



Decision Document

Environmental Protection Act 1986, Part V

Applicant: Mt Morgans WA Mining Pty Ltd

Works Approval: W6008/2016/1

Registered office: Level 2, 1 Preston Street
COMO WA 6152

ACN: 612 053 291

Premises address: Mt Morgans Gold Project
Mining tenements M39/236, M39/395, M39/390, M39/272, M39/18,
M39/228, M39/264, M39/304, M39/240, M39/248, L39/245, L39/246,
M39/441, M39/250, M39/504, M39/745, M39/403, M39/282, M39/36 and
M39/1107
LAVERTON WA 6440

Issue date: 2 February 2017

Commencement date: 3 February 2017

Expiry date: 3 February 2017

Decision

Based on the assessment detailed in this document the Department Water and Environmental Regulation (DWER), has decided to issue a works approval. DWER 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: Fiona Sharpe / Josephine Tuohy
Licensing Officers

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 applicant's responsibility to ensure they have all relevant approvals for their Premises.

2 Administrative summary

Administrative details		
Application type	Works Approval <input type="checkbox"/> New Licence <input type="checkbox"/> Licence amendment <input type="checkbox"/> Works Approval amendment <input checked="" type="checkbox"/>	
Activities that cause the premises to become prescribed premises	Category number(s)	Assessed design capacity
	5	2.5 million tonnes per annum
	6	1.2 million tonnes per annum
	54	145.5 kL per day
	64	4,500 tonnes per annum
	73	1,150
Application verified	Date: 21/11/2017	
Application fee paid	Date: 06/12/2017	
Works Approval has been complied with	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	
Compliance Certificate received	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	
Commercial-in-confidence claim	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Commercial-in-confidence claim outcome	-	
Is the proposal a Major Resource	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	



Project?		
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the <i>Environmental Protection Act 1986</i> ?	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"/>
Is the proposal subject to Ministerial Conditions?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	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 <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Is the Premises within an Environmental Protection Policy (EPP) Area: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If Yes include details of which EPP(s) here.		
Is the Premises subject to any EPP requirements? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If Yes, include details here, eg Site is subject to SO ₂ requirements of Kwinana EPP.		

3 Executive summary of proposal and assessment

3.1 Background

The Mount Morgans Gold Project is located approximately 30 km south-west of Laverton. It is owned by Mt Morgans WA Mining Pty Ltd, (MMWM) which is wholly owned subsidiary of Dacian Gold Limited. The site has historically been operated since the 1980s by a number of companies prior to MMWM it in 2012. The site has been in care and maintenance since 2011.

MMWM applied for and was granted a works approval (W6008/2016/1) and licence (L9010/2016/1) for the following prescribed categories:

- 5 – Processing and beneficiation of metallic or non-metallic ore;
- 6 – Mine dewatering;
- 54 – Sewage facility;
- 65 – Class II or III landfill; and
- 73 – Bulk storage of chemicals.

The following infrastructure is required to be constructed:

- Run of Mines Pads
- Processing plant
- Tailings Storage Facility (TSF)
- Water storage dams
- Workshops
- Administration offices
- Accommodation village



- Waste water treatment plants
- Pipelines

The Delegated Officer has determined that the activities at the mine trigger all of the above prescribed activities under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations). This document is based on an assessment of the application for a Part V *Environmental Protection Act 1986* (EP Act) works approval, which was verified on 7 November 2016.

MMWM submitted an application on 18 October 2017 to amend works approval W6008/2016/1 and licence L9010/2016/1. MMWM propose the following amendments:

- Amendment to activities associated with Category 6 – Mine dewatering and discharge to existing open pits (50,000 tonnes or more per annum).
- Amendment to activities associated with Category 64 – Class II putrescible landfill site (20 tonnes or more per annum).
- Removal of Category 52 – Electric power generation using a fuel (more than or equal to 10 MW).

Detailed information is provided in Section 3.2 Operational requirements.

3.2 Operational requirements

Category 5 – Processing or beneficiation of metallic or non-metallic ore

MMWM will construct a carbon-in-leach processing plant with an annual production capacity of 2.5 million tonnes. The processing of the carbon-in-leach plant include crushing, grinding, a gravity circuit, carbon-in-leach circuit and a carbon stripping and goldroom circuit.

A hill side paddock style TSF with two cells, is proposed for the storage of tailings. The TSF will be constructed in stages using an upstream technique. Stage 1 of Cell 1 will be constructed to a maximum height of 9 m (RL 408 mAHD). Cell 2 will be on the north-east side of Cell 1. Both of the cells are proposed to be raised using an upstream method of construction with two stages. Stage 2 construction (first raise of the embankments) will be 4 m height. Stage 3 comprises a 2 m raise to a final elevation of 414 mAHD.

