



Application for Licence Amendment

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

Licence Number	L8308/2008/2
Licence Holder	CITIC Pacific Mining Management Pty Ltd
ACN	119 578 371
File Number	DER2014/000430-2
Premises	Sino Iron Project Mine Site Mining Tenements M08/123, M08/124, M08/125, M08/264, M08/265, M08/266, G08/54 and L08/126 MARDIE WA 6714 As defined by the Premises map attached to the Revised Licence
Date of Report	23 March 2021
Decision	Revised licence granted

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1. Decision summary

Licence L8308/2008/2 is held by CITIC Pacific Mining Management Pty Ltd (Licence Holder) for the Sino Iron Project Mine Site (the Premises), located on mining tenements M08/123, M08/124, M08/125, M08/264, M08/265, M08/266, G08/54 and L08/126.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during the operation of the Premises. As a result of this assessment, Revised Licence L8308/2008/2 has been granted.

The Revised Licence issued as a result of this amendment supersedes the existing Licence previously granted in relation to the Premises.

2. Scope of assessment

2.1 Regulatory framework

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

2.2 Amendment summary

On 14 October 2020, the Licence Holder submitted an application (CPM 2020c) to the department to amend Licence L8308/2008/2 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act) with the following amendments being sought:

- Tailings Storage Facility (TSF) 2, Raise 4, up to a maximum embankment height of 66 mRL (western embankment) and 70 mRL (eastern embankment); and
- An increase in discharge of TSF water (decant and seepage) via emission point DC2 from 1 gigalitres per annum (GL/a) to 2 GL/a.

On 1 February 2021 an Amendment Report and Revised Licence were granted for the assessment of the 2 GL/a discharge through emission point DC2.

This Amendment Report relates to the assessment of the TSF2, Raise 4 only.

In respect to categories on the existing licence, this amendment relates to changes to Category 5 activities only. No changes to the aspects of the existing licence relating to Category 6, 12, 52, 54, 57, 64 and 73 have been requested by Licence Holder.

During this amendment the following changes have also been made:

- Extension of the expiry date from the 31/05/2021 until the 31/05/2022.
- Category 5 assessed production / design capacity increased from 85,400,000 tonnes per annual period to 95,000,000 tonnes per annual period for the Primary Crushers (1 to 4) and Mill Lines (1 to 6). This increase aligns with Ministerial Statement (MS) 635, which authorises a rate of mining up to 95 million tonnes per annum (Mtpa). Refer to Section 2.3.
- The definition for *measurement locations* has been updated as the Licence Holder has stated (CPM 2021a) that they have entered into a licence agreement with the Australian Hydrographic Service to obtain tidal data for monitoring site Fortescue Road (21°0'0"S; 116°6'0"E). The definition has been amended by the deletion of the text shown in strikethrough below and the insertion of the text shown in bold and underline below:

*measurement locations means tidal data collected from the CITIC Tug Pen and CITIC ~~MOF Wharf and Bureau of Meteorology site Steamboat Island~~ **Australian Hydrographic Service site Fortescue Road.***

The department has granted the following approvals in relation to the TSF at the Premises:

- Works Approval W4447/2008/1 granted on 15 September 2008 assessed and approved the construction of an 800 ha TSF (Stages 1 and 2) with a maximum embankment height of 54 m (68 mRL).
- Licence L8308/2008/2 amended on 24 March 2016 transferred the operational phases of TSF Stage 1 and TSF Stage 1B (TSF1B) (interim lift forming the outline of TSF Stage 2 (TSF2)) from W4447/2008/1 to the licence for a 880 ha facility to a maximum height of 28.5 mRL.
- Licence L8308/2008/2 amended on 28 July 2016 updated TSF Stage 1 to a maximum height of 32.8 mRL (Stage 1) and 28.8 mRL (Stage 1B).
- Amendment Notice 2 for L8308/2008/2 granted on 9 June 2017 authorised the operation and increase of TSF1B embankment height from 28.8 mRL to 33 mRL.
- Amendment Notice 3 for L8308/2008/2 granted on 11 August 2017 authorised the construction and operation of TSF2 for a 987 ha facility up to an embankment height of 49 mRL.
- Amendment Notice 7 granted on 18 April 2019 authorised the downstream construction (in ~3 m lifts) and operation of TSF2 (Raise 3) up to an embankment height of 61 mRL.

2.2.1 TSF2 current operations

All facilities, including the required finger drains, seepage trenches (compliance documentation received on 9 March 2018 (CPM 2018)), pumps and groundwater monitoring bores are already in place from current operations to support the proposed TSF2, Raise 4 lift.

The Licence Holder has existing requirements under L8308/2008/2 to monitor ambient groundwater at bores (TSF_001; BH08-06 (09DD598); BH08-07 (09DD599); TSF_009; BH08-09 (09DD602); TSF_002; TSF_017 (17NC764); and 07WB002 (07NC256)) associated with the TSF2. Refer to Figure 1.

A linear low density polyethylene (LLDPE) geomembrane liner system has been installed in TSF2 up to 39 mRL, however, due to the steeper design slopes, an elastomeric bituminous geomembrane (BGM) has been used as it has greater puncture resistance and does not require the same degree of surface preparation to install. The permeability of the elastomeric BGM liner is approximately 4×10^{-14} m/s and has currently been installed up to 51 mRL (CPM 2020a).

