



Works Approval

Environmental Protection Act 1986, Part V

Works Approval Holder: **Beatons Creek Gold Pty Ltd**

Works Approval Number: **W5959/2016/1**

Registered office: Level 1, 25 Richardson Street
WEST PERTH WA 6005

ACN: 150 336 799

Premises address: Beatons Creek Bulk Sample Project
NULLAGINE WA 6758
M46/11 and within GPS coordinates listed below and
as depicted in Schedule 1

Point	Easting (MGA51)	Northing (MGA51)
1	201451	7579259
2	201571	7579152
3	201765	7578555
4	201678	7578427
5	201377	7578287
6	201166	7578527
7	201291	7578718
8	201268	7578945

Issue date: Thursday, 21 July 2016

Commencement date: Monday, 25 July 2016

Expiry date: Saturday, 20 July 2019

The following category/s from the *Environmental Protection Regulations 1987* cause this
Premises to be a prescribed premises for the purposes of the *Environmental Protection Act 1986*:

Category number	Category description	Category production or design capacity	Approved premises production or design capacity
70	Screening etc. of material: premises on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.	More than 5 000 but less than 50 000 tonnes per year	30 000 tonnes per annual period



Conditions

This Works Approval is subject to the conditions set out in the attached pages.

Date signed: 21 July 2016

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Alana Kidd

Manager Licensing – Resource Industries

Officer delegated under section 20
of the *Environmental Protection Act 1986*



Works Approval Conditions

1 General

1.1 Interpretation

1.1.1 In the Works Approval, definitions from the *Environmental Protection Act 1986* apply unless the contrary intention appears.

1.1.2 In the Works Approval, unless the contrary intention appears:

'Act' means the *Environmental Protection Act 1986*;

'annual period' means the inclusive period from 1 July until 30 June in the following year;

'ARI' means Average Recurrence Interval;

'CEO' means Chief Executive Officer of the Department of Environment Regulation;

'CEO' for the purpose of correspondence means;

Chief Executive Officer
Department Administering the Environmental Protection Act 1986
Locked Bag 33
CLOISTERS SQUARE WA 6850
Email: info@der.wa.gov.au

'Commissioning' means the process of operation and testing that verifies the works and all relevant systems, plant, machinery and equipment have been installed and are performing in accordance with the design specification set out in the works approval application;

'HDPE' means high-density polyethylene;

'Premises' means the area defined in the Premises Map in Schedule 1 and listed as the Premises address on page 1 of the Works Approval;

'Schedule 1' means Schedule 1 of this Works Approval unless otherwise stated;

'Works Approval' means this Works Approval numbered W5959/2016/1 and issued under the Act; and

'Works Approval Holder' means the person or organisation named as the Works Approval Holder on page 1 of the Works Approval.

1.1.3 Any reference to an Australian or other standard in the Works Approval means the relevant parts of the standard in force from time to time during the term of this Works Approval.

1.1.4 Any reference to a guideline or code of practice in the Works Approval means the current version of the guideline or code of practice in force from time to time, and shall include any amendments or replacements to that guidelines or code of practice made during the term of this Works Approval.



1.2 General conditions

1.2.1 The Works Approval Holder shall construct the works in accordance with the documentation detailed in Table 1.2.1:

Table 1.2.1: Construction Requirements ¹		
Document	Parts	Date of Document
Beatons Creek Bulk Sample Project - Works Approval Application Environmental Supporting Document, 360 Environmental	All, including Drawings and Appendices	June 2016

Note 1: Where the details and commitments of the documents listed in condition 1.2.1 are inconsistent with any other condition of this Works Approval, the conditions of this Works Approval shall prevail.

1.2.2 The Works Approval Holder must not depart from the specifications in Column 1 and 2 for the infrastructure in each row of Table 1.2.2 except:

- where such departure is minor in nature and does not materially change or affect the infrastructure; or
- where such departure improves the functionality of the infrastructure and does not increase risks to public health, public amenity or the environment; and is in accordance with all other conditions of this Works Approval.