The following table shows an overview of the TSF construction stages:

TSF Cell	Construction Stage	Embankment Crest Elevation (m RL)	Storage Capacity (Mt)
Cell 1	Stage 1 (starter)	408	2.6
	Stage 2	412	3.9
	Stage 3	414	2.3
Cell 2	Stage 1 (starter)	408	3.0
	Stage 2	412	3.7
	Stage 3	414	2.1
Total			17.6

Tailings will be discharged through multiple rotating spigots on the perimeter embankment of each cell as a slurry consisting of 45%-50% solids. A decant pond will form at the centre of the cells where a central decant tower will pump the water back to the plant for re-use.

Category 6 – Mine dewatering

For mining purposes, dewatering within the site will be necessary. MMWM developed a site wide water balance for water management purposes. It is expected that after water is used for dust suppression and mining purposes any excess water from Jupiter will be discharged to the Mt Marven



open pit. Any excess water at Westralia will be discharged to five existing pits; King Street, Ramornie, Ramornie North, and Sarah and Craic.

Dewatering pipelines for the Westralia dewatering have been constructed with the following configurations:

- Westralia open pit to Sarah, Ramornie and Ramornie North open pits;
- Westralia open pit to King Street open pit;
- Westralia open pit to Transvaal;
- Morgans North open pit and Craic open pit;
- Transvaal open pit to Craic open pit;

All pipelines carrying hypersaline water will be bunded and fitted with leak detection flow meters and shut/off isolation valves.

The construction of the Westralia dewatering pipelines completed stage 1 of works approval W6008/2016/1.

26 February 2018 - This Amendment

MMWM are proposing to discharge:

- Dewatering of Ramornie pit with discharge to Sarah pit. This is required due to a conduit of interlinking hydrogeological structures between the proposed underground development and Ramornie pit. Dewatering from the Ramornie pit (via pipelines), in combination with underground dewatering to Sarah pit will result in a temporary pit lake of 207,847m³ (allowing for 5 m freeboard). Water stored in Sarah pit will be used for dust suppression (1.5L/s), reuse underground (13 L/s) and reuse at the wash-down pad (03.6 L/s).
- Discharge of water used in the wash-down pad back into Sarah pit (0.6 L/s). This water will be treated through an oil-water separator to reduce the hydrocarbon concentration to 15mg/L. On an annual basis, this accounts for 9% of the total pit volume.
- Transfer of water from Transvaal to Sarah pit to maintain the water supply for the uses above. Dewatering of Transvaal was previously approved under the works approval and licence, however discharge was proposed to Craic pit.

Category 52 – Power generation

MMWM initially had approval to construct a 15 MW diesel power station comprising of 7 duty generators and 2 standby generators under works approval W600/2016/1. The power station was to be located adjacent to the processing plant in the Jupiter area. Temporary power supply was to be established at the Westralia service area during the construction phase. This was to comprise of gen sets providing 4 MW power.

26 February 2018 - This Amendment:

MMWM propose to construct an offtake station and high-pressure gas pipeline, from the Eastern Goldfields Pipeline, which transverses MMWM tenure, north of Jupiter. The pipeline will extend for approximately 5 km in a southerly direction towards Jupiter. The proposed power station will have capacity to deliver 19.5 MW of power at 11 Kv. The station will consist of 5 x 3.3 MW gas fuelled generators and 3 x 1 MW diesel driven generators. The power generation will remain below the threshold for Category 52: 20 MW or more in aggregate (using natural gas) or 10 MW or more in aggregate (using a fuel other than natural gas), therefore this has not been included in the assessment of this Decision Document. Conditions relating to Category 52 have been removed from the works approval.

Category 54 – Sewage facility

MMWM initially proposed to construct two waste water treatment plants (WWTP) under works approval W6008/2016/1 granted on 3 January 2017. A WWTP would be constructed at the Westralia accommodation village, and a WWTP constructed at the Jupiter process plant and mine site.



On 12 July 2017, MMWM submitted a Compliance Report for the Westralia Accommodation village WWTP in accordance with the works approval. DWER reviewed the Compliance Report, reassessed the risks and amended the licence on 4 August 2017 to include the Westralia accommodation village.

The constructed Westralia WWTP has been rated for 420 people accommodated at 180 litres per person per day (75.6 kL/day). The plant consists of two 50 kL capacity containerised units (100 kL/day), treating waste water through a combined anoxic/aerobic suspended growth treatment process. The treated waste water will be pumped to a 3.6 Ha irrigation field. As a contingency, a 350kL HDPE lined pond has been constructed for storage of treated wastewater during periods of heavy rainfall or during emergency situations for reprocessing back at the treatment plant.

Jupiter WWTP is yet to be constructed and will include a 7.5 kL/day capacity, with the plant rated for 150 people, based on 50 L /person / day. Treated waste water is proposed to be discharged directly into the Jupiter process water circuit.

The construction of the Westralia WWTP partially completes stage 3 of works approval W6008/20168/1.

Category 64 – Class II or III landfill

MMWM propose to construct two landfill sites, one at Jupiter and one at Westralia for both inert and putrescible waste. It is anticipated that 2,500 tonnes of inert waste and 2,000 tonnes of putrescible waste will be generated per annum. The landfills will be constructed on waste rock dumps.