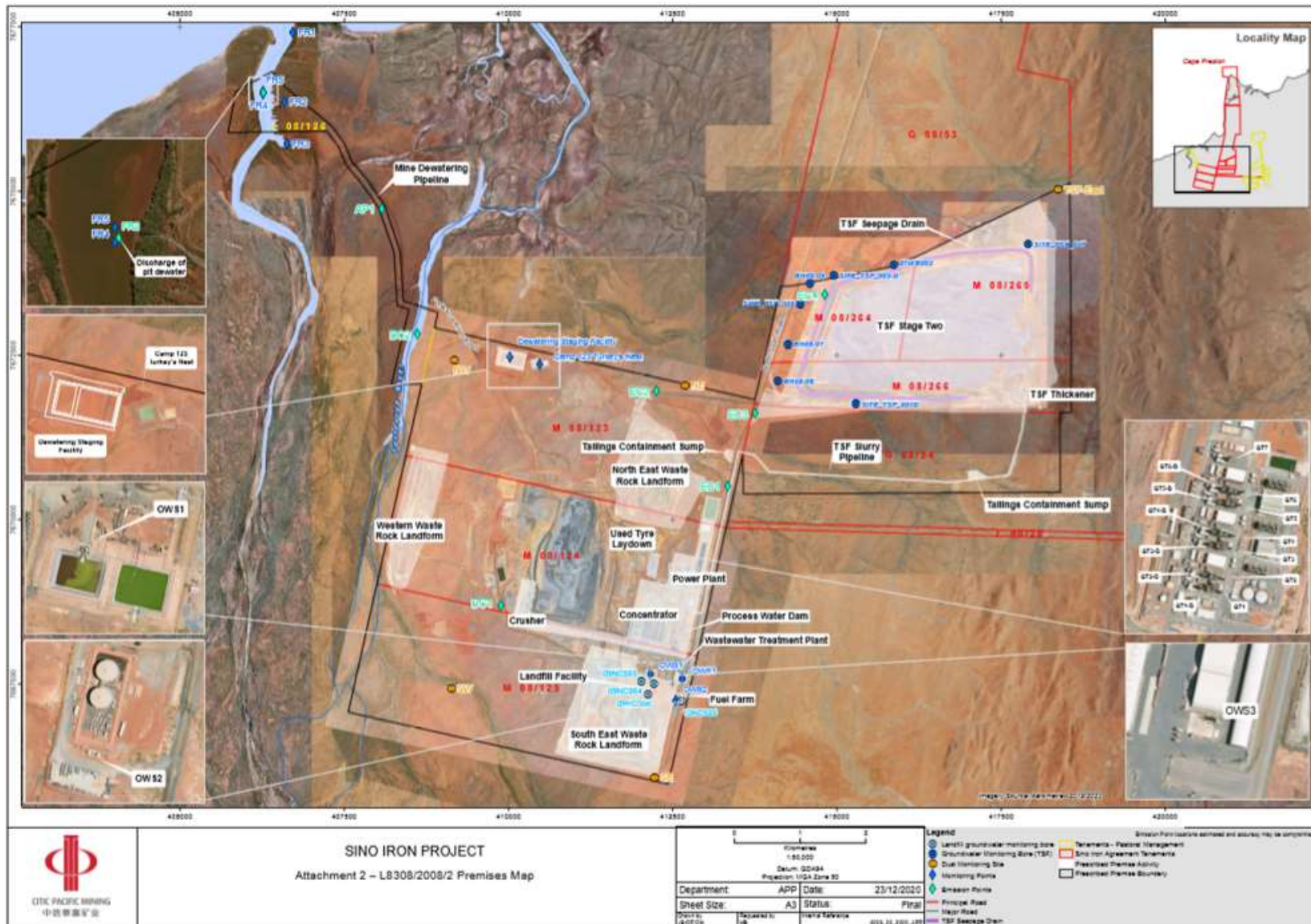


Figure 1: Premises map and location of TSF2 existing groundwater monitoring bores

2.2.2 TSF2 Raise 4

The key characteristics of TSF2 Raise 4 (continuation of existing operation) are provided in Table 1. The physical and chemical characteristics of the tailings remain comparable to the characteristics which formed the basis of the TSF2 Raises 1-3 design. It should be noted that TSF2 has been and continues to be constructed with steeper design angles on the walls due to tenure constraints.

Table 1: Key characteristics of TSF2

Total Size of TSF Footprint	<987 ha (as defined by MS 635 as amended and MS 1066)
TSF Surface Area	~550 ha
Maximum Embankment Height	Western Embankment: 66 mRL Eastern Embankment: 70 mRL Northern and Southern Embankments: grade between 66 mRL and 70 mRL
Decant location	Perimeter decant, north-west corner
Tailings Throughput	~69% of ore feed
Average Tailings Slurry Density	~61% solid by mass
Tailings Settled Dry Density	1.75 t/m ³
Beach Slope	0.3%

Based on estimated concentration production rates, it is projected TSF2 Raise 4 will extend the operational life of TSF2 from approximately Q2 2023 until approximately Q2 2025. Table 2 details the modelled capacity of TSF2.

Table 2: TSF2 Modelled capacity

Stage	Additional Tailings Storage Capacity (Mm ³)	Maximum Tailings Beach Elevation (mRL)		Embankment Elevation (mRL)	
		East	West	East	West
TSF2 Raise 2 (actual)	78	45.0	~38.0	61.0	48.0
TSF2 Raise 3 (actual)	76	60.5	50.7	61.0	61.0
TSF2 Raise 4 (proposed raise)	46	68.8	59.8	70.0	66.0
TSF2 TOTAL	200	68.8	59.8	70.0	66.0

TSF2 Raise 4 will form a centreline raise on the TSF2 Raise 3 embankment as shown in Figures 2 and 3. The lower lifts of the raise will be wide enough to be constructed using the mine fleet, however the upper portions of the raise will require a smaller civil construction fleet to place and compact the construction material.

For increased stability, a buttress is required along sections of the southern and western embankments.