Table 1.2.2: Column 1	Construction specifications Column 2
Infrastructure	Specifications (design and construction)
All	The following specifications apply: a) no storage of fuels or oils (hydrocarbons) on site; and b) no mechanical maintenance to be conducted on site.
Bunding beneath crusher	The following specifications apply: (a) Impervious material to achieve a permeability of less than 1×10^{-9} m/s; and (b) Sufficient capacity to fully contain any potential spills from the crusher not less than 110%.
Sedimentation and recirculation ponds	Pond(s) sized to ensure containment (i.e. no discharge from the spillway) except in the event of a greater than 1 in 100 ARI, 72-hour duration rainfall event.
Tailings/return water pipelines	HDPE.

1.2.3 The Works Approval Holder shall construct all pipelines containing tailings/return water to either be:

- equipped with automatic cut-outs in the event of pipe failure; or
- provided with secondary containment sufficient to contain any spill for a period equal to the time between routine inspections.

1.2.4 The Works Approval Holder shall commission the crushing and gravity circuit and associated infrastructure, for a period not exceeding 1 week.



2 Information

2.1 Reporting

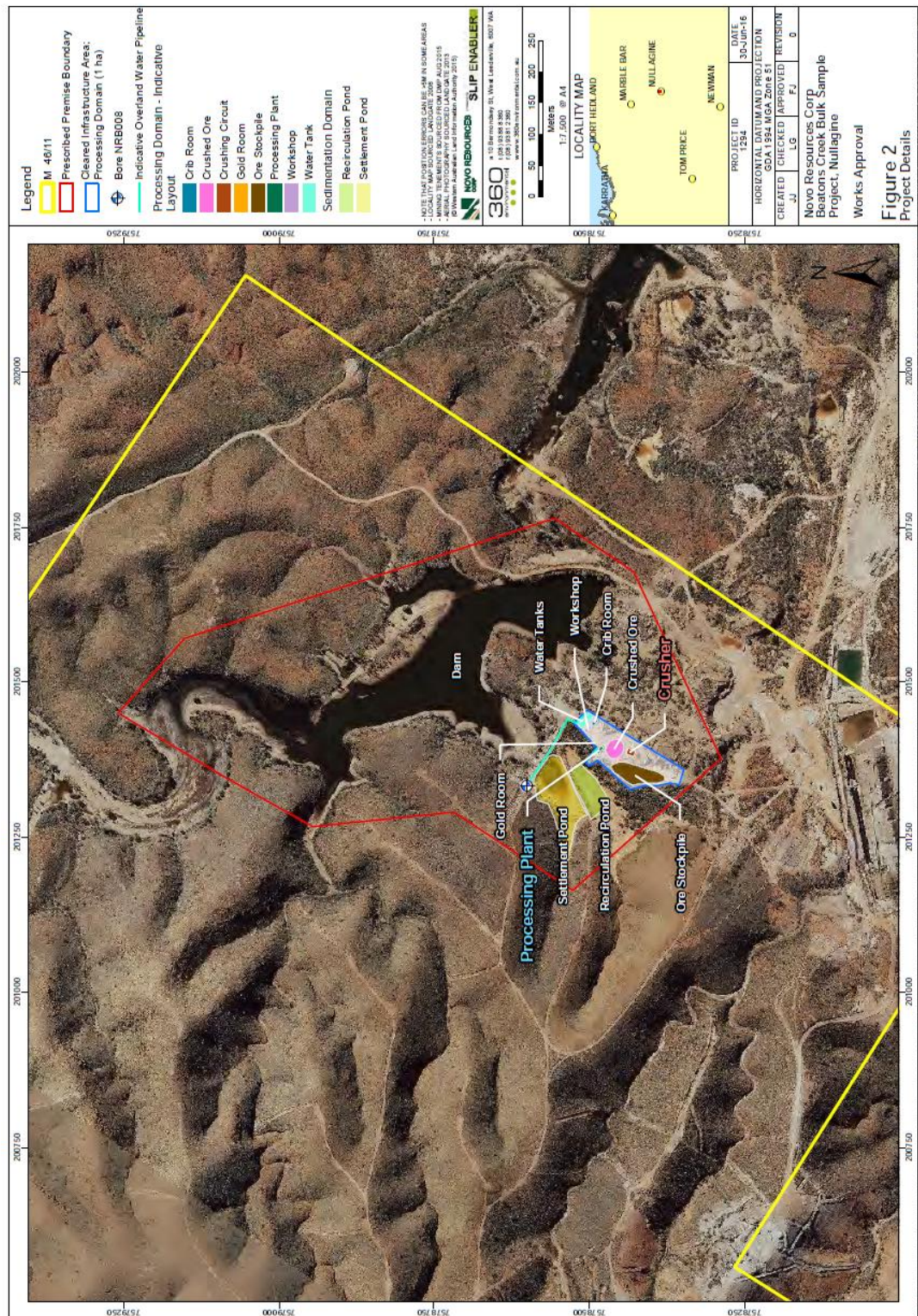
- 2.1.1 The Works Approval Holder shall submit a compliance document to the CEO, following the construction of the works and prior to commissioning of the same.
- 2.1.2 The compliance document shall:
- (a) certify that the works were constructed in accordance with the conditions of the Works Approval; and
 - (b) be signed by a person authorised to represent the Works Approval Holder and contain the printed name and position of that person within the company.