On 5 July 2017, MMWM submitted a Compliance Report to DWER for the Jupiter Class II or III putrescible landfill facility in accordance with works approval W6008/2016/1, granted on 3 January 2017. The submission of this compliance report triggered a DWER-initiated amendment (granted on 17 January 2018) to Licence L9010/2016/1 to include category 64 Class II or III putrescible landfill including relevant conditions of licence evaluated for their emission risk at the Jupiter landfill. It is anticipated that 2,500 tonnes per annum of inert waste and 2,000 tonnes per annum of putrescible waste will be generated and disposed at the Westralia and Jupiter landfills. This amendment was finalised and granted on 17 January 2018.

DWER has reviewed the Compliance Report for the Jupiter landfill and determined it has been constructed on the North Waste Rock Dump (NWRD) consistent with the infrastructure proposed and assessed against the public health and environmental receptors determined at works approval.

The Delegated officer therefore considered the risk to the environment of the Jupiter landfill remains unchanged from that assessed at works approval and determined that the operations of the Jupiter landfill facility will not result in emissions which are unacceptable to public health or the environment and therefore grants this amendment.

The Delegated Officer has amended the conditions of licence L9010/2016/1 to include the Jupiter landfill facility, conditions that identify waste types for disposal plus the waste cover material requirements and included a map in schedule 1 that demarcates the landfill on the NWRD.

The construction of the Jupiter Class II or III putrescible landfill facility completes stage 2 of works approval W6008/2016/1.

26 February 2018 - This Amendment:

MMWM are proposing to construct a tyre landfill within Jupiter West Waste Rock Dump (Figure 1). Anticipated tyre usage over the life of mine is shown below in Figure 1:



Machine	Number
150t truck	300
100t truck	300
40t truck	50
Grader	60

Figure 1: Estimate of tyre numbers for life of mine

Category 73 – Storage of bulk chemicals

MMWM will store diesel in self-bunded tanks as follows:

- Westralia: 2 X 110 kL tanks
- Jupiter: 3 X 200 kL tanks (for power station) and 3 X 110 kL tanks (to supply open pit operations).

3.3 Location and siting

Siting Context

The project is located approximately 30 km south-west of Laverton, in the north eastern Goldfields of Western Australia. Two mining areas within the prescribed premises are proposed. They are: Jupiter (comprising of Heffernans, Doublejay and Ganymede open pits) and Westralia (comprising of Beresford underground, Allanson underground, Morgans North open pit cutback and Transvaal underground).

Sensitive Land Uses

The closest human receptor to the Mt Morgans Gold Project, is the Mt Margaret Community, which is located directly northwest of Jupiter and is approximately 2 km from the proposed processing plant. The nearest point from the TSF is 900 m from the community. The nearest point from one of the haul roads is 800 m.

A small section of the project (Craic open pit, magazine compound, a section of the TSF and the production borefield) is located on an active pastoral station running sheep and beef (Glenorn pastoral station lease).

Specified Ecosystems

The project is not located within 30 km of a Public Drinking Water Source Area.

A Level 1 vegetation assessment was carried out in the area in March 2016 by a qualified botanist, in accordance with the Environmental Protection Authority (EPA) “Terrestrial Biological Surveys as an Element of Biodiversity Protection; Position Statement No 3” (EPA 2002) and Guidance Statement No 51 “Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004)”. A total of 32 Families, 77 Genera and 195 Species were recorded within the entire area. The results of the survey showed no Declared Rare Flora, no Threatened flora or Priority flora species were recorded in the area. The project has been granted a Native Vegetation Clearing Permit (see below).

A fauna and habitat assessment was carried out in March 2016 by Western Wildlife. The majority of the conservation significant species identified are migratory shorebirds protected under international conventions, 11 in total, which may be present when Lake Carey, a large salt lake situated approximately 2.5 km to the south of the Jupiter prospect is inundated. Two of the migratory shorebirds were recorded in the project area during the fauna survey: the Common Greenshank and the Red-necked Stint. Lake Carey is considered a specified ecosystem because it is habitat for listed migratory shorebirds.



Topography

The project is located in the Eastern Murchison subregion of the Murchison Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion. It lies within the Laverton Greenstone Belt, which forms the north-eastern part of the Eastern Goldfields Province of the Yilgarn Craton of Western Australia. It consists of granitic rocks and areas of sedimentary banded iron formation (BIF) rocks.

Groundwater and water sources

The premises lies within the Lake Carey catchment and this is the nearest surface water body, with the lakeshore approximately 2.5 km to the south of the Jupiter prospect. It is separated by a banded ironstone formation (BIF) ridge, approximately 80 m high. Lake Carey may fill during occasional intense rainfall events. There are no major river systems in the vicinity of the project area but there are several ephemeral creeks which drain in a southeast direction towards Lake Carey.