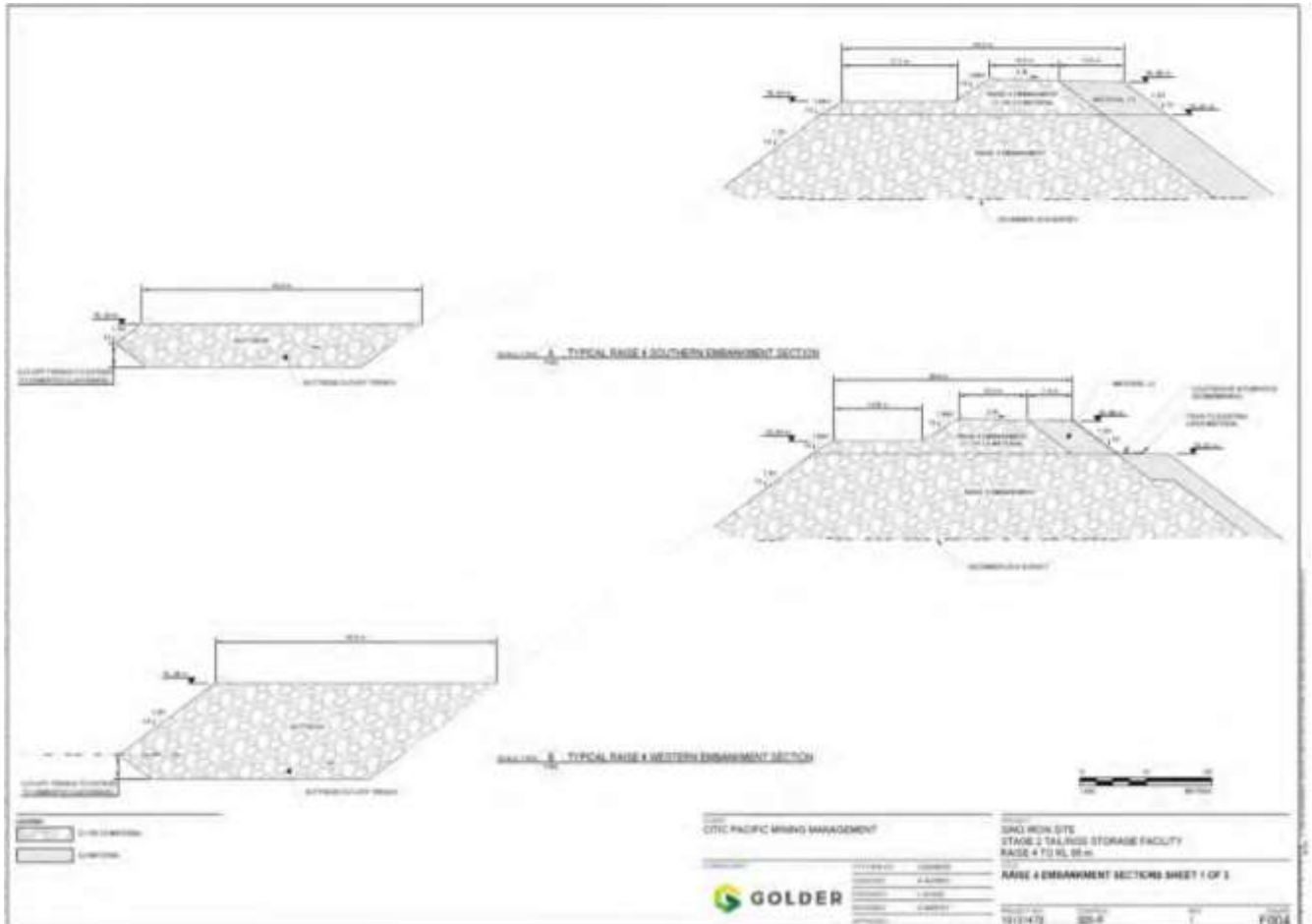


Figure 2: Design to 66 mRL with buttress

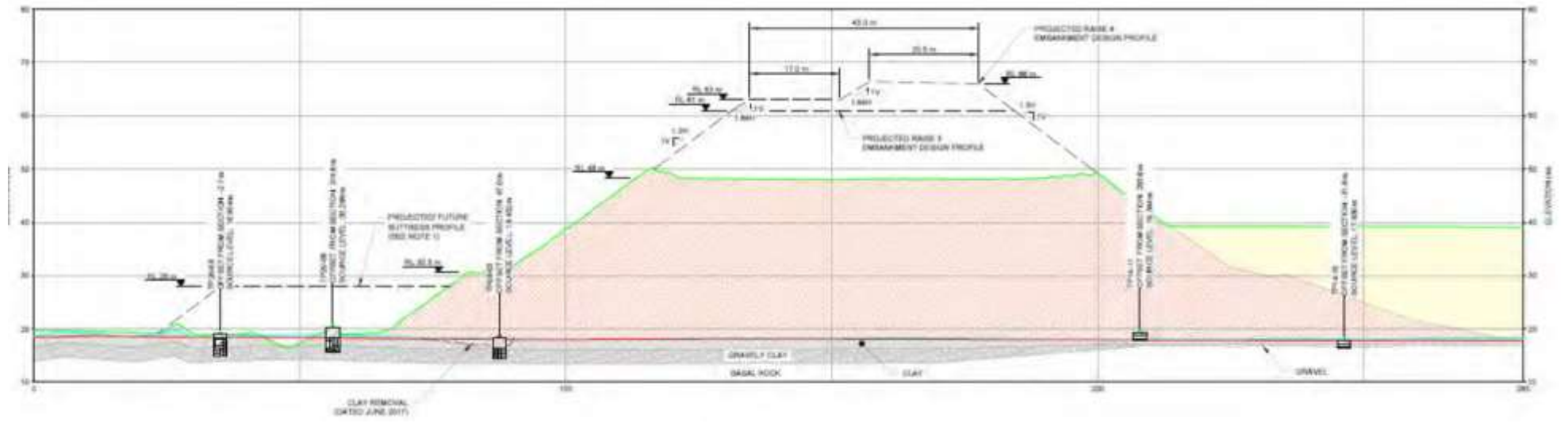


Figure 3: Design to 66 mRL with buttress

Seepage

Seepage modelling suggest a total seepage outflow of 106 L/s for TSF2 Raise 4 under normal operating conditions. The seepage pond is estimated to collect approximately 16 L/s (~15%) of this flow. The remaining 90 L/s (~85%) of seepage remains entrained in the foundation of TSF2.

CPM 2020c states “groundwater modelling indicates a groundwater drawdown cone will form around the mine pit in response to pit dewatering activities. Seepage from the TSF will result in a groundwater mound beneath the TSF. The TSF is located on the north-east boundary of the projected zone of dewatering influence from the mine pit and modelling suggests that a portion of seepage water from the TSF may flow back towards the mine pit during operations and post closure. Five tailings seepage management bores (18NC939, 18NC940, 20NC962, 20NC963 & 20NC964) have been installed within the projected zone of dewatering influence. These seepage management bores will enable groundwater levels to be regulated”.

This seepage management system (SMS) expansion is to address the Department of Mines, Industry Regulation and Safety (DMIRS) requirements (REGID 67764-J00446). The SMS is based on the hydrogeological regime which comprises essentially two groundwater systems:

- 1 A shallow system dominated by alluvium and eluvium with relatively high permeability and storage; and
- 2 A deeper older lower permeability system comprising cherty banded iron formations and mafic volcanics.

The SMS is concentrated in areas of higher permeability, which tends to be dominantly in areas of intensive weathering and fracturing. There are currently six dewatering bores focused in these areas, with a network of surrounding monitoring bores used to monitor the system performance (CPM 2021a).

Table 3 (CPM 2020c) shows the water quality results from the five tailings seepage management bores. The water recovered from these bores is directed to the seepage pond and discharged via emission point DC2 to DuBoulay Creek. This discharge has been assessed under the 2 GL/a discharge through emission point DC2, which was granted on 1 February 2021.