Schedule 1: Maps

Premises map

The Premises is shown in the map below. The red line depicts the Premises boundary.





Decision Document

Environmental Protection Act 1986, Part V

Proponent: **Beatons Creek Gold Pty Ltd**

Works Approval: **W5959/2016/1**

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WEST PERTH WA 6005

ACN: 150 336 799

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8	201268	7578945

Issue date: Thursday, 21 July 2016

Commencement date: Monday, 25 July 2016

Expiry date: Saturday, 20 July 2019

Decision

Based on the assessment detailed in this document the Department of Environment Regulation (DER) has decided to issue a works approval. DER considers that in reaching this decision, it has taken into account all relevant considerations and legal requirements and that the Works Approval 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:

Alana Kidd
Delegated Officer



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1 Purpose of this Document

This decision document explains how DER has assessed and determined the application and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER'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
	70	30 000 tonnes per annual period
Application verified	Date: 10/03/16	
Application fee paid	Date: 24/03/16	
Works Approval has been complied with	Yes ☐ No ☐ N/A ☒	
Compliance Certificate received	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 <i>Environmental Protection Act 1986</i> ?	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 <i>Environmental Protection Act 1986</i>)?	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, e.g. Site is subject to SO ₂ requirements of Kwinana EPP.		



3 Executive summary of proposal and assessment

Beaton's Creek Gold Pty Ltd (BCG) is proposing to develop the Beatons Creek Paleoplacer Gold Project (Paleoplacer Project) which involves the development of a gold mine and associated infrastructure near Nullagine in the East Pilbara.

As part of the planning for the Paleoplacer Project, BCG propose to extract and process bulk samples from three or four locations on Mining Tenement M46/11 to gain a more detailed understanding of the ore's characteristics in relation to processing and gold recovery.

This Works Approval is to construct a crushing circuit (mobile impact crusher) and gravity plant (iCON IGR 3000).