Other approvals

MMWM submitted a Native Vegetation Clearing Permit (NVCP) to the then Department of Mines and Petroleum (DMP) in September 2016 for assessment and approved in December 2016. They hold a current Groundwater Well Licence GWL169901(5). This approves up to 1.4 GL of annual abstraction. A Mining Proposal was submitted to the DMP in September 2016 and approved in December 2016.

The layout of the processing plant and TSF, with the location of the Mt Margaret Community can be seen in the map in Figure 4

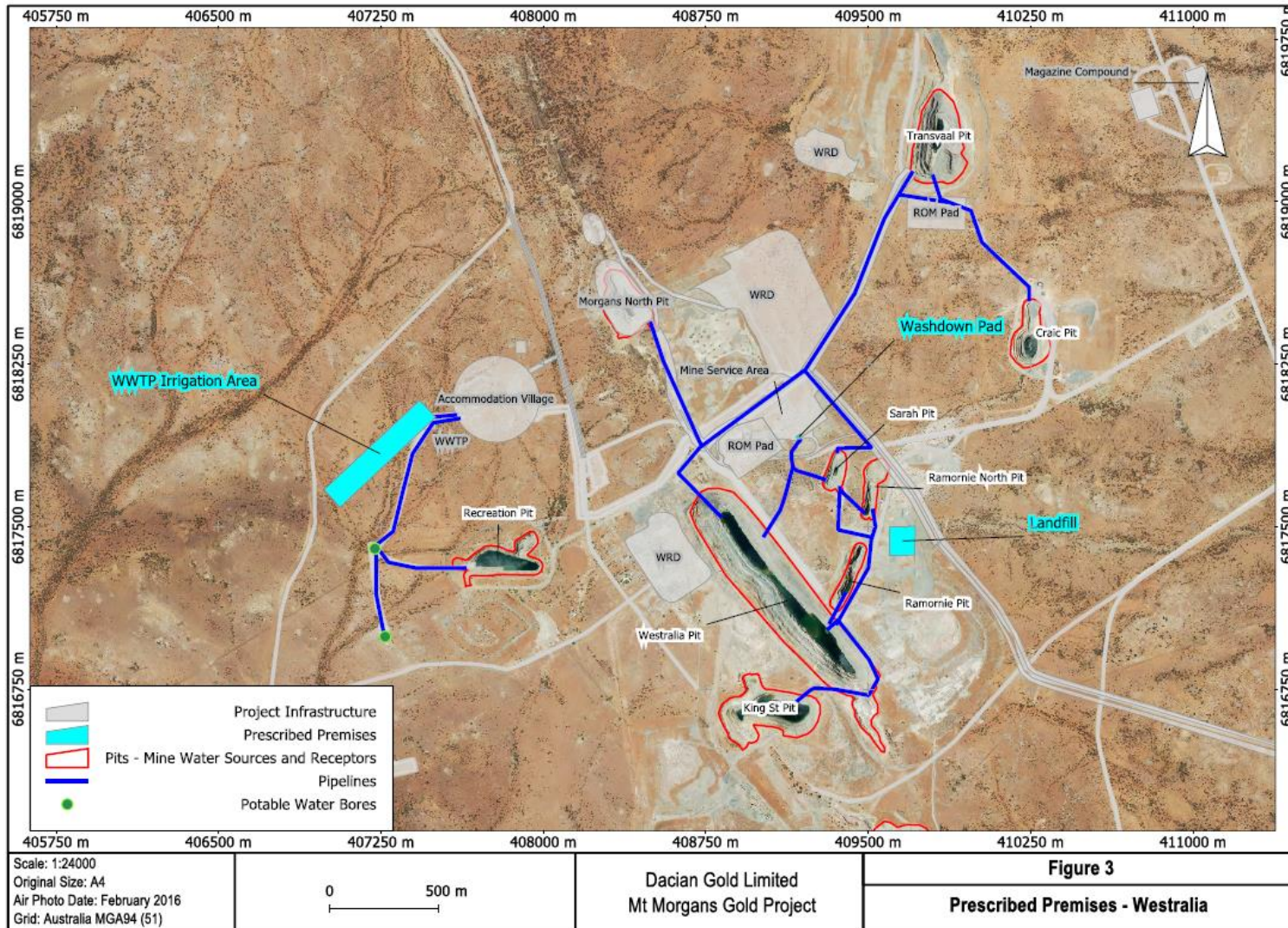


Figure 2: Westralia Site Plan

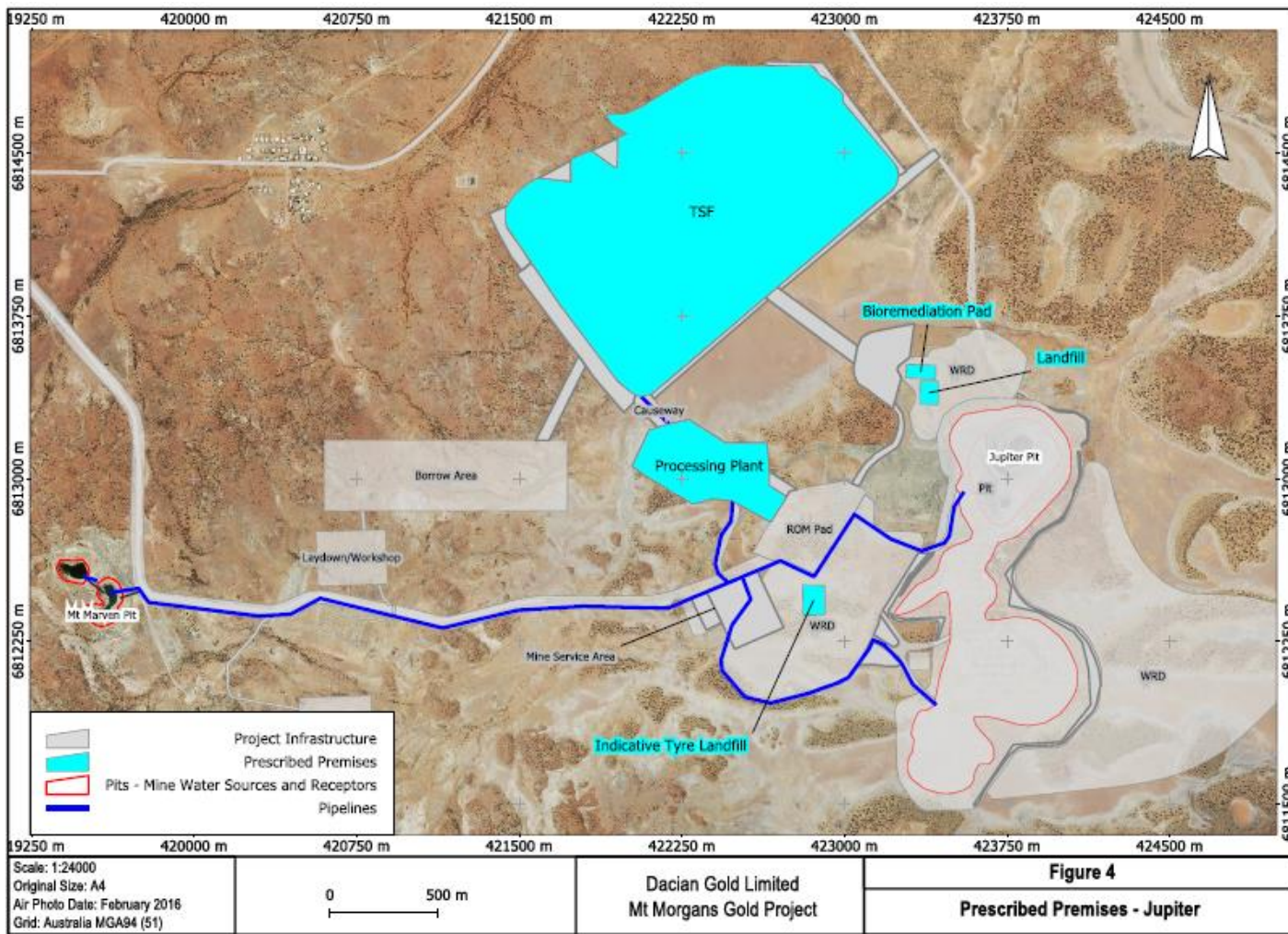


Figure 3: Jupiter Site Plan with proposed tyre landfill

