Decision Document

Environmental Protection Act 1986, Part V

Licence Holder: Exterra Resources Limited

Licence: L9012/2016/1

Registered office:	Ground Floor, 20 Kings Park Road WEST PERTH WA 6005
ACN:	138 222 705
Premises address:	Second Fortune Gold Mine Mining tenement M39/255, M39/649, M39/650 and miscellaneous licence L39/12 MENZIES WA 6436
Issue date:	Monday, 10 April 2017
Commencement date:	Tuesday, 11 April 2017
Expiry date:	Friday, 10 April 2037

Decision

Based on the assessment detailed in this document the Department of Water and Environmental Regulation (DWER) has decided to issue a licence. DWER considers that in reaching this decision, it has taken into account all relevant considerations and legal requirements and that the Licence and its conditions will ensure that an appropriate level of environmental protection is provided.

Decision Document prepared by:	Rachel Vukmirovic Licensing Officer
Decision Document authorised by:	Tim Gentle Delegated Officer

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1 Purpose of this Document

This decision document explains how DWER has assessed and determined the application and provides a record of DWER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DWER's assessment and decision making under Part V of the *Environmental Protection Act 1986.* Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.

2 Administrative summary

Administrative details		
Application type	Works Approval ☐ New Licence ☒ Licence amendment ☐ Works Approval amendment ☐	
Activities that cause the premises to become prescribed premises	**Category number(s)**	**Assessed design capacity**
	5	156 000 tonnes per annual period
	6	210 000 tonnes per annual period
Application verified Application fee paid	Date: 11/11/2016 Date: 21/11/2016	
Works Approval has been complied with Compliance Certificate received	Yes☒ No☐ N/A☐ Yes☒ No☐ N/A☐	
Commercial-in-confidence claim	Yes☐ No☒	
Commercial-in-confidence claim outcome		
Is the proposal a Major Resource Project?	Yes☐ No☒	
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986*?	Yes☐ No☒	Referral decision No: Managed under Part V ☐

		Assessed under Part IV ☐
Is the proposal subject to Ministerial Conditions?	Yes☐ No☒	Ministerial statement No: EPA Report No:
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the *Environmental Protection Act 1986*)?	Yes☒ No☐ Department of Water consulted Yes ☒ No ☐	
Is the Premises within an Environmental Protection Policy (EPP) Area Yes☐ No☒ If Yes include details of which EPP(s) here.		
Is the Premises subject to any EPP requirements? Yes☐ No☒ If Yes, include details here, eg Site is subject to SO_2 requirements of Kwinana EPP.		

3 Executive summary of proposal and assessment

The Second Fortune Gold Mine (gold mine) is located within the Goldfields region of Western Australia and is approximately 200 kilometres (km) north-east of Kalgoorlie and approximately 80 km south of Laverton.

The gold mine has been mined previously from 1941 to 1994 and the existing infrastructure from previous mining operations includes "*one open pit, an underground mine shaft, two waste rock dumps, a decommissioned processing plant, tailings storage facility (TSF), evaporation pond, airstrip, camp and other supporting infrastructure*" (MBS Environmental, October 2016).

A works approval was granted in October 2013 (W5474/2013/1) authorising the construction of dewatering infrastructure to enable the recommencement of mining activities at the gold mine. The works approval authorises the construction of dewatering pipelines and evaporation ponds. The water is to be used on site for dust suppression activities, camp potable supply (post reverse osmosis treatment) and process water.

The groundwater data provided with the application indicates the groundwater beneath the site ranges "*from brackish to moderately saline*" with total dissolved solids (TDS) ranging from 2900-17000 milligrams per litre (mg/L) (MBS Environmental, October 2016). The groundwater is considered a sensitive receptor for the purpose of this assessment because it is partly brackish and therefore capable of being used for beneficial purposes.

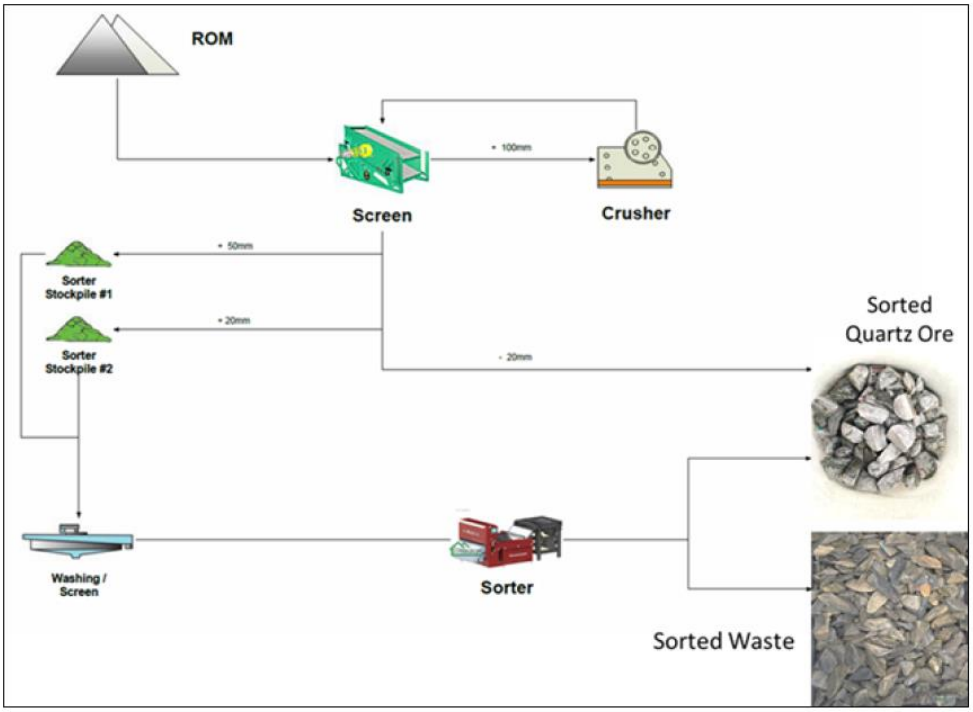
A works approval amendment and licence application was received by DER (now DWER) on 28 October 2016 to include Category 5 processing or beneficiation of metallic or non-metallic ore. Approval was granted via a works approval amendment notice on 2 February 2017 authorising construction of a crushing, screening and sorting circuit. The ore from the existing Run of Mine pad is to be processed through plant consisting of:

- Static grizzly;
- Primary jaw crusher;
- Vibrating triple deck screen;
- Washing screen;
- Vibrating feeder;

- Optical ore sorter including compressor for air drying;
- Mobile conveyors; and
- Wheel loader.

Figure 1 depicts a flow diagram of the ore crushing, screening and sorting process.

Figure 1: Second Fortune Ore Crushing, Screening and Sorting Process



This Licence is for the prescribed activities of Category 5 processing or beneficiation of metallic or non-metallic ore and Category 6 mine dewatering. The potential emissions during operation identified from the application supporting documentation are dust, noise, dewatering effluent, process water and contaminated stormwater.

The ore crushing, screening and sorting process has a maximum design capacity of 70 tonnes per hour which equates to 613 200 tonnes per annum if operating continuously at full capacity. The applicants nominated production throughput is 156,000 tonnes per year producing 72 000 tonnes of sorted ore per year. Based on an estimate of mining reserve, the crushing, screening and sorting operations will have an approximate duration of 32 months.

Process water for the washing process will be sourced from the dewatering operation. The used process wash water will be contained in a tank and decanted to a second tank to be reused as wash water. Slimes will be recovered from the first tank and added to the ore stockpile and taken off site for further processing and disposal at a toll treatment facility.

Location, environmental siting and potential receptors

Table 1 below lists the relevant human receptors in the vicinity of the prescribed activities.

Table 1: Receptors and distance to prescribed activities

Residential and Sensitive Premises	Distance from Prescribed Activities
Laverton town	Approximately 80 km to the north
Leonora	Approximately 115 km to the north-west
Yundamindra pastoral homestead (closest residential receptor)	Approximately 35 km to the west north-west

Table 2 below lists the relevant environmental receptors in the vicinity of the prescribed premises.

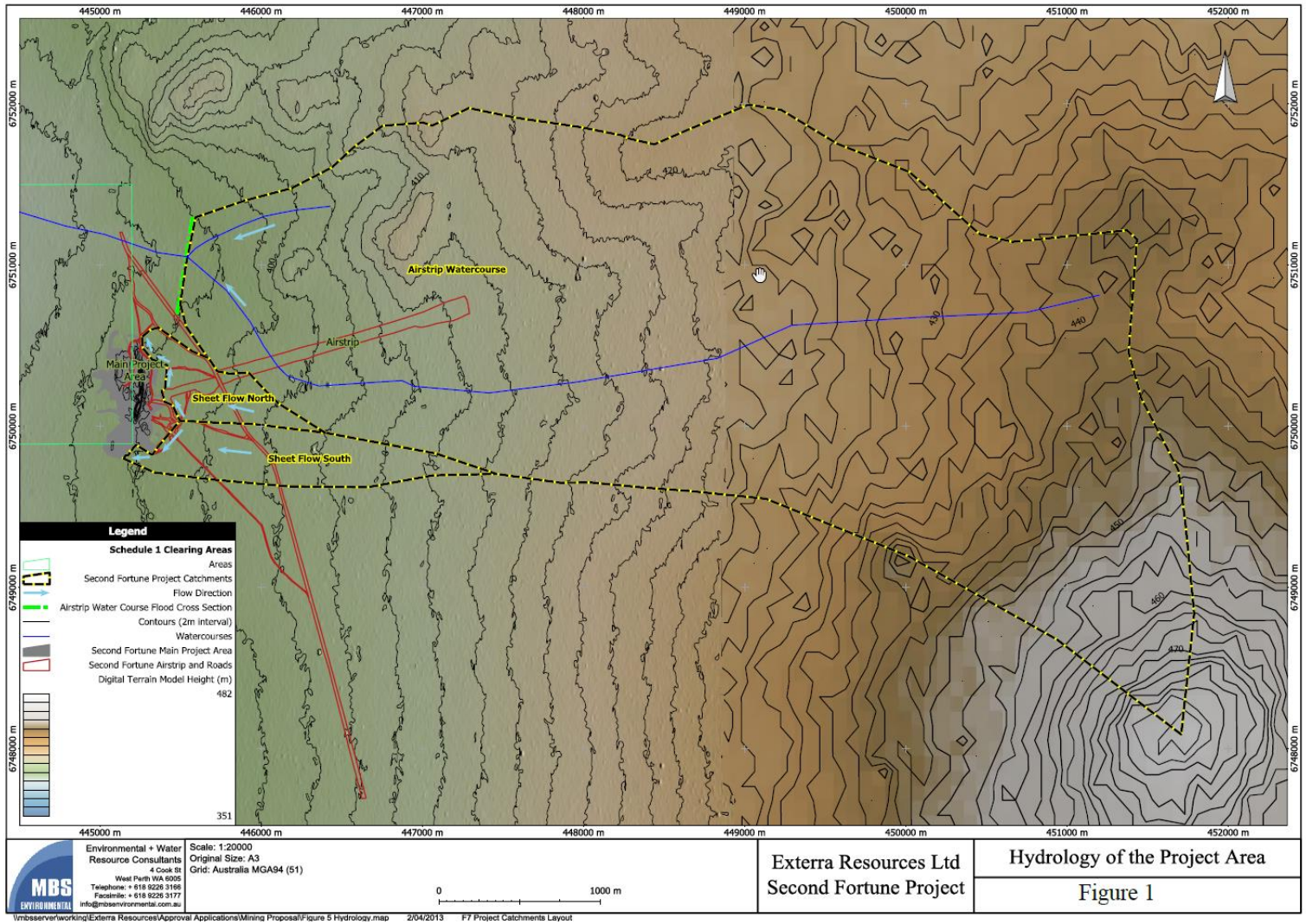
Table 2: Environmental receptors and distance to prescribed activities