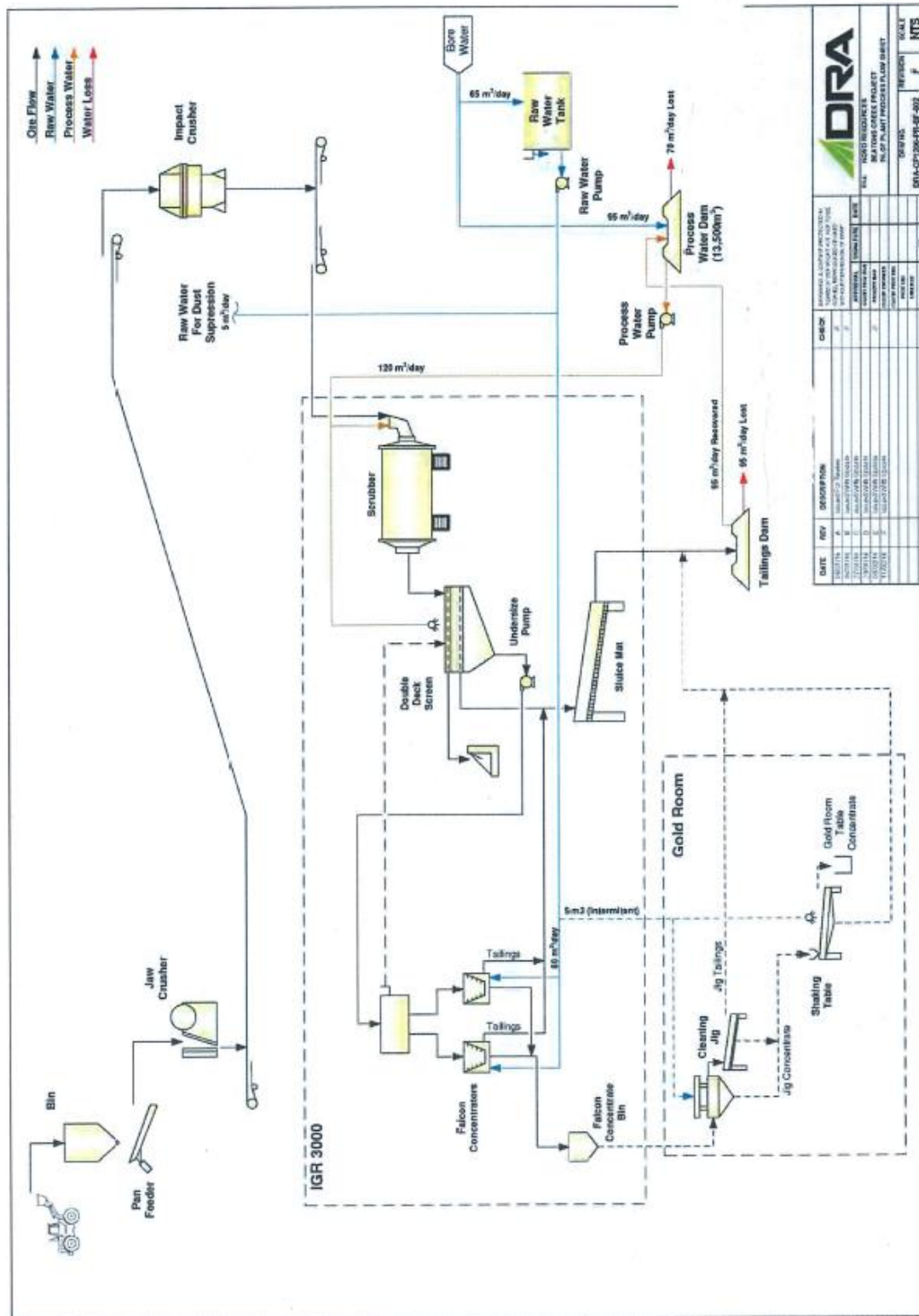
Construction involves mobilising the crusher and gravity plant to site and assembly, installing the overland pipelines and installing all support infrastructure and associated bunding.

BCG propose to extract and process a bulk sample from three or four locations on M46/11. The samples will be extracted outside of the Premises boundary. The mineralised ore will be transported to the processing area within the prescribed premises where it will be stockpiled.

BCG proposes to mill the ore through a crushing circuit and gravity plant; this is a no chemical process. The iCON IGR 3000 gold recovery plant has a design capacity of 30 tonnes per hour (t/hour). BCG will be processing a total of 30 000 tonnes over a period of six months as described in the Small Operations Mining Proposal.

BCG will load the ore from the ore stockpile using a front-end loader into the impact crusher and the crushed ore will either be stockpiled within the processing domain or conveyed directly to the gravity plant. Crushed ore will progress through the scrubber and Falcon concentrators (components of the iCON IGR 3000). The Falcons on the iCON IGR 3000 will produce approximately 0.5 kg of concentrate per tonne of ore. The Falcon concentrate will proceed to the gold room where it will be processed further through a shaker table to further concentrate the product. The gold concentrate produced will be transported to Perth for further processing and finishing. A processing flow sheet is shown in figure 1.

Figure 1: Processing flow sheet





Waste from the no-chemical gravity plant will be in the form of a slurry of crushed ore and water. It will be deposited into an existing sedimentation/recirculation pond (un-lined) to the north west of the gravity plant. Deposition of tailings will be via a HDPE 90 mm line from the gravity plant. The waste ore will settle out and water from the sedimentation/recirculation pond will be pumped back to the gravity plant for recycling.