Table 3: Tailing seepage management bores water quality analysis

Parameter	DuBoulay Creek Baseline Range ¹		18 NC939*		18NC940*		20NC962 (18 Aug 2020)	20NC963 (27 Aug 2020)	20NC964 (3 Sept 2020)	Decant / Seepage DC2 Discharge Monitoring (May-19 to Aug-20)		
	Min	Max	Min	Max	Min	Max				Min	Max	
Oxygen Reduction Potential (mV) ¹	-	-	-	-	-	-	-	-	-	193.0	284.8	
pH (pH units)	7.8	8.6	7.98	8.13	7.87	8.02	7.85	7.85	7.81	7.67	8.12	
Dissolved Oxygen (mg/L) ¹	-	-	-	-	-	-	-	-	-	7.23	9.56	
Temperature (°C) ¹	-	-	-	-	-	-	-	-	-	23.9	31.5	
Electrical Conductivity (µs/cm)	1,530	106,000	6,560	9,730	7,470	9,570	9,360	7,680	7,720	6,400	9,300	
Total Dissolved Solids @ 180°C (mg/L)	859	92,000	5,010	6,000	5,560	6,780	6,940	5,850	5,970	4,450	6,800	
Total Sulfur (mg/L)	-	-	-	-	-	-	-	-	-	113	202	
Calcium (mg/L)	36	1,160	272	420	393	558	392	489	574	261	483	
Sodium (mg/L)	232	26,600	917	1,140	772	843	1,120	629	630	770	1,020	
Total Alkalinity (mg/L)	96	159	168	263	145	250	167	240	203	176	258	
Chloride (mg/L)	390	48,000	2,090	2,960	2,280	3,040	2,870	2,310	2,300	1,600	2,920	
Magnesium (mg/L)	37	3,480	224	350	329	444	316	357	342	168	358	
Potassium (mg/L)	14	1,240	2	2	2	3	2	2	2	10	37	
Sulfate(SO ₄ ²⁻) (mg/L)	74	5,660	324	402	215	271	459	647	586	326	554	
Bicarbonate(HCO ₃ ⁻) (mg/L)	96	159	168	263	145	250	167	240	203	176	258	
Carbonate(CO ₃ ²⁻) (mg/L)	<1	14	<1		<1		<1	<1	<1	<1		
Dissolved Metals	Aluminium (mg/L)	<0.10	0.0013	<0.01		<0.01		<0.01	<0.01	<0.01	<0.01	
	Lead (mg/L)	<0.01	0.0169	<0.001		<0.001		<0.001	<0.001	<0.001	<0.001	
	Mercury (mg/L)	-		<0.0001		<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	
	Copper (mg/L)	<0.01	0.017	<0.001		<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.002
	Hexavalent Chromium (mg/L)	<0.01	0.0003	<0.01		<0.01		<0.01	<0.01	<0.01	<0.01	
	Nickel (mg/L)	<0.01	0.0013	<0.001	0.039	<0.001	0.009	<0.001	<0.001	0.002	<0.001	0.002
	Zinc (mg/L)	<0.01		0.011	0.023	0.019	0.059	0.045	0.018	0.019	<0.005	0.011
	Cadmium (mg/L)	<0.001		<0.001	0.0012	<0.0001		<0.0001	0.0001	<0.0001	<0.0001	
	Cobalt (mg/L)	<0.01	0.001	<0.001		<0.001		<0.001	<0.001	<0.001	<0.001	
	Iron (mg/L)	<0.5	0.009	<0.05	0.06	<0.05		<0.05	<0.05	<0.05	<0.05	
	Manganese (mg/L)	<0.01	0.0186	<0.001	0.006	<0.001	0.003	0.006	0.009	0.005	<0.001	0.008

¹ In-field non-NATA accredited analysis

* Based on 6 samples collected from Mar-19 to Jun-20

[†] Range of 14 monthly opportunistic sampling events conducted between Apr-14 and Feb-16 at 408643, 7673190 (approximately 350m downstream of emission)

Vegetation health

CPM 2020b states that seepage and resulting groundwater mounding impacting vegetation has been observed.

The application was referred internally and based on the statement above, it was surmised that “this suggests that a perched aquifer is forming in the regolith above bedrock in some areas”. It was therefore recommended that a ground-based geophysical investigation be carried out in the area where vegetation had been affected by soil salinisation. The purpose of the investigation would be to determine the extent and severity of soil salinisation in this area in a non-invasive manner. Suitable geophysical techniques for doing this include the use of electrical resistivity and electromagnetic induction techniques.

The Licence Holder has stated that the areas where some impacts have been observed is where the SMS dewatering bores are focused, and is also in the footprint of the future TSF expansion to the north of the existing TSF2. The Licence Holder considers “that further investigation into this area is unwarranted at this time and any issues will be taken into account with the TSF design for the northern expansion when it commences.” (CPM 2021a).

2.3 Part IV of the EP Act

The Premises is subject to MS 635, MS 822 and MS 1066 under Part IV of the EP Act:

- MS 635, issued on 20 October 2003, approved the construction and operation of a 44.8 Mtpa iron ore mine, power station, desalination plant, processing plant, accommodation, and port facilities in the Cape Preston area.

- MS 635, Attachments 1 to 5 have resulted in approvals to increase the mining rate to 95 Mtpa, the production of concentrate to 27.6 Mtpa and produced waste to tailings storage to 67.4 Mtpa and discharge of up to 2 GL/a of dewatered groundwater from the mine pit to a point near the mouth of the Fortescue River.
- MS 822, issued on 23 December 2009, amended conditions in MS 635 to remove requirements for further investigations into seawater quality and the location of the marine outfall and replaced them with conditions related to Ecological Protection Areas.
- MS 1066, issued on 20 October 2017, approved the expansion of the iron ore mine, processing plant and export facilities in the Cape Preston area. For the mine and processing plant this included deepening the mine pit, additional infrastructure (including waste storage, creek diversion and infrastructure corridors), additional dewatering and discharge of surplus dewater.

3. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guidance Statement: Risk Assessments* (DER 2017).

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

3.1 Source-pathways and receptors

3.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises operation which have been considered in this Amendment Report are detailed in Table 4 below. Table 4 also details the proposed control measures the Licence Holder has proposed to assist in controlling these emissions, where necessary.