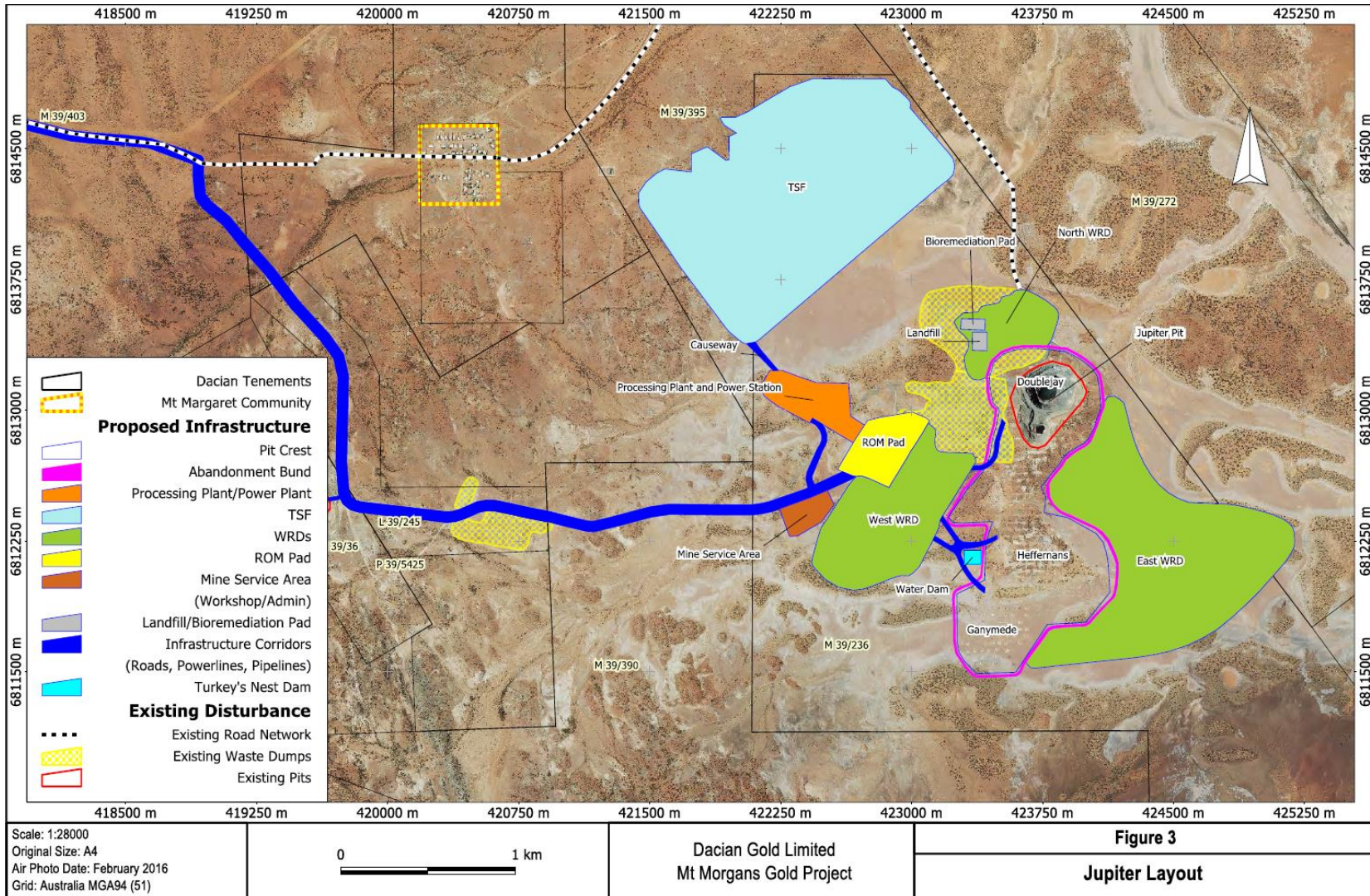


Figure 4: Jupiter Site Plan with processing plant, TSF and Mt Margaret Community



4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987* and DWER'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 – 1.2.3	Construction and Commissioning Construction and infrastructure requirements are included in the Works Approval, outlining construction specifications MMWM has committed to meeting. Commissioning is to be completed in accordance with the Commissioning Plan submitted to DWER on 1 December 2016.	Application supporting documentation
Premises operation	W – no conditions Licence conditions	Construction, Commissioning and Operation Categories 5, 6, 73 and 64 - DWER's assessment and decision making is detailed in Appendix A.	Application supporting documentation General provisions of the <i>Environmental Protection Act 1986</i>
Emissions general	W – no conditions Licence condition	Operation Descriptive limits will be set through a condition of the licence and therefore a condition regarding recording and investigation of exceedances of limits has been included.	N/A
Point source emissions to air including monitoring	W – no conditions L – no conditions	Construction and commissioning Point source air emissions will not be emitted during the construction phase of the Mt Morgan Gold Project. Operation	Application supporting documentation General



