation and the application form. 2. A document supplied to DMIRS but not DWER advised that dewatering of C Pit prior to the addition of waste rock to establish the TSF base. DMIRS will request further information. 3. Permeability of the base of the TSF was not provided. 4. It would be beneficial for the origin and current location of the required materials to be clarified in a material balance table demonstrating the required volumes of material for each stage of the proposed activities. 5. In bore CPWB1 TDS ranges between 8,515mg/L to 77,800mg/L however, an analysis of the fluctuation in recorded data has not been provided. 6. A geochemical assessment of the characterisation of tailings (for leachate and solids) against a recognised relevant standard has not been provided. 7. Lithium Hydroxide tailings will be deposited 1m above the predicted C pit ground water recovery level (337m AHD). Justification has not been provided as to the sufficiency of the 1m buffer between the final level of backfilled waste material and the expected groundwater recovery level. 8. Table 12 of the TSF Design Report states that geochemical testing of the C pit floor surface will occur prior to tailing deposition (aiming for 100% NAF), however, no information is 	<ol style="list-style-type: none"> 1. The TSF will be constrained by the volume of tailings authorised to be deposited rather than the estimated timeframes of the deposition. 2. The removal of water from C-Pit to allow for development of the TSF base has not been confirmed by YIPL. Dewatering has not been considered in this assessment and would require YIPL to apply for this for future DWER assessment. 3. Further information has been provided by the applicant detailing the expected permeability of the TSF base. Please refer to sections 4.1 and 4.2.3 in regards to the permeability of the TSF base. 4. A material balance table is not required by the DWER for the assessment of the application. 5. Groundwater monitoring is included in the licence conditions to verify TDS. 6. Geochemical assessments have been provided. DWER's consideration of this information is outlined in section 4.1. 7. The applicant has proposed to raise the height of the TSF base to 340m AHD which will provide a predicted separation of 2-3m. 8. Information from YIPL states that the tailings material is non-acid forming and contains significant levels of acid buffering capacity/acid

	<p>provided regarding a contingency plan if test results are unfavourable.</p> <p>9. The Source-Pathway-Receptor model used by YIPL assumes C Pit will be a groundwater sink and does not clearly demonstrate that groundwater is not a receptor due to the quality, although as outlined above there are uncertainties regarding groundwater fluctuations.</p>	<p>neutralisation capacity due to excess residual calcite from lime neutralisation. DWER have also added conditions that require the monitoring of groundwater and the tailings material for pH.</p> <p>9. Groundwater monitoring is included in the licence to verify the groundwater conditions beneath the TSF. If additional controls are required, DWER may reconsider this after a review of the groundwater monitoring data required under this amendment.</p>
Albemarle advised of proposal (17/04/2020)	<p>DWER received comments from Albemarle on 01/05/2020 which outlined the following:</p> <p>More recent data exists about the likely characteristics of the tailings to be generated by the Kemerton lithium refinery, which may be relevant to DWER's assessment of the Application.</p>	The more recent data was provided by YIPL to DWER on 20 August 2020.
Main Roads advised of proposal (29/04/2020)	<p>DWER received comments from Main Roads on 29/05/2020 which outlined the following:</p> <p>Should the haulage operator be moving in excess of 300,000 tonnes per annum on the state road system under the Concessional Loading Scheme, they should be aware of Main Roads WA's Concessional Loading Road Maintenance Contribution Policy and contact Main Roads WA to discuss.</p>	No response was required.
Applicant referred draft documents (8/10/2020)	<p>DWER received comments from applicant on 22/10/2020 and 29/10/2020 which included the following points:</p> <ol style="list-style-type: none"> Table on cover page, Table 1.2.3 and Table 1.2.6: amended to reflect the tailings quantity of 600,000tonnes per annual period. Table 1.1.1 and Map of C Pit monitoring bore: The C Pit monitoring bore position be noted as <i>'the precise location of the monitoring bore to be confirmed on site. Immediately down gradient of C-pit and within already disturbed areas of native</i> 	<ol style="list-style-type: none"> Throughput updated. The diagram provided by the applicant did not provide the same level of detail as included in the map included in the draft documents. To accommodate this, the infrastructure location column in Table 1.1.1 has been updated to include: <i>'The precise location of the monitoring bore to be confirmed on site. Position of the bore should be within the banded iron formation</i>

	<p><i>vegetation, as shown in Map C</i>. The Map C provided by applicant showed the bore as slightly north west of the map within the draft licence.</p> <ol style="list-style-type: none"> 3. Table 1.2.2: Monitoring frequency for deposition levels of tails should be changed from weekly to monthly. 4. Table 1.2.3 Remove the restriction in Specification column for tailings acceptance. 5. Table 1.2.4: Remove item (ii) and reference to 'target moisture in item (iii) in the 'process requirements' for tailings. The operating manual has been reviewed by PSM (TSF design engineer) to seek clarity on the tailings testing and acceptance criteria. The manual has subsequently been revised to allow for the following: Tailings moisture will be monitored at the Kemerton plant only and tails will be accepted on an as received basis. Records will be provided from the facility. Tails will be tipped at the nominated location within C Pit. The material will be field assessed for physical properties and moisture conditioned, as required, prior to placement in the TSF. Quality Control (QC) samples will be taken and sent to laboratory for testing at a rate of one sample per 1,000m³ as per table 5 in the Operating manual. QC sampling will allow the moisture data from the Kemerton Facility to be validated and assist in the calibration of onsite assessment procedures for receipt of the tailings. 6. Table 3.1.1 The unit of measurement in relation to the piezometers and SWL would be better in m AHD. <p>Included with the comments were updated maps and diagrams for the premises.</p>	<p><i>immediately down gradient of C-pit and within already disturbed areas of native vegetation, as shown in Map C</i></p> <ol style="list-style-type: none"> 3. Monitoring frequency changed to monthly. 4. The requirement for tailings meeting the optimum moisture content has been removed. Re-instatement of the optimum moisture content as a specification for acceptance of tailings for final disposal will be considered in the future based on the reported characteristics of the tailing sand the performance of the TSF as reported through the Annual Environmental Report (AER) and TSF annual audit. 5. The following amendments to Table 1.2.4 have been made to allow for the flexible adjustment of moisture during handling of the tailings and still provide management of density of the tailings to reduce potential for contamination of rain/surface water by reducing permeability of tailings as far as is practicable: <ul style="list-style-type: none"> <i>(ii) Tailings dumped at nominated locations within C and moisture conditioned prior to final disposal into the TSF.</i> <i>(iii) Tailings will be spread into layers in the TSF, which do not exceed 500 mm loose, and compacted to a minimum of 95% maximum dry density.</i> <p>To allow for ongoing assessment of the performance of the TSF under the conditions of the licence the reporting conditions in Table 4.2.1 will include the TSF annual audit</p>
--	--	--

		<p>as prepared by the designer of the facility be included in the AER.</p> <p>6. The unit of measurement, m AHD, has been added to units column of Table 3.1.1 for the monitoring bore and the piezometers. The unit of mbgl is also required for the monitoring bore, and metres below base of tailings will be a required unit for the piezometers.</p>
--	--	---