Environmental receptor	Distance from Prescribed Activities
Minor, non-perennial watercourse[1]	Approximately 900m from ore processing plant and 600m from evaporation ponds
Groundwater[2]	Water table is between 8 to 11 metres below ground level. Hydraulic gradient towards the north. Capable of beneficial use (TDS ranging from 2900-17000 mg/L)
Mount Linden Range banded ironstone vegetation complex (Priority Ecological Community (PEC) priority 3) [3]	Site located within the 50 km buffer
Threatened (Declared Rare) and Priority Flora under Priorities 1, 2, 3 and 4[4]	Has the potential to be located on site

Note 1: The hydrology of the area is depicted in Figure 2.
Note 2: Crown Water Reserve 5584, vested in the Department of Water (DoW) partially overlays tenement M39/255 to the west of the pit. DoW advised that the water reserve is a historic water reserve which is no longer required.
Note 3: Native vegetation clearing permit 5584/1 for the project area was granted by the Department of Mines and Petroleum on 11 July 2013.
Note 4: A desk top assessment and site inspection conducted by MBS Environmental and commissioned by the applicant has determined the presence of threatened/priority flora to be unlikely or very unlikely.

Figure 2: Hydrology of the project area

Diagram depicting the surface water catchments and flows of the project area.



Decision table 4 below applies a risk assessment to the potential emissions which may arise from the operation of the gold mine. The table identifies whether these emissions present a material risk requiring regulatory controls.

Licence L9012/2016/1 was issued on 10 April 2017 authorising the operation of the category 5 infrastructure. The licence also gave authorisation to operate the category 6 infrastructure once compliance documentation in accordance with works approval W5474/2013/1 was received.

This amendment to Licence L9012/2016/1 has been initiated by the Licensee as some minor variations from the works authorised by Works Approval W5474/2013/1 require some description changes to the Licence for the category 6 infrastructure. This amendment pertains to the changes to the location of groundwater monitoring bores and minor structural changes to the evaporation ponds. Some existing conditions have been renumbered as part of this amendment.

The variations to the works approved under works approval W5474/2013/1 consist of:

- One dewatering pipeline instead of two.
- No return water pipeline.
- Settling dams 1 and 2 were not constructed within the evaporation pond structure.
- Evaporation pond cell 1 has a reduced storage capacity whereas evaporation pond cell 2 has an increased storage capacity. Overall the total storage capacity of both evaporation ponds has increased.
- Evaporation pond cell 1 and cell 2 have been constructed with a freeboard of 800 mm which is greater than the original 500 mm proposed.
- Changes to the location of groundwater monitoring bores.

Upon assessment of the compliance document, DER (now DWER) considered the variations to be acceptable as they are not considered material in that they achieve the same outcomes. The risk assessments in table 4 have been updated to reflect these changes.

References

MBS Environmental (October 2016) *Additional Information (Attachment 9) Second Fortune Gold Project Works Approval Amendment and Licence Application* prepared for Exterra Resources Limited

4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987* and the Department's Operational Procedure on Assessing Emissions and Discharges from Prescribed Premises. Where other references have been used in making the decision they are detailed in the decision document.

DECISION TABLE			
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
Premises operation	L1.2.1 L1.2.2 L1.2.3 L1.2.4	Stage 1 infrastructure has been completed and compliance documentation received in accordance with works approval W5474/2013/1 therefore former condition 1.2.1 has been removed. References to "Stage 1" have now been removed from the Licence. Condition 1.2.1 requires the Licensee to record and investigate the exceedance of any limit in the premises operation section of the Licence. Details of DWER's assessment and decision making are included in Appendix A and B which includes justification for the inclusion of conditions 1.2.2-1.2.4 of the Licence. References to the settling dam cell 1 and 2 which originally formed part of the evaporative pond structure have been removed from table 1.2.1. This change has been deemed a minor variation from the works authorised by works approval W5474/2013/1.	Application supporting documentation General provisions of the *Environmental Protection Act 1986* *Environmental Protection (Unauthorised Discharges) Regulations 2004*
Emissions general	N/A	General emission conditions are not required in the Licence.	N/A
Point source emissions to air including monitoring	N/A	Point source emissions to air are not expected during operation therefore no conditions relating to point source emissions to air will be applied to the Licence.	Application supporting documentation
Point source emissions to surface water including monitoring	N/A	Point source emissions to surface water are not expected during operation therefore no conditions relating to point source emissions to surface water will be applied to the Licence.	Application supporting documentation