Table 4: Licence Holder controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Vehicle movement Earthworks	Air / wind dispersion	<ul style="list-style-type: none"> • Keep the area of exposed surfaces to the minimum required for construction activities. • Apply sufficient water to dry dust prone areas. • Tailings will not be used as a construction material. • No mechanical disturbance to the existing tailings surface. • Implement the <i>Sino Iron Project, Fibrous Minerals Management Plan</i>.

Emission	Sources	Potential pathways	Proposed controls
Operation			
Dust	Increased tailings storage within the TSF	Air / wind dispersion	<ul style="list-style-type: none"> • Keep tailings beach wet to prevent fugitive dust emissions by rotation of spigots. • No mechanical disturbance once tailings surface is dry. • Rotate discharge spigot to maximise evaporation and consolidation of tailings. • Control the channeling of discharged tailings by maximising number of spigots. • Daily visual inspections of the tailings beach for signs of drying or dust generation. • Use of a polyacrylamide flocculant in thickeners. • Implement the <i>Sino Iron Project, Fibrous Minerals Management Plan</i>.
Spillage of tailings, seepage water and decant return water	Tailings pipeline pipeline leaks, ruptures or failure	Direct discharges to land	<ul style="list-style-type: none"> • The existing tailings pipeline is equipped with pressure monitoring sensors which are continuously monitored within the processing control room. • Two containment sumps are located along the pipeline route for the temporary storage of tailings in the event of a pipeline breach. • Tailings pipeline and dams inspected daily.
	Seepage or decant return water pipeline leaks, ruptures or failure		<ul style="list-style-type: none"> • Daily inspection of the pipeline whilst operational.
	Tailings bypass maintenance pipeline leaks, ruptures or failure		<ul style="list-style-type: none"> • Limited operations. Bypass maintenance pipeline will only be utilised when the tailings pipeline is offline during to maintenance activities (anticipated once or twice a year). • Daily integrity inspections of the pipeline whilst operational. • Pipeline is constructed within a compacted earthen bund. • Where the pipeline crosses surface water expressions, the pipe has been encased within a steel sleeve so tailings will be directed to the earthen bund in the event of a rupture. • A pressure transmitter is to be installed

Emission	Sources	Potential pathways	Proposed controls
	<p>Overflow of seepage and decant water containment infrastructure</p>		<p>within the bypass pipeline and connected to the existing control systems on the main tailings pipeline. Any large drop in pressure during the operation of the bypass pipeline will trigger an alarm in the control room.</p> <ul style="list-style-type: none"> • Daily inspections of the seepage and staging ponds and associated pipelines.
Tailings seepage	Increased tailings seepage from increased tailings disposal	Seepage of leachate	<ul style="list-style-type: none"> • An elastomeric BGM liner system will continue to be installed along the flanks of the northern and western embankments. • A low permeability zone will be constructed within the upstream northern embankment and south-western corner immediately beyond the extent of the elastomeric BGM liner. • Ongoing monitoring of the supernatant pond and monitoring bore water levels and quality. • Five tailings seepage management bores (18NC939, 18NC940, 20NC962, 20NC963 and 20NC964) have been installed within the projected zone of dewatering influence. • Existing seepage control infrastructure (finger drains and seepage trenches) beneath TSF2 which drain to a seepage pond.
Tailings material	Overtopping of tailings from increased tailings disposal	Direct discharges to land	<ul style="list-style-type: none"> • Designed to safely store the design storm event arising from a 1 in 10,000 AEP 72-hour rainfall, plus a contingency storage to allowance to contain the 1 in 50 (2%) AEP wind wave run-up and an addition freeboard of 0.5 m. • Regular surveys of the tailing dam surface to monitor freeboard level. • Water decanted from the TSF using an existing decant structure to a staging pond. • Existing decant structure comprises: <ul style="list-style-type: none"> - A primary decant structure with an internal decant sump and reinforced, slotted concrete rings surrounded by rock filter; and - A secondary decant system which allows for the pumping of supernatant

Emission	Sources	Potential pathways	Proposed controls
			<p>water in cases where the primary decant is raised and maintained and to expand decanting capability where required.</p> <ul style="list-style-type: none"> Existing decant system pumping capacity is 1,000 m³/hr. Maintain the size of the supernatant pond at approximately 9% of the TSF basin area and at approximately equal radius around the north-west perimeter decant.

3.1.2 Receptors

In accordance with the *Guidance Statement: Risk Assessment* (DER 2017), the Delegated Officer has excluded employees, visitors and contractors of the Licence Holder's from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 5 and Figure 4 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises (*Guidance Statement: Environmental Siting* (DER 2016)).

Table 5: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
A public road facilitating access to the Fortescue River mouth recreation area (informal campsite not managed by the City of Karratha)	Passes approximately 1.5 km to the south of the TSF2 running in an east-west direction
Environmental receptors	Distance from prescribed activity
Edwards Creek Stormwater and process water is authorised to be discharged via emission points EC3 and EC4 (discharge pipe to a tributary of Edwards Creek) as a result of an uncontrollable event.	2 km from the TSF2 Edward Creek then merges into DuBoulay Creek
DuBoulay Creek TSF2 seepage and decant water is discharged via emission point DC2 which is located within DuBoulay Creek in a tidal location where hypersaline conditions are experienced regularly and also subjected to flood conditions after significant rainfall in the Fortescue River catchment.	5 km from the TSF2