Should the sediment/recirculation ponds overtop (via the top of the dam wall), the escaping water and tailings slurry could make its way downstream and merge with the waters of the Upper Lake before passing through the Upper Lake spillway, through the Lower Lake and Lower Lake Dam overflow. Escaping water could then make its way along the path of the existing ephemeral creek, over Marble Bar Road and ultimately to the Nullagine River.

A spillway to the north of the sedimentation/recirculation ponds will be constructed to manage excess stormwater during high intensity rainfall events to prevent over-topping of the pond walls. This will maintain the integrity of the pond walls. The spillway will be designed to only discharge in the event of a greater than 1 in 100 Annual Recurrence Interval (ARI), 72-hour duration rainfall event.

The sediment/recirculation ponds are currently unlined. A sample undertaken of existing, in-situ materials during a geotechnical investigation has determined the vertical permeability to be $1-2 \times 10^{-7}$ metres per second (low to moderate permeability).

Mineralisation at the bulk sample sites is divided into two distinct zones:

- The oxide zone; and
- The sulphide zone underlying the oxide horizon, this zone will not be mined as part of the bulk sample project.

The oxide/sulphide boundary is located 20-25 m below ground level, the bulk samples will be mined around 5 m.

An application for a Registration under Schedule 1 of the *Environmental Protection Regulations 1987* has also been made for a category 70 prescribed activity. The capacity is limited through the Small Operations Mining Proposal being assessed by the Department of Mines and Petroleum (DMP).

Potential emissions that could reasonably be expected to arise from the construction and operation of the Premises are:

1. Emissions to groundwater - the Premises is located within the current Priority 1 Nullagine Public Drinking Water Reserve Area (PDWSA) with the objective of *risk avoidance*. Depth to groundwater is between 70-150m below ground level.
2. Emissions to surface water – a minor non-perennial watercourse is located within the mining tenement. The dam located downstream of the sedimentation/recirculation ponds may be used by some Nullagine residents for seasonal swimming.
3. Noise and dust emissions – the nearest sensitive receptor is located at the Nullagine townsite located approximately 1 km from the boundary of the mining tenement.

The proposal outlines that this is a six-month project with a limited capacity of 30 000 tonnes. Approval to operate may be granted under a category 70 Registration, subject to demonstrating compliance with the Works Approval conditions, regulatory controls and provisions of the *Environmental Protection Act 1986*. An assessment of the risks from the construction and operation of the proposal are assessed in Table 4.



4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987* and DER'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
General conditions	W1.2.1 – W1.2.4.	Construction Condition W1.2.1 will require the Works Approval Holder to construct Beatons Creek Bulk Sample Project in accordance with the supporting documents and general provisions of the EP Act. Condition W1.2.2 is included within the Works Approval stating the design and construction specifications for the works as outlined in the works approval supporting documentation. It also provides scope for minor variations that do not materially change or affect the infrastructure and will not increase the risk to public health, amenity or the environment. This condition also includes additional construction specifications to those outlined in the supporting documents. Condition W1.2.3 has been included in the Works Approval as the application does not include details on the tailings/return water pipelines and any provision for pipeline failure. Condition W1.2.4 has been included as the proponent has requested a commissioning period of one week. Operation DER's assessment and decision making with respect to the deposition of tailings are detailed in Appendix A.	General provisions of the <i>Environmental Protection Act 1986</i>. Application supporting documentation. <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>.
Emissions general	W – no conditions.	Construction and operation There are no conditions relating to general emissions during construction or operation.	N/A.