DECISION TABLE			
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
Point source emissions to groundwater including monitoring	L2.1.1 L3.2.1	Details of DWER's assessment and decision making are included in Appendix B.	Application supporting documentation *Environmental Protection Act 1986*
Emissions to land including monitoring	N/A	Emissions to land are not expected during operation therefore no conditions relating to emissions to land will be applied to the Licence.	Application supporting documentation
Fugitive emissions	N/A	<u>Human health and amenity impacts</u> Yundamindra pastoral homestead is the closest human receptor located approximately 35 km from the activity. The Delegated Officer considers the distance to human receptors to be too great for health and amenity impacts to occur.	Application supporting documentation General provisions of the *Environmental Protection Act 1986*
		<u>Flora impacts</u> <u>Emission description</u> *Emission:* Release of particulate matter from the operation of crushing and screening plant, movement of stockpiled material and vehicular movement on unsealed surfaces. *Impact*: Smothering and the potential suppression of photosynthetic and respiratory functions of vegetation. *Controls*: The Licence Holder has provided the results of a desk top assessment that concluded a number of Threatened (Declared Rare) and Priority Flora that could occur in the area. A site assessment was conducted by MBS Environmental on behalf of the applicant on 18 December 2012 to determine the potential for conservation significant flora to be present. The Licence Holder has determined the likelihood of occurrence of conservation significant flora as unlikely or very unlikely due to the absence of habitat and the highly disturbed nature of the site. The site is also located within the 50 km buffer Priority Ecological Community (PEC) Banded Ironstone Ridge Vegetation Complex. However the Licence Holder notes that	

DECISION TABLE			
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		this vegetation community is unlikely due to banded ironstone outcropping not being observed on site. The Licence Holder has proposed the following dust mitigation measures: • Use of water cart or fixed sprays on unsealed roads; • Dust minimization of ROM pad and processing plant by use of water sprays to moisten ore prior to processing; and • Washing of ore as part of the process increasing moisture content. <u>Risk Assessment</u> Noting the highly disturbed nature of the site and that the presence of declared or priority fauna is unlikely, the Delegated Officer has determined the risk rating as follows: *Consequence*: ***Slight***, minimal on-site impacts. *Likelihood*: ***Rare***, the risk event may only occur in exceptional circumstances. *Risk rating*: The Delegated Officer has compared the consequence and likelihood rating described above through the Emissions Risk Matrix (Section 6, Table 1) and determined the overall rating of risk to be ***low***. <u>Regulatory Controls</u> No regulatory controls are required during operation. The Delegated Officer has determined the potential risk of fugitive dust emissions as low due to the highly disturbed nature of the site. Therefore no conditions relating to fugitive dust emissions are required on the Licence.	
Odour	N/A	Odour emissions are not expected during operation therefore no conditions relating to odour will be applied to the Licence.	Application supporting documentation
Noise	N/A	Yundamindra pastoral homestead is the closest sensitive receptor located approximately 35 km from the activity. The Delegated Officer considers the distance to human receptors to be too great for noise impacts to occur. The *Environmental Protection (Noise) Regulations 1997* apply.	*Environmental Protection (Noise) Regulations 1997*

DECISION TABLE			
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
Monitoring general	L3.1.1-3.1.5	General monitoring conditions have been included in the Licence to ensure monitoring is carried out in accordance with relevant standards. The Licence Holder is required to record and investigate the exceedance of the limit on standing water level.	Application supporting documentation *Environmental Protection Act 1986*
Monitoring of inputs and outputs	N/A	Monitoring of inputs and outputs is not a requirement of the Licence.	N/A
Process monitoring	N/A	Process monitoring is not a requirement of the Licence.	N/A
Ambient quality monitoring	L3.3.1 L3.3.2	Details of DWER's assessment and decision making are included in Appendix B. Details of DWER's assessment and decision making are included in Appendix C.	Application supporting documentation *Environmental Protection Act 1986*
Meteorological monitoring	N/A	Meteorological monitoring is not a requirement of the Licence.	N/A
Improvements	N/A	Improvements are not a requirement of the Licence.	N/A
Information	L4.1.1-4.1.3 L4.2.1-4.2.3 L4.3.1	Administrative conditions including records, reporting and notification have been applied to the Licence. A change of condition number has been documented in table 4.3.1.	Application supporting documentation *Environmental Protection Act*

DECISION TABLE			
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
			1986
Licence Duration	N/A	Having regard to the Guidance Statement: *Licence Duration* this Licence will be granted for a period of 20 years.	The Department's Guidance Statement: *Licence Duration* (August 2016)

5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
13/07/2017	Proponent sent a draft amended instrument	Email received 24/07/2017 requesting the licence is issued and waiving the 21 day consultation period	-

6 Risk Assessment

Note: This matrix is taken from the Department's Corporate Policy Statement No. 07 - Operational Risk Management

Table 1: Emissions Risk Matrix

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

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

Appendix A

Waste – hydrocarbons

Emission Description

Emission: Waste associated with seepage, leaks and spills of hydrocarbons.

Impact: Impacts to terrestrial ecosystems, surface water quality, surface water ecosystems and groundwater quality. The groundwater is considered a sensitive receptor for the purpose of this assessment because it is partly brackish and therefore capable of being used for beneficial purposes. Sheet flow drains to Lake Raeside.

Controls: The closest surface water system (minor non-perennial watercourse) is 900 m from the processing plant. Flood bunds divert stormwater around processing areas. The site is not located within a Public Drinking Water Source Area (PDWSA). The depth to groundwater is "*8-11 m*" and is located "*in the weathered zone and is associated with structural features (fractures and joints) in the underlying rocks*". The "*structural features are mainly tight and offer limited permeability*" (MBS Environmental, October 2016).