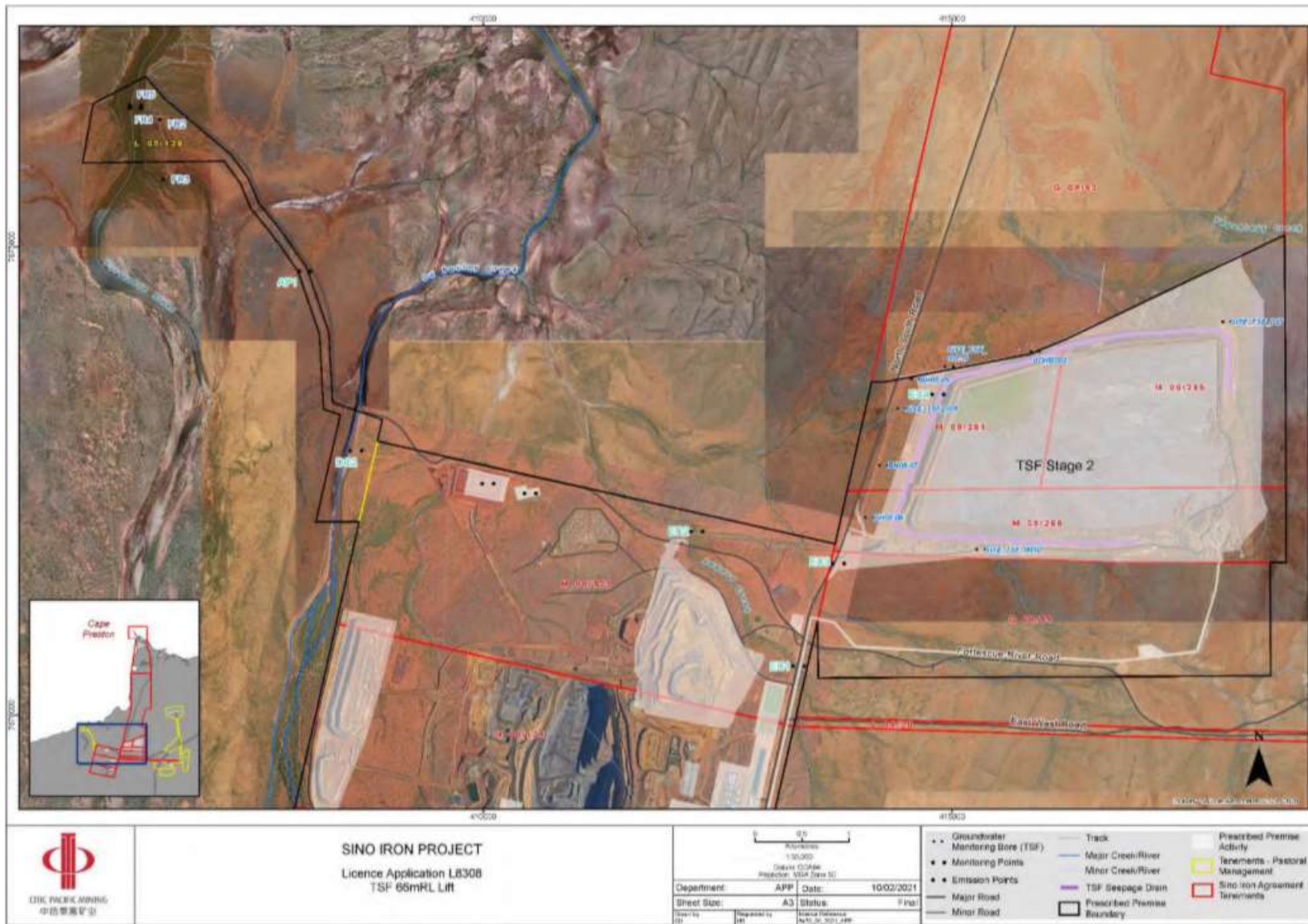


Figure 4: Distance to sensitive receptors

3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guidance Statement: Risk Assessments* (DER 2017) for those emission sources which are proposed to change and takes into account potential source-pathway and receptor linkages as identified in Section 3.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the Licence Holder has proposed mitigation measures/controls (as detailed in Section 3.1), these have been considered when determining the final risk rating. Where the Delegated Officer considers the Licence Holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

Additional regulatory controls may be imposed where the Licence Holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 6.

The Revised Licence L8308/2008/2 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises.

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

Table 6. Risk assessment of potential emissions and discharges from the Premises during construction and operation of TSF2 Raise 4

Risk Event					Risk rating ¹ C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls				
Construction								
Construction of TSF2 Raise 4	Dust associated with earthmoving and vehicle movement	Air / wind dispersion causing reduced visibility and amenity impacts	Public while utilising access to the Fortescue River	Refer to Section 3.1	C = Minor L = Possible Medium Risk	Y	Condition 9	N/A
Operation								
TSF2	Dust associated with increased tailings storage	Air / wind dispersion causing reduced visibility and amenity impacts	Public while utilising access to the Fortescue River	Refer to Section 3.1	C = Minor L = Possible Medium Risk	Y	Condition 9	N/A
	Spillage of tailings, seepage water or decant return water through leaks, pipeline ruptures or failure	Direct discharges to land impacting vegetation / soil adjacent to pipelines, resulting in groundwater and soil contamination and inundation / smothering of terrestrial vegetation	Soil Groundwater	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 10 Condition 11	N/A
	Overflow of seepage and decant water containment infrastructure	Direct discharges to land impacting vegetation / soil adjacent to the containment infrastructure	Soil Groundwater	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Y	Condition 7	N/A

Risk Event					Risk rating ¹ C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls				
		resulting in the inundation of vegetation						
	Tailings seepage associated with increased tailings disposal	Seepage of leachate causing impacts to groundwater quality and groundwater dependent vegetation. Also resulting in groundwater mounding	Groundwater Groundwater dependent vegetation	Refer to Section 3.1	C = Moderate L = Possible High Risk	N	Condition 8 Condition 12 Condition 13 Condition 26 <u>Condition 27</u>	Refer to Section 3.3
	Overtopping of tailings from increased tailings disposal	Direct discharges to land impacting vegetation adjacent to the TSF resulting in soil contamination inhibiting vegetation growth and survival	Vegetation Soil	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 8 Condition 13	N/A

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guidance Statement: Risk Assessments* (DER 2017).

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

3.3 Additional regulatory controls imposed

Condition 27

Groundwater monitoring bore 16NC750 has been added to the licence for the ambient groundwater monitoring associated with TSF2 (refer to Appendix 1 for previous condition 15).

Grounds: The application was referred internally, and it was recommended that at least one additional groundwater monitoring site be located on the eastern side of this facility.

Rationale: Typically, sufficient monitoring bores are required around a TSF to define the radial characteristics of groundwater flow near the facility and the extent to which groundwater mounding is taking place.

This means that monitoring bores are usually required on each side of the facility. There appears to be sufficient groundwater monitoring sites on the northern, western and southern sides of TSF2.

The following parameters have been added to condition 27 for the ambient groundwater monitoring associated with the TSF:

- Acrylamide;
- Total Nitrogen;
- Nitrate as N;
- Nitrite as N; and
- Ammonia.

Rationale:

Acrylamide

Polyacrylamide flocculants are added to thickeners to accelerate the settling of fine suspended particles from solution. These chemicals are generally considered to be environmentally benign. However, in water that contains elevated concentrations of dissolved iron and is exposed to intense sunlight, chemical reactions can take place (primarily the Fenton reaction) that can break-down these polymers to form monomeric acrylamide (Xiong et al., 2018).