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>MMWM has an existing approval Under Part V of the EP Act to construct a power station fuelled by diesel generators. MMWM are now proposing to construct an offtake station and high-pressure gas pipeline from the Eastern Goldfields Pipeline, which transverses MMWM tenure, north of Jupiter to fuel the power station. The proposed power station will have capacity to deliver 19.5 MW of power at 11 Kv. The station will consist of 5 x 3.3 MW gas fuelled generators and 3 x 1 MW diesel driven generators. The power generation will remain below the threshold for Category 52: 20 MW or more in aggregate (using natural gas) or 10 MW or more in aggregate (using a fuel other than natural gas), therefore point source emissions to air from the power station have not been assessed.</p> <p><i>Emission:</i> The emissions from the originally approved diesel fuel power station were combustion gases (NOx, SOx and particulates. The most significant emission from operation of the power station under normal circumstances was oxides of Nitrogen (NOx) from combustion of diesel fuel. Emissions to air from mining are expected to predominantly comprise dust particles (PM₁₀) as well as combustion products of oxide. The sources include the emissions from combustion of diesel by heavy and light vehicles, combustion of diesel for power generation and emissions from the carbon regeneration kiln.</p> <p><i>Impact:</i> The original impact of emissions from a power station fuelled by diesel would potentially have an impact by reducing local air quality above the NEPM standard at the closest sensitive receptor, Mt Margaret community, which is located 2.3 km from the power station. Excessive NOx concentrations can cause respiratory issues such as bronchitis in asthmatic children, reduced lung function and lower resistance to respiratory infections such as influenza. Given that the power station will now (mainly) run on gas, the impact is expected to meet the specific consequence criteria for public health.</p> <p><i>Controls:</i> Mt Morgans has committed to the up keeping of engine maintenance to ensure efficient running and optimum fuel consumption, low sulfur diesel use, exhausts</p>	provisions of the <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
		<p>from power station orientated away from the community.</p> <p>An air quality assessment was carried out by Pacific Environmental Limited of oxides of nitrogen (NO_x) and particles as PM₁₀. They were modelled to represent the potential impacts on humans and the environment from the following sources:</p> <ul style="list-style-type: none"> • Open cut and underground mining; • Ore processing plant; • Carbon regeneration kiln; and • On-site power station (based on the original plan for a diesel powered power station) <p>The results, in isolation of other emission sources, indicated predicted ground level concentrations are not considered significant. Both short-term (24 hours) and long-term (1 year) impacts were considered and results predicted levels of NO₂ to be below the assessment criteria for the nearest sensitive receptor, the Mt Margaret Community.</p> <p>(The risk assessment for PM₁₀ can be found in the 'fugitive emissions' section of this table).</p> <p>DWER technical specialists carried out an extensive review on the modelling provided. The modelling of NO₂ has been deemed acceptable as it has been carried out on a conservative basis (based on the power station operating at 100% capacity for every hour within a year). The Delegated Officer has assessed the risk based on the technical advice from DER AQS and determined the results of the modelling has been carried out in an acceptable manner. MMWM are proposing the use of 5 x gas fuelled generators and 2 x diesel fuelled generators and therefore the emissions are likely to have decreased.</p> <p><u>Risk Assessment</u> <i>Consequence:</i> Minor (specific consequence criteria for public health are likely to be</p>	



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		met) <i>Likelihood:</i> Rare (the risk even may only occur in exceptional circumstances) <i>Risk Rating:</i> Low <u>Regulatory Controls</u> No regulatory controls are proposed.	
Point source emissions to surface water including monitoring	W – no conditions L – no conditions	Construction, Commissioning and Operation There are no point source emissions to surface water with the construction, commissioning and operation at the Mt Morgans Gold Project. No conditions apply. The site lies within the Lake Carey catchment and the lakeshore is 2.5 km to the south of the Jupiter prospect. It is separated by a banded iron formation ridge approximately 80 m high.	Applicant supporting documentation
Point source emissions to groundwater including monitoring	W – no conditions Licence conditions	Construction and Commissioning No emissions to groundwater will occur during the construction and commissioning of the Mt Morgans Gold Project. Operation <i>Emission:</i> Mine dewatering will be transported in pipelines from Westralia and Jupiter to various open pits for storage. <i>Impact:</i> Potential water mounding of the water table in the vicinity of the receiving pits. Mounding can potentially cause impacts on surrounding native vegetation by inundating the roots. The quality of the groundwater being shifted between pits is brackish-saline with total dissolved solids ranging between 1,700 – 12,000 mg/L in the Westralia receiving pits and between 5,600 – 116,000 mg/L in the Jupiter receiving pit (Mt Marven). Generally groundwater in the Westralia area ranges from 6,000 – 14,500 mg/L TDS and from 180,000 – 260,000 mg/L TDS in the Jupiter area. The lower values in the pit water are	Application supporting documentation General provisions of the <i>Environmental Protection Act 1986</i>



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		<p>indicative of collected rainwater.</p> <p>A vegetation survey, carried out by a qualified botanist, concluded that of the 195 species recorded in the survey area, no species are listed as Declared Rare Flora, Threatened or Priority species. The majority of vegetation types are Acacia shrublands which are generally shallow rooted.</p> <p><i>Controls:</i> Hydrogeology in the project area consists of fractured rock aquifers generally of low and very low permeability within the basaltic rock mass. Groundwater inflows will be managed through in-pit and underground sumps with discharge to approved open pits as required. It is likely the pits will act as groundwater sinks, rather than sources, due to the low hydrogeological permeability.</p> <p>The water is being shifted within the same aquifer and water quality data of all the pits has been provided to show this is of similar quality. A minimum freeboard of 5 m will be maintained in the pits and a water balance has been calculated to ensure there are sufficient volumes available in all the receiving pits. The proponent has also stated they will commit to water quality monitoring and water volume monitoring of the pits.</p> <p><u>Risk Assessment</u> <i>Consequence:</i> Minor – some on-site low impacts may occur. <i>Likelihood:</i> Unlikely – given the hydrogeology in the area, and the controls in place by the proponent, it is unlikely the consequence will occur. <i>Risk Rating:</i> Medium</p> <p><u>Regulatory Controls</u> Regulatory controls will consist of conditions requiring volumetric flow to be recorded to determine volumes of water received, as well as quarterly monitoring of pH and TDS to ensure water quality remains consistent. The proponent’s commitment of maintaining a 5 m freeboard on all receiving pits will also be made binding as a licence condition to</p>	