The volume of hydrocarbons stored on site is below the prescribed threshold of 1000 m^3 for category 73 (approximately 170 m^3).

The Licence Holder's proposed mitigation of spills and leaks of hydrocarbons include:

- *"All tanks and pipes containing hydrocarbons will be located above ground and bunded.*
- *Hydrocarbons will be stored and transferred within low permeability compounds designed to contain not less than 110% of the volume of the largest storage vessel and at least 25% of the total capacity of all tanks for a multiple tank system.*
- *Fuel bowsers and fuel delivery inlets will be located on concrete or HDPE-lined pads to contain any drips and spills. The pads will drain to a sump to allow removal of collected material.*
- *Heavy and light vehicles will be washed down in a purpose built wash down facility. Sediment from washdown pad will be collected in a concrete sump and wash down water treated via an oil-water separator to enable recovery of hydrocarbons. Only quick-break degreasers will be used within the facility to ensure the maximum efficiency of the oil water separator.*
- *Heavy and light vehicle maintenance will be undertaken in designated workshop areas located on concrete pads constructed so that they drain to an oil water separator system. Hydrocarbon spillages and leakages will be captured and appropriately managed through the use of hydrocarbon absorbent materials.*
- *Spill kits will be located at all hydrocarbon and chemical storage areas on site to ensure immediate clean-up of any spills of contaminants such as oil or fuel.*
- *Hydrocarbon contaminated water will be directed to an oil water separation system.*
- *Oily rags, vehicle filters and other hydrocarbon waste (e.g., waste oil) will be collected and stored in bins, tanks or on bunded pallets for periodic collection and disposal offsite by a licensed contractor.*
- *Soil contaminated by hydrocarbons will either be treated in-situ or moved to a bioremediation area for treatment.*
- *Minor spillage occurring as a result of accidents or breakdowns will be addressed and reported through the incident report procedure"* (MBS Environmental, October 2016).

Risk assessment

Noting the volumes of hydrocarbons to be stored on site and the distance to environmental receptors, the Delegated Officer has determined the risk rating of seepage, leaks and spills of hydrocarbons as follows:

Consequence: ***Slight***, minimal on-site impacts.

Likelihood: ***Unlikely***, the risk event will probably not occur in most circumstances.

Risk Rating: The Delegated Officer has compared the consequence and likelihood rating described above through the Emissions Risk Matrix (Section 6, Table 1) and determined the overall rating of risk to be ***low***.

Regulatory controls

The Delegated Officer has determined the risk of waste associated with the leak, spills and seepage of hydrocarbons as low due to the low volumes to be stored on site and distance to sensitive receptors. Impacts from leaks and spills of hydrocarbons are likely to only occur in exceptional circumstances therefore no conditions relating to hydrocarbon management are required in the Licence.

The general provisions of the *Environmental Protection Act 1986* with respect to the causing of pollution and environmental harm, as well as subsidiary legislation including the *Environmental Protection (Unauthorised Discharges) Regulation 2004* apply.

Waste – process water

Emission description

Emission: Waste associated with spills and leaks of process water from infrastructure, tanks and pipelines. Process water used for washing ore could potentially contain leached metals and metalloids.

Impact: Impact to terrestrial ecosystems, surface water quality, surface water ecosystems and groundwater quality. The groundwater is considered a sensitive receptor for the purpose of this assessment because it is partly brackish and therefore capable of being used for beneficial purposes.

Controls: The Premises is not located within a PDWSA and the closest surface water system is located 900 m north of the processing area. The depth to groundwater is "*8-11 m*" and is located "*in the weathered zone and is associated with structural features (fractures and joints) in the underlying rocks*". Additionally, the "*structural features are mainly tight and offer limited permeability*" (MBS Environmental, October 2016).

The Licence Holder's proposed pollution mitigation includes that the ore will be washed in plant comprising "*portable tanks or vats"* (MBS Environmental, October 2016). Water will be decanted to a second tank for reuse as process water. No chemicals are used in the process. Process water tanks are to be located in bunded areas and leaks will be inspected daily. Process water will not be discharged on site.

Risk assessment

Noting that despite the no-chemical process the process water has the potential to contain leached metals and metalloids, and that the groundwater is capable of being used for beneficial purposes. The Delegated Officer has determined the risk as follows:

Consequence: ***Minor***, low level on-site impacts.

Likelihood: ***Unlikely***, the risk event will probably not occur in most circumstances.

Risk Rating: The Delegated Officer has compared the consequence and likelihood rating described above through the Emissions Risk Matrix (Section 6, Table 1) and determined the overall rating of risk to be ***medium***.

Regulatory controls

Condition 1.2.4 has been included in the Licence that requires the Licence Holder to undertake daily inspections of process water infrastructure, tanks and pipelines. Additionally, the general provisions of the *Environmental Protection Act 1986* with respect to the causing of pollution and environmental

harm, as well as subsidiary legislation including the *Environmental Protection (Unauthorised Discharges) Regulation 2004* apply.

Residual risk assessment

Noting the additional regulatory controls, the Delegated officer considers the residual risk assessment as:
Consequence: ***Minor***, low level on-site impacts.
Likelihood: ***Unlikely***, the risk event will probably not occur in most circumstances.
Risk Rating: The Delegated Officer has compared the consequence and likelihood rating described above through the Emissions Risk Matrix (Section 6, Table 1) and determined the overall rating of risk to be ***medium***.