Acrylamide is highly toxic and can cause mutagenic impacts on sensitive receptors. Although this chemical compound is chemically unstable in surface water bodies, it is sufficiently persistent to cause harmful impacts on aquatic organisms. As a consequence of this, a review of acrylamide that was carried out by the European Union has recommended a limit of 20 µg/L for this chemical compound in marine water bodies to protect aquatic organisms (refer to page 75 of European Chemicals Bureau, 2002). There are currently no Australian guidelines for protecting aquatic organisms from the effects of acrylamide.

Nitrate and ammonium ions

Elevated concentrations of nitrate and ammonium ions are present in process water at the site and are of particular concern, as these commonly exceed the marine limit of 0.75 mg/L-N (at pH=8.1) that has been established in the 2018 Australian and New Zealand water quality guidelines (for more details, refer to web site <https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/toxicants/ammonia-2000>). Impacts include eutrophication and declined water quality, as well as direct and indirect detrimental effects on aquatic organisms.

4. Consultation

Table 7 provides a summary of the consultation undertaken by the department.

Table 7: Consultation

Consultation method	Comments received	Department response
Local Government Authority advised of proposal 13/11/2020	<p>The City of Karratha (the City) replied on 16/11/2020 stating <i>“The development being referred to under this amendment has been approved under granted mining tenements and the Mining Act. The City does not have technical expertise in relation to assessing the environmental impacts of this proposal in relation to the immediate site and surrounds and trusts the relevant State Departments to make these considerations. It is noted that the tailings storage facility is likely located within the catchments of natural drainage lines that may end downstream at or near to mangrove/riparian communities within coastal areas.</i></p> <p><i>The City does not have any objections to the proposed amendment to the licence in question with the understanding environmental impacts are being well considered by the relevant State Department/s.”</i></p>	Noted.
DMIRS advised of proposal 13/11/2020	<p>DMIRS replied on 2/12/2020 and 12/02/2021 confirming that written advice had been received from their Geotech Engineer who stated <i>“Based on the information provided in the design report and the additional information submitted subsequent to the DMIRS request, I consider the overall stability of Stage 2 Raise 4 perimeter embankment of the TSF will continue to meet the DMIRS requirements.”</i></p>	Noted.
Department of Jobs, Tourism, Science and Innovation (JTSI) advised of proposal 11/01/2021	<p>JTSI replied on 12/01/2021 stating they do not have any comment with regard to the licence amendment, subject to the amendment being consistent with project approvals under Part IV or V the EP Act.</p>	Noted.
Licence Holder was provided with draft amendment on 12/03/2021	<p>The Licence Holder responded on 19/03/2021 (CPM 2021b) and waived the remaining comment period on 22/03/2021.</p> <p>Refer to Appendix 1.</p>	Refer to Appendix 1.

5. Conclusion

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

References

1. Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy; no. 4.
2. CITIC Pacific Mining Management Pty Ltd (CPM) 2020a, *RE: L8308 amendment for the increase in discharge volume to emission point DC2*, received from Harley Barron, dated 15 December 2020.
3. CPM 2018, *Sino Iron Project – Compliance Document – Tailings Storage Facility Stage 2 – L8308/2008/2*, CPM Ref: DR045463, dated 9 March 2018.
4. CPM 2019, *Sino Iron Project Mine Site, Annual Environmental Report – L8308/2008/2*, For financial year 2018 – 2019, Revision No. 01, dated 12 September 2019.
5. CPM 2020b, *Sino Iron Project Mine Site, Annual Environmental Report – L8308/2008/2*, For annual period 2019 – 2020, Document No: DR049563, Revision 02, dated 4 September 2020.
6. CPM 2020c, *Sino Iron Project Mine Site – Tailings Storage Facility Stage 2 Raise 4 (66mRL) – Application to Amend L8308/2008/2*, CPM Ref: DR049562, dated 30 September 2020.
7. CPM 2021a, Administrative changes to L8308/2008/2, received from Harley Barron, dated 22 February 2021.
8. CPM 2021b, L8308/2008/2 draft licence comments, received from Harley Barron, dated 19 March 2021.
9. Department of Environment Regulation (DER) 2016, *Guidance Statement: Environmental Siting*, Perth, Western Australia.
10. DER 2017, *Guidance Statement: Risk Assessments*, Perth, Western Australia.
11. DER 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
12. European Chemicals Bureau, 2002. European Union Risk Assessment Report: Acrylamide. European Union technical report which is available from web site <https://echa.europa.eu/documents/10162/50218bf9-ba0f-4254-a0d9-d577a5504ca7>.
13. Xiong, B., Dettam Loss, R., Shields, D., Pawlik, T., Hochreiter, R., Zydney, A.L. and Kumar, M., 2018. Polyacrylamide degradation and its implications in environmental systems. *Nature Clean Water*, 1. The paper is available from web site <https://www.nature.com/articles/s41545-018-0016-8>.

Appendix 1: Summary of Licence Holder's comments on risk assessment and draft conditions

Condition	Summary of Licence Holder's comment	Department's response
Condition 13 – Table 6	<p>The licence holder request that the buttress height and width be excluded from the licence.</p> <p>The licence holder has stated that the dimensions of the buttress are subject to change depending on a variety of factors including independent engineering designs, rehabilitation designs and rehabilitation activities. Including buttress dimensions would necessitate a licence amendment if the licence holder opted to change the height of the buttress for operational or rehabilitation reasons.</p>	<p>The department has removed the dimensions for the buttress and updated the wording to stipulate the buttress will be on the southern and western sides of the TSF as advised by the licence holder.</p>
	<p>The licence holder has requested the removal of the following:</p> <p><i>The buttress to incorporate a cut-off trench excavated down to the well cemented gravel or competent bedrock and backfilled with competent free draining rock fill</i></p> <p>Stating, the installation of the buttress is required for geotechnical stability and has been reviewed and approved by DMIRS.</p>	<p>The department has removed this requirement.</p>
Previous condition 15	<p>The licence holder has requested the removal of the requirement to install at least one groundwater monitoring bore on the eastern side of TSF2 to monitor Standing Water Level and water quality.</p> <p>The licence holder proposes to utilise an existing groundwater monitoring bore, 16NC750.</p>	<p>The department has removed this requirement and added 16NC750 to the ambient groundwater monitoring program for the TSF (condition 27 – Table 13).</p>
	<p>The licence holder has requested the removal of the requirement that the groundwater monitoring bore be designed and constructed in accordance with <i>ASTM D5092/D5092M-16: Standard practice for design and installation of groundwater monitoring bores.</i></p> <p>The licence holder has stated that this practice is not applicable in fractured rock or karst rock conditions, but may be applicable for other porous rock formations. The</p>	<p>The department has removed this requirement.</p>