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 air including monitoring	W – no conditions.	Construction and operation No point source emissions to air are expected during construction or operation, therefore no conditions relating to point source emissions to air or the monitoring of these emissions are required to be added to the Works Approval.	Application supporting documentation
Point source emissions to surface water including monitoring	W – no conditions.	Construction and operation No point source emissions to surface water are expected during construction or operation, therefore no conditions relating to point source emissions to surface water or the monitoring of these emissions are required to be added to the Works Approval.	Application supporting documentation
Point source emissions to groundwater including monitoring	W – no conditions.	Construction and operation No point source emissions to groundwater are expected during construction or operation, therefore no conditions relating to point source emissions to groundwater or the monitoring of these emissions are required to be added to the Works Approval.	Application supporting documentation.
Emissions to land including monitoring	W – no conditions.	Construction No emissions to land are expected during construction; therefore no conditions relating to emissions to land or the monitoring of these emissions are required to be added to the Works Approval. Operation DER's assessment and decision making with respect to the deposition of tailings into the existing sedimentation/recirculation ponds are detailed in Appendix A.	Application supporting documentation. <i>Environmental Protection (Unauthorised Discharges) Regulations 2004.</i>
Fugitive emissions	W – no conditions.	Construction and operation <u>Emission Description</u> <i>Emission:</i> Dust generated from the crushing and stockpiling of the ore and vehicle movement. <i>Impact:</i> Nuisance dust impacts on the residents of Nullagine townsite and recreational users of Nullagine Dam.	<i>Environmental Protection Act 1986.</i>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<i>Controls:</i> Dust suppression via water tanker and watering of bare surfaces if dust is visibly observed. The Nullagine townsite is located approximately 1.3 km from the processing areas. <u>Risk Assessment</u> <i>Consequence:</i> Insignificant <i>Likelihood:</i> Possible <i>Risk Rating:</i> Low Nil, the substantive offences of the EP Act provide enforceable prohibitions for dust emissions that result in pollution or environmental harm.	
Odour	W – no conditions.	Construction and operation No odour emissions are expected during construction and operation, no conditions relating to odour are considered necessary.	General provisions of the <i>Environmental Protection Act 1986</i>. Application supporting documentation.
Noise	W – no conditions.	Construction and operation The nearest sensitive receptor is approximately 1 km from the tenement boundary. The location of the crusher provides an additional separation distance of approximately 300m. Noise emissions from the Premises can be managed under the provisions of <i>Environmental Protection (Noise) Regulations 1997</i> and section 49 of the <i>Environmental Protection Act 1986</i>. No conditions relating to noise are considered necessary.	General provisions of the <i>Environmental Protection Act 1986</i>. <i>Environmental Protection (Noise) Regulations 1997</i>.



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	W – no conditions.	General monitoring conditions are not required during construction or operation.	N/A.
Monitoring of inputs and outputs	W – no conditions.	Monitoring of inputs and outputs is not required during construction or operation.	N/A.
Process monitoring	W – no conditions.	Process monitoring is not required during construction or operation.	N/A.
Ambient quality monitoring	W – no conditions.	Construction and Operation The proponent has committed to conducting monthly monitoring of groundwater quality at an abstraction bore (ref NRB008) which is proposed at the request of the Department of Water (DoW). DoW has determined the monitoring bore to be appropriate to capture any seepage. The parameters to be monitored are aluminium, iron, manganese, thallium and total petroleum hydrocarbons.	Application supporting documentation.
Meteorological monitoring	W – no conditions.	Meteorological monitoring is not required during construction or operation.	N/A.
Improvements	W – no conditions.	Improvement conditions are not a requirement of the Works Approval.	N/A.
Information	W2.1.1 - W2.1.2.	Construction and Operation Condition W2.1.1 requires the Works Approval Holder to submit a compliance document to DER once construction of Beatons Creek Bulk Sample Project has been completed. Condition W2.1.2 specifies the requirements of the compliance document. No additional conditions are required on the Works Approval.	N/A.
Works Approval Duration	N/A.	The Works Approval will be issued for a period of three years. There are no factors that warrant the limitation of the Works Approval duration.	N/A.



5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
4/04/2016	Application advertised in West Australian (or other relevant newspaper)	Nil comments received.	N/A.
4/04/2016	Application referred to stakeholders listed: 1. Department of Water (DoW) 2. Department of Mines and Petroleum (DMP) 3. Shire of East Pilbara	DoW comments received 18/4/16 (Reg ID 58019): • Recommendation that the project be conditioned to ensure the oxide/sulphide boundary is not intercepted as part of the mining proposal; and • Recommendation that a monitoring bore be installed downstream of the sedimentation/recirculation pond to capture groundwater flow data and verify the lack of groundwater interaction, and/or seepage towards the dam. Further comment from DoW received 16/5/16 • The Beatons Creek tenements are northwest of the town, sitting on a granite rock system, so no transmission to groundwater. Granite weathers to sands and clays. Therefore the only transmission of contaminants would be from surface water flows (more likely) or along fractures in the granite (it is unlikely that a fracture would be 1. Very transmissive, 2. Connected to the Nullagine River, and 3. Have sufficient	The supporting documentation outlines the proponent's commitment to extract samples within the oxide zone only. The supporting documentation outlines the proponent's commitment to undertake monitoring of a downstream bore that has been deemed appropriate by the Department of Water.