Waste – stormwater

Emission Description

Emission: Stormwater run-off containing sediment from the processing of ore.

Impact: Impact to terrestrial ecosystems, surface water quality, surface water ecosystems and groundwater quality degradation from run-off. Sheet flow drains to Lake Raeside. The groundwater is considered a sensitive receptor for the purpose of this assessment because it is partly brackish and therefore capable of being used for beneficial purposes.
Controls: The Premises is not located within a drinking water area. The depth to groundwater is "*8-11 m*" and is located "*in the weathered zone and is associated with structural features (fractures and joints) in the underlying rocks*". Additionally, the "*structural features are mainly tight and offer limited permeability*" (MBS Environmental, October 2016). Flood bunds divert stormwater around processing areas. The closest surface water system is located 900 m north of the processing area. Sediment could filter out through the soil profile as it percolates.

Risk Assessment

Noting the distance to sensitive receptors, the Delegated Officer has determined the risk rating below:
Consequence: ***Slight***, minimal on-site impacts.
Likelihood: ***Unlikely***, the risk event will probably not occur in most circumstances.
Risk Rating: The Delegated Officer has compared the consequence and likelihood rating described above through the Emissions Risk Matrix (Section 6, Table 1) and determined the overall rating of risk to be ***low***.

Regulatory Controls

No regulatory controls are required during operation. The Delegated Officer has determined the risk of potentially contaminated stormwater as low due to the distance to environmental receptors. Impacts from potentially contaminated stormwater are likely to only occur in exceptional circumstances therefore no conditions relating to stormwater management are required in the Licence.

The general provisions of the *Environmental Protection Act 1986* with respect to the causing of pollution and environmental harm, as well as subsidiary legislation including the *Environmental Protection (Unauthorised Discharges) Regulation 2004* apply.

Leaks and spills due to pipeline failure

Emission description

Emission: Ruptured dewatering pipeline resulting in a discharge of brackish/moderately saline dewatering effluent to the environment.

Impact: Soil contamination, soil erosion, groundwater contamination and vegetation loss/damage. The groundwater is considered a sensitive receptor for the purpose of this assessment because it is partly brackish and therefore capable of being used for beneficial purposes.

Controls: The depth to groundwater is "*8-11 m*" and is located "*in the weathered zone and is associated with structural features (fractures and joints) in the underlying rocks*". Additionally, the "*structural features are mainly tight and offer limited permeability*" (MBS Environmental, October 2016).

The pipeline has been installed within bunding consisting of an earthen 'v notch' drain. Collection sumps are situated at low points along the pipeline to capture any leaks from the pipeline. Inspections of the pipeline will be undertaken daily. Quarterly monitoring of vegetation health is proposed.

Risk assessment

Noting that the groundwater is capable of being used for beneficial purposes and the Licence Holder's controls, the Delegated Officer has determined the risk below:
Consequence: ***Minor***, low level on-site impacts.
Likelihood: ***Unlikely***, the risk event will probably not occur in most circumstances.
Risk rating: The Delegated Officer has compared the consequence and likelihood rating described above through the Emissions Risk Matrix (Section 6, Table 1) and determined the overall rating of risk to be ***Medium***.

Regulatory controls

Condition 1.2.3 has been included in the licence to ensure that the Licence Holder ensures that the dewatering pipeline has either a leak detection system, automatic cut-outs of secondary containment with sufficient capacity to contain a leak. Additionally condition 1.2.4 requires the Licence Holder to undertake daily inspections of the pipeline.
Updates to licence conditions 1.2.3 and 1.2.4 have been made to reflect that there is now only one dewatering pipeline instead of the two originally proposed.

Residual risk assessment

Noting the additional regulatory controls, the Delegated Officer considers the residual risk as:
Consequence: ***Minor***, low level on-site impacts.
Likelihood: ***Unlikely***, the risk event will probably not occur in most circumstances.
Risk rating: The Delegated Officer has compared the consequence and likelihood rating described above through the Emissions Risk Matrix (Section 6, Table 1) and determined the overall rating of risk to be ***Medium***.

Appendix B

Point source emissions to groundwater including monitoring

Emission description

To facilitate underground mining, Exterra Resources Limited is to use ponds and associated pipeline infrastructure to support dewatering activities.

Dewatering waste water will be discharged at a rate of 6 litres per second into evaporation ponds 1 and 2. A single dewatering polyethylene pipeline (110 millimetre PE100 PN 16) at approximately 500 metres in length has been placed in bunding consisting of an earthen 'v notch' drain. Collection sumps are situated at low points along the pipeline to capture any leaks from the pipeline.