Condition	Summary of Licence Holder's comment	Department's response
	<p>licence holder confirms that 16NC750 has been drilled in a fractured rock geology.</p>	
	<p>The licence holder has requested the removal of the requirement that well screens must target the part, or parts, of the aquifer most likely to be affected by contamination. Where temporary/seasonal perched features are present, wells must be nested, and the perched features individually screened.</p> <p>The licence holder has stated that the well screen was positioned to ensure saturated conditions were maintained covering baseline water table fluctuations as per <i>NEPM Assessment of Site Contamination 2013</i>.</p>	<p>The department has removed this requirement.</p>
	<p>The licence holder has requested the removal of the requirement that bore construction details must be documented within a bore construction log to demonstrate compliance with ASTM D5092/D5092M-16. The construction logs shall include elevations of the top of casing position to be used as the reference point for water-level measurements, and the elevations of the ground surface protective installations.</p> <p>The licence holder confirms that 16NC750 has been drilled in a fractured rock geology and drilled in accordance with the Minimum Construction Requirements for Water Bores in Australia (2012) – Australian Government National Water Commission.</p>	<p>The department has removed this requirement.</p>
	<p>The licence holder has requested the removal of the requirement that a bore location map (using aerial image overlay) must be prepared and include the location of all monitoring bores in the monitoring network and their respective identification numbers.</p> <p>The licence holder has provided a map which includes 16NC750.</p>	<p>The department has removed this requirement.</p>
<p>Previous condition 16</p>	<p>The licence holder has requested the removal of the condition as evidence has been provided.</p> <p><i>The licence holder must, within 60 calendar days of the monitoring bores being constructed, submit to the CEO a bore construction report evidencing compliance with the requirements of condition 15.</i></p>	<p>The department has removed this condition.</p>

Appendix 2: Application validation summary

SECTION 1: APPLICATION SUMMARY				
Application type				
Amendment to licence	<input checked="" type="checkbox"/>	Current licence number:	L8308/2008/2	
		Relevant works approval number:	N/A	<input type="checkbox"/>
Registration	<input type="checkbox"/>	Current works approval number:	None	<input type="checkbox"/>
Date application received		14 October 2020		
Applicant and Premises details				
Applicant name/s (full legal name/s)		CITIC Pacific Mining Management Pty Ltd		
Premises name		Sino Iron Project Mine Site		
Premises location		Mining Leases M08/123, M08/124 and M08/125, MARDIE WA 6714		
Local Government Authority		City of Karratha		
Application documents				
HPCM file reference number:		DER2014/000430-2~7 and DER2014/000430-2~8		
Key application documents (additional to application form):		<ul style="list-style-type: none"> Sino Iron Project Mine Site – Tailings Storage Facility Stage 2 Raise 4 (66mRL) – Application to Amend L8308/2008/2 (DWERDT350465) 		
Scope of application/assessment				
Summary of proposed activities or changes to existing operations.		Licence amendment for TSF2 Raise 4 from 61 mRL to 66 mRL (western embankment) and 70 mRL (eastern embankment).		
Category number/s (activities that cause the premises to become prescribed premises)				
Table 1: Prescribed premises categories				
Prescribed premises category and description	Assessed production or design capacity	Proposed changes to the production or design capacity (amendments only)		
Category 5: Processing or beneficiation of metallic or non-metallic ore	Primary Crushers (1, 2, 3 and 4) 85,400,000 tonnes per Annual Period Concentrators (Mill Lines 1, 2, 3, 4, 5 and 6) 85,400,000 tonnes per Annual Period (producing 27,600,000 tonnes per Annual Period) Tailings Storage Facility (Stage 2) 67,400,000 tonnes per Annual Period	Primary Crushers (1, 2, 3 and 4) and Concentrators (Mill Lines 1, 2, 3, 4, 5 and 6) changed from 85,400,000 tonnes per annual period to 95,000,000 tonnes per annual period to align with Ministerial Statement 635.		
Category 6: Mine dewatering discharge	8,000,000 tonnes per Annual Period	N/A		

	(8 gigalitres per Annual Period)	
Category 12: Screening, etc. of material	2,700,000 tonnes per Annual Period	N/A
Category 52: Electric power generation	480 megawatts	N/A
Category 54: Sewage facility	160 cubic metres per day	N/A
Category 57: Used tyre storage (general)	No more than 500 tyres	N/A
Category 64: Class II putrescible landfill site	Landfill Facilities and Waste Rock Landforms 25,000 tonnes per annual period (excluding Clean Fill used for cover material)	N/A
Category 73: Bulk storage of chemicals, etc	4,800 cubic metres in aggregate	N/A

Legislative context and other approvals

Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Referral decision No: Managed under Part V <input type="checkbox"/> Assessed under Part IV <input type="checkbox"/>
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Ministerial statement No: 635, 822, 1066 EPA Report No: 1056, 1343, 1602
Has the proposal been referred and/or assessed under the EPBC Act?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Reference No: Sino Iron Mine Continuation Proposal (EPBC 2017/7862)
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Certificate of title <input type="checkbox"/> General lease <input type="checkbox"/> Expiry: Mining lease / tenement <input type="checkbox"/> Expiry: Other evidence <input type="checkbox"/> Expiry:
Has the applicant obtained all relevant planning approvals?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Approval: Expiry date: If N/A explain why?
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	CPS No: Clearing approved under Ministerial Statements No clearing is proposed.
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Application reference No: N/A Licence/permit No: N/A

Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Application reference No: N/A Licence/permit No: N/A Licence / permit not required.
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Name: N/A Type: N/A Has Regulatory Services (Water) been consulted? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Regional office: N/A
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Name: N/A Priority: N/A Are the proposed activities/ landuse compatible with the PDWSA (refer to WQPN 25)? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
Is the Premises subject to any other Acts or subsidiary regulations (e.g. <i>Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx</i>)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	<i>Iron Ore Processing (Mineralogy Pty Ltd) Agreement Act 2002</i>
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	N/A
Is the Premises subject to any EPP requirements?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	N/A
Is the Premises a known or suspected contaminated site under the <i>Contaminated Sites Act 2003</i> ?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Classification: N/A Date of classification: N/A