Date	Event	Comments received/Notes	How comments were taken into consideration
18/07/2016	Further comments received from DoW regarding spillway discharge to the Nullagine Dam	storage volume to contribute a measureable contaminant load). DMP nil comments received. Shire of East Pilbara nil comments received. Comments received 21/7/2016 DoW do not consider the spillway will present a contamination risk to the water reserve.	N/A
12/07/2016	Proponent sent a copy of draft instrument	Comments received 20/7/2016: • Provision of Premises boundary GPS coordinates; and • Minor changes of terms.	GPS coordinates included in Premises address. Minor administrative changes made.



6 Risk Assessment

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

Table 1: Emissions Risk Matrix

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



Appendix A

Premises Operation – Risks to Stormwater

Emission Description

Emission: Stormwater possibly contaminated with hydrocarbons from operation, and hydrocarbon spills into the surrounding environment.

Impact: Contamination of localised soils and groundwater and/or surface water drainage systems. Potential impacts on ecology of surface water. The site is located within the P1 Nullagine Public Drinking Water Source Area (PDWSA). The Nullagine Dam is located downstream of the processing areas.

Controls: No hydrocarbons will be stored on site and daily refuelling will be undertaken from Nullagine Fuel Station. No mechanical servicing will be conducted on site. The generators that run the processing plant are self-contained/self-bunded. A high-density polyethylene (HDPE) lined bund will be constructed to contain leaks from the crusher. The bund will be inspected prior to forecast storm events and emptied to a lidded tank to prevent the escape of hydrocarbon contaminated water into the environment. All stormwater within process areas is directed to the sedimentation/recirculation ponds.

Risk Assessment

Consequence: Minor

Likelihood: Unlikely

Risk Rating: Moderate

Regulatory Controls

W1.2.1 - W1.2.2 has been included in the Works Approval to ensure that the Works Approval Holder constructs relevant infrastructure to the specifications outlined to limit the risk of stormwater contamination. It is also the occupier's responsibility to ensure that they comply with relevant legislative requirements for secondary activities such as the storage and handling of environmentally hazardous materials. Unauthorised discharges of environmentally hazardous materials are subject to the provisions of the *Environmental Protection (Unauthorised Discharges) Regulations 2004*.

Residual Risk

Consequence: Minor

Likelihood: Unlikely

Risk Rating: Moderate

Premises Operation – Tailings Deposition

Normal Operation

Emission description

Emission: Deposition of waste slurry into unlined sedimentation/recirculation ponds consisting of crushed ore and water potentially causing an emission of trace metals and metalloids to groundwater.

Impact: Potential contamination of groundwater within the Nullagine Priority 1 PDWSA through unlined ponds. In-situ materials have a hydraulic conductivity of $1-2 \times 10^{-7}$ metres/second (low to moderate permeability) which could lead to some seepage. The proponent has stipulated that the risk of metals and metalloids being leached as a result of the mining operation will be low on the basis of geochemical test-work that has been undertaken to characterise the properties of the ore and potential waste rocks. This testing has indicated that the ore does not contain sulphide minerals and generally has a sulfur content of less than 0.05%.



DER notes that, although rock containing such low sulfur content is generally considered to have a low potential for releasing acidity and metals into solution, this may not be the case for materials from the proposed bulk sample project for the following reasons:

- The ore has a negligible acid neutralising capacity (ANC) and is known to contain stored acidity in the form of secondary iron and aluminium sulfate minerals such as jarosite and alunite; and
- The ore will be finely crushed, greatly increasing the surface area of minerals that will be exposed to water during ore processing – column tests on sand-sized material with a negligible ANC has indicated that substantial amounts of metals and metalloids can be leached into solution from material with sulfur levels as low as 0.015% (Singh *et al.*, 2012).