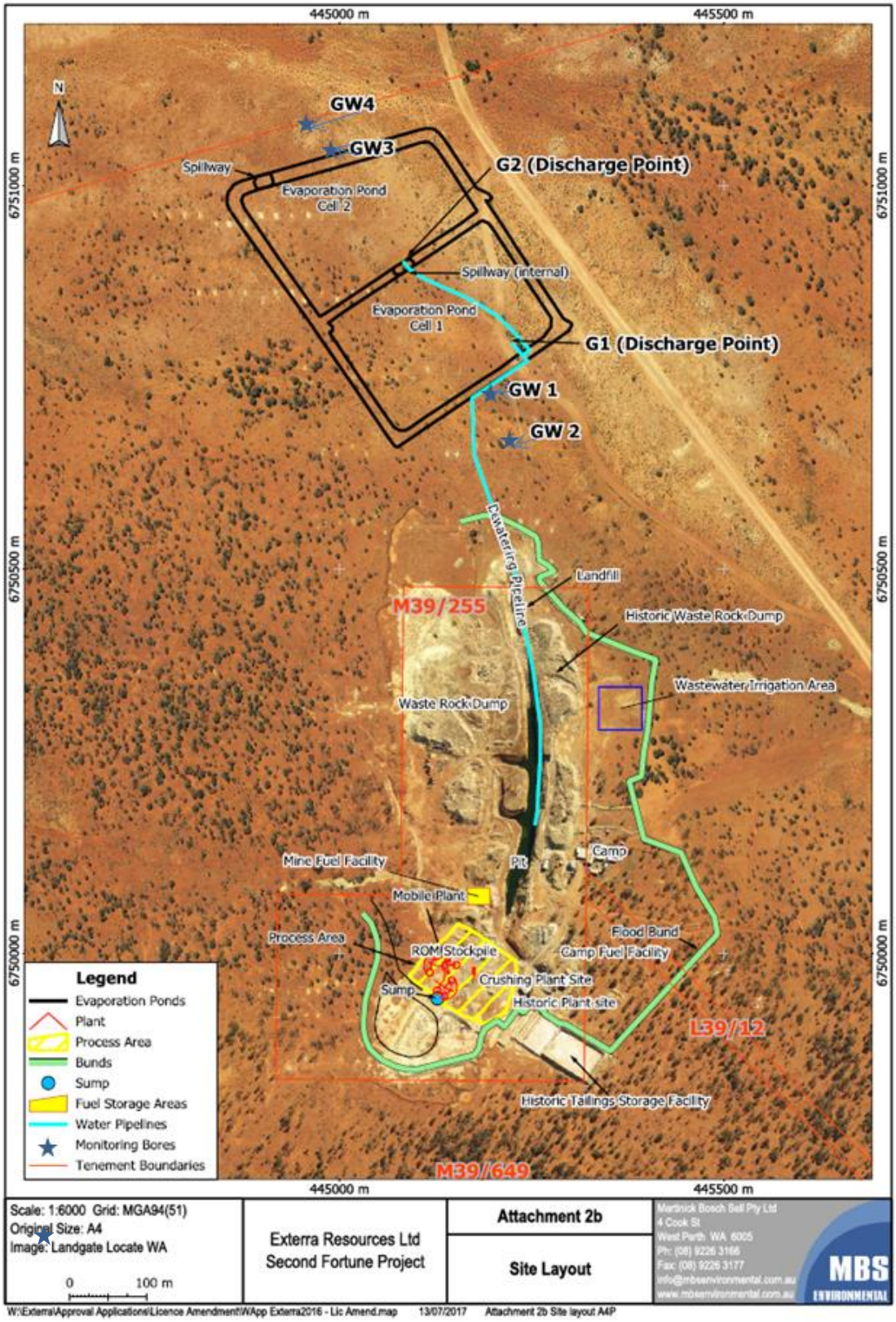
The ponds have been constructed using compacted soils (300 mm thickness) to a permeability of less than 1 x 10^{-8} metres per second (m/s). Due to the permeability being less than 1 x 10^{-9} m/s, seepage from the ponds is considered an emission to groundwater. The liner properties are outlined in Table 1 below.

Table 1: Liner properties of the pond system

Property	Requirements
Compacted soil liner thickness	300mm
Percentage fines	Greater than 25%
Liquid limit	Less than 70%
Plasticity index	Greater than 15%
Emerson class number	4 to 6
Permeability	Less than 1 x 10^{-8}m/s

The properties have been mostly based on those set out in the Department of Water's Water Quality Protection Note (WQPN) 27 *Liners for containing pollutants, using engineered soils.* However, the properties are outside of those defined as acceptable in WQPN 27. Due to this, the Licence Holder proposes groundwater monitoring around the ponds at the locations depicted in Figure 2 below.

Figure 2: Map depicting the location of monitoring bores around Ponds 1 and 2.



A freeboard of 800 mm has been incorporated within the design above design storage levels and a spillway will only discharge in the event of a 100 year Average Recurrence Interval (ARI), 72-hour duration rainfall event.

The hydrogeology of the area is described as "*groundwater occurs in the weathered zone and is associated with structural features (fractures and joints) in the underlying rocks. Groundwater flows from mineral exploration drillholes suggest that the structural features are mainly tight and offer limited permeability"* (MBS Environmental, October 2016). The water table is approximately eight to eleven metres below ground level. The groundwater monitoring provided indicates "*brackish to moderately saline*" groundwater beneath the project area (MBS Environmental, October 2016). The hydraulic gradient is from the south to the north.

Seepage through the base materials or seepage after an overtopping event

Emission description
Emission: Discharge of mine dewatering effluent and bitterns into Ponds 1 and 2 leading to seepage through the base. Discharge of mine dewatering effluent due to an overtopping/overflow event.

Impact: Localised contamination of soils and impacts to vegetation. Contamination of groundwater through exchange of water from the pit to the underlying groundwater. The groundwater is considered a sensitive receptor for the purpose of this assessment because it is partly brackish and therefore capable of being used for beneficial purposes.Vegetation loss/damage due to groundwater mounding causing increased pore pressure.

Controls: Low permeability base materials of less than 1×10^{-8} m/s. Quarterly groundwater monitoring commencing two months prior to discharge to evaporation ponds will occur in upstream and downstream groundwater bores. There are two upstream and two downstream bores. The parameters proposed include pH, total dissolved solids (TDS), salinity (EC), total nitrates, total sulfates and metals and metalloids (Mg, Na, K, Al, As, Cr, Cu, Pb, Mn, Ni, Se and Zn). Quarterly vegetation monitoring for canopy thickness and health decline will occur by taking photographs is an applicant commitment. A freeboard of 800 mm is to be maintained above operational design capacity. The spillway will only discharge in the event of a 100 year Average Recurrence Interval (ARI), 72-hour duration rainfall event.

Risk assessment

Noting that the underlying groundwater has the potential for beneficial use and the Licence Holder's proposed monitoring, the Delegated Officer has determined the risk below:
Consequence: ***Minor***, low level on-site impacts.
Likelihood: ***Possible***, the risk event could occur at some time
Risk rating: The Delegated Officer has compared the consequence and likelihood rating described above through the Emissions Risk Matrix (Section 6, Table 1) and determined the overall rating of risk to be ***Medium***.

Regulatory controls

Condition 1.2.2 specifies the infrastructure requirements for the emission to groundwater and the material to be discharged. Freeboard requirements have been included in table 1.2.1 to ensure a minimum 800 mm freeboard is maintained. Condition 1.2.4 requires the Licence Holder to undertake daily inspections to confirm freeboard capacity.

Condition 2.1.1 specifies the emission point to groundwater.

Condition 3.2.1 has been applied to the licence to monitor volumetric flow rate to the ponds. Groundwater monitoring at bores GW1, GW2, GW3 and GW4 have been applied to the licence

through condition 3.3.1 to enable the monitoring of potential impacts from seepage through base materials. Further parameters have been included such as cobalt (Co), cadmium, mercury (Hg) and thallium (Tl). These elements are mobile or somewhat mobile in neutral conditions (Smith, 2007).

In addition, a standing water level limit of ≥4 mbgl applies as a safeguard against rising groundwater levels which can impact on surrounding vegetation. This is considered an adequate safeguard as taproots of mulga have been found to reach 3 metres deep (Australian Herbarium, 2012).

Residual risk assessment

Due to the additional regulatory controls, the Delegated Officer has determined the residual risk as:
Consequence: ***Minor***, low level on-site impacts.
Likelihood: ***Possible***, the risk event could occur at some time
Risk rating: The Delegated Officer has compared the consequence and likelihood rating described above through the Emissions Risk Matrix (Section 6, Table 1) and determined the overall rating of risk to be ***Medium***.

References

Smith, K.S., 2007. Strategies to predict metal mobility in surficial mining environments, in DeGraff, J.V. (Ed.), Understanding and Responding to Hazardous Substances at Mine Sites in the Western United States. *Geological Society of America Reviews in Engineering Geology*, **v.XVII**, 25-45.
The paper is available from web site https://minerals.usgs.gov/east/mea/Smith2007_508.pdf

Australian National Herbarium, 2012 (updated 24 December 2015) Growing Native Plants. *Acacia anuera - Mulga, Mulga Wattle,* cited 24/01/2017, https://www.anbg.gov.au/gnp/interns-2010/acacia-aneura.html

Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand, Australian and New Zealand Guidelines for Fresh and Marine Water, 2000.
Available at http://www.environment.gov.au/system/files/resources/53cda9ea-7ec2-49d4-af29-d1dde09e96ef/files/nwqms-guidelines-4-vol1.pdf

Appendix C

Impacts to wildlife and surface water monitoring

Emission description

Emission: Dewatering effluent with elevated dissolved metals and metalloids.
Impact: Potential for toxic impacts to birds or other wildlife that drink the water containing elevated metals and metalloids. The groundwater is considered brackish to moderately saline. TDS levels in the limited groundwater data provided by the applicant indicate TDS ranging from 2900 to 17000 mg/L; therefore water salinity is within the drinkable range for birds (Griffiths et al., 2009).
Controls: The groundwater data provided indicates that levels of arsenic, lead, manganese, mercury and selenium are below ANZECC/ARMCANZ 2000 trigger values for freshwater ecosystem (80% of species). However the groundwater data provided was not at a sufficient detection level to compare against ANZECC/ARMCANZ 2000 trigger values for cadmium, chromium, copper, nickel and zinc.

Risk Assessment

Consequence: ***Moderate***, specific consequence criteria (for environment) are at risk of not being met.
Likelihood: ***Possible***, the risk event could occur at some time.
Risk rating: The Delegated Officer has compared the consequence and likelihood rating described above through the Emissions Risk Matrix (Section 6, Table 1) and determined the overall rating of risk to be ***Medium***.

Regulatory Controls

Condition 3.3.2 has been added to the Licence which requires the Licence Holder to undertake the monitoring of surface water quality at a frequency of 6 months. The Licence Holder is required to ensure that the analysis is undertaken at a sufficient detection level to compare against ANZECC/ARMCANZ 2000 trigger values.

Residual Risk Assessment

Consequence: ***Moderate***, specific consequence criteria (for environment) are at risk of not being met.
Likelihood: ***Possible***, the risk event could occur at some time
Risk rating: The Delegated Officer has compared the consequence and likelihood rating described above through the Emissions Risk Matrix (Section 6, Table 1) and determined the overall rating of risk to be ***Medium***.

References

Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand, Australian and New Zealand Guidelines for Fresh and Marine Water, 2000.
Available at http://www.environment.gov.au/system/files/resources/53cda9ea-7ec2-49d4-af29-d1dde09e96ef/files/nwqms-guidelines-4-vol1.pdf

Griffiths S.R, Smith G.B, Donato DB Factors influencing the risk of wildlife cyanide poisoning on a tailings storage facility in the Eastern Goldfields of Western Australia, *Ecotoxicology and Environmental Safety Vol 72, Issue 5.*