Although the depth to the water table beneath the site is large (70 to 150 m), the risk of groundwater contamination taking place is not negligible because of the presence of steeply dipping fractures in bedrock which may allow locally rapid water flow. However, the Department of Water (DoW) has advised that the transmission of contaminants along fractures in the granite would be unlikely due to the fractures not being very transmissive or have sufficient storage volume to contribute a measurable contaminant load. On balance, in view of the small scale and limited duration of the proposal, it is considered acceptable.

Controls: The proponent has committed to refraining from any chemical processing. The proponent has committed to processing ore within the oxide zone only. The proponent has made a commitment to monitor groundwater quality at a downstream bore as requested by DoW. The Proponent has confirmed the location of a downstream bore to be appropriate in liaison with DoW. The parameters to be monitored are aluminium, iron, manganese, thallium and total petroleum hydrocarbons. Groundwater is between 70m to 150m below ground level.

Risk Assessment

Consequence: Minor

Likelihood: Rare

Risk Rating: Low

Regulatory Controls

Nil, in view of the information above no further controls are deemed necessary.

Residual Risk

Consequence: Minor

Likelihood: Rare

Risk Rating: Low

Abnormal Operation/Emergency Situation

Emission Description – Tailings overtopping or discharge from sedimentation pond

Emission: Overflow of tailings from the sedimentation/recirculation ponds caused by embankment failure, operator error, or a storm event.

Impact: Tailings deposition and discharge of water potentially containing leached metals and metalloids within the downstream Nullagine Dam. Should the ponds overtop, the escaping water and tailings slurry could migrate downstream and merge with the waters of the Upper Lake before passing through the Upper Lake spillway, through the Lower Lake and Lower Lake Dam overflow. Escaping water could then make its way along the path of the existing ephemeral creek, over Marble Bar Road and ultimately to the Nullagine River. Refer to Figure 2 for a map indicating the potential flow pathway. The Nullagine Dam may be used for seasonal swimming by Nullagine residents.



Controls: The proponent proposes to construct an emergency spillway to protect the integrity of the embankments in the event of extreme rainfall events. This is consistent with national standards for such structures (ANCOLD 2012). In the event of extreme rainfall the structure would be protected from breaching and release of waters would be limited and diluted by stormwater.

Risk Assessment

Consequence: Moderate

Likelihood: Possible

Risk Rating: Moderate

Regulatory Controls

Table 1.2.2 of W1.2.2 requires that the sedimentation pond is constructed to have provision to retain rainfall events up to and including those of 1 in 100 ARI, 72-hour duration. That is, the pond must have the freeboard capacity to not discharge from the spillway during these rainfall events.

Residual Risk

Consequence: Minor

Likelihood: Unlikely

Risk Rating: Moderate

Abnormal Operation/Emergency Situation

Emission Description – Tailings discharge from pipeline failure

Emission: Tailings deposition pipeline failure leading to uncontrolled release of tailings and process water.

Impact: Tailings discharge to land. Potential for discharge to be released to adjacent Nullagine Dam,

Controls: Deposition of waste slurry will be via a HDPE 90mm line from the process plant. The proponent proposes to undertake daily inspections of the sedimentation/recirculation ponds and pipeline. The pipeline pump has an emergency shutoff, and will be manned by an operator at all times during operation. Drainage from the processing site is directed to the recirculation pond; depending on the mechanism and location of the pipeline failure most spillage should be captured by this pond.

Risk Assessment

Consequence: Minor

Likelihood: Unlikely

Risk Rating: Moderate

Regulatory Controls

W1.2.3 has been included in the Works Approval requiring the Works Approval Holder to equip the pipeline with automatic cut-outs, or provide secondary containment with sufficient capacity to contain a spill for a period equal to the time between routine inspections.

Residual Risk

Consequence: Minor

Likelihood: Rare

Risk Rating: Low



References

Singh, B., Pal, Y. and Wong, S., 2012. *Experimental Oxidation of Bassendean Sand*. Department of Environment and Conservation Technical Report which is available from web site www.der.wa.gov.au.

CMW Geosciences Pty Ltd, 2016. *Beatons Creek Gold Project Sedimentation Pond Dam Wall Assessment Nullagine, WA. Geotechnical Investigation Report*.

ANCOLD, 2012. *Guidelines on tailings dams. Planning, design, construction, operation and closure*.

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