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Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>protect nearby vegetation and to prevent possible overtopping following a significant rainfall event.</p> <p><u>Residual Risk</u> <i>Consequence:</i> Minor <i>Likelihood:</i> Rare <i>Risk Rating:</i> Low</p> <p>Operation <i>Emission:</i> Discharge of water used in the wash-down pad to be discharged into Sarah pit (0.6 L/s). This water will be treated through an oil-water separator to reduce the hydrocarbon concentration to 15 mg/L. On an annual basis, this accounts for 9% of the total pit lake volume.</p> <p><i>Impact:</i> Contamination of Sarah pit lake due to ineffective function of oil-water separator with possible ingestion by birds including conservation significant species that may occur in the area.</p> <p><i>Controls:</i> The Licence Holder is proposing to monitor the pit lake water quality including hydrocarbons, pH and TDS and regular servicing of the oil-water separator to maintain functionality.</p> <p><u>Risk Rating</u> <i>Consequence:</i> Moderate – onsite impacts mid-level based on the quantity of treated wastewater to be discharged to Sarah pit on an annual basis, the low permeability of the area and the groundwater level is approximately 359m AHD or 90m below natural ground level. <i>Likelihood:</i> Unlikely – the risk event will probably not occur in most circumstances based on the Licence Holder’s proposed controls. <i>Risk Rating:</i> Medium risk – acceptable, generally subject to regulatory controls.</p>	



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Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p><u>Regulatory Controls</u> The Licence will be updated to include additional monitoring requirements for Sarah pit and infrastructure inspections for the oil-water separator.</p>	
Emissions to land including monitoring	<p>W – no conditions</p> <p>L – no conditions</p>	<p>Construction and Commissioning No emissions to land will occur during the construction and commissioning of the Mt Morgans Gold Project.</p> <p>Operation <i>Emission:</i> Nutrient-rich waste water is discharged to designated irrigation fields.</p> <p><i>Impact:</i> A build-up of nutrients can cause localised contamination of soils and vegetation which could lead to the deterioration of land quality. In accordance with Water Quality Protection Note 22 (Department of Water 2008) the eutrophication risk category based on soil type and location is category D. This means there is a low eutrophication risk due to the soil type being clay/loam alluvium.</p> <p>Waste water may pose a human health risk to nearby receptors if contamination to drinking water were a possibility.</p> <p><i>Controls:</i> The proponent has used guidelines from the Department of Water (DoW) to choose two appropriate irrigation sites. Expected effluent quality and flow rates have been provided by the proponent in the below table:</p>	<p>Application supporting documentation</p> <p>General provisions of the <i>Environmental Protection Act 1986</i></p> <p>Department of Water – Water Quality Protection Note 22, 2008</p>



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		<table border="1"> <thead> <tr> <th colspan="2" rowspan="2">Expected Effluent Quality</th> <th colspan="4">Source of Contribution and Flow Rate</th> </tr> <tr> <th>Accommodation Village</th> <th>Westralia MSA</th> <th>Jupiter MSA</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>158,000 (L/day)</td> <td>18,000 (L/day)</td> <td>7,500 (L/day)</td> <td>183,500 (L/day)</td> </tr> <tr> <td>Biological Oxygen Demand</td> <td>20mg/L</td> <td>3.160 kg/day</td> <td>0.360 kg/day</td> <td>0.150 kg/day</td> <td>3.670 kg/day</td> </tr> <tr> <td>Total Suspended Solids</td> <td>30mg/L</td> <td>4.740 kg/day</td> <td>0.540 kg/day</td> <td>0.225 kg/day</td> <td>5.505 kg/day</td> </tr> <tr> <td>Total Nitrogen</td> <td>5mg/L</td> <td>0.790 kg/day</td> <td>0.09 kg/day</td> <td>0.037 kg/day</td> <td>0.917 kg/day</td> </tr> <tr> <td>E/Coli</td> <td>1,000 CFU / 100mL</td> <td>0.158 ML/day</td> <td>0.018 ML/day</td> <td>0.0075 ML/day</td> <td>0.1835 ML/day</td> </tr> </tbody> </table> <p>The accommodation village irrigation area will be 6 hectares. A conservative Total Phosphorus (TP) rate of 12 mg/L has been provided separately to the above table.</p> <p>The predicted effluent qualities, soil type and total irrigation area sizes have been used to calculate the Total Nitrogen (TN) and TP loading in kg/ha/year, with results compared to the DoW Water Quality Protection Note 22. For the Accommodation Village, the TN was calculated at 5.48 kg/ha/year, well below the limit of 480 kg/ha/year. The rate of TP was calculated at 87.6 kg/ha/year, below the limit of 120 kg/ha/year.</p> <p>The distance from the accommodation camp WWTP to the Mt Margaret community is 13.5 km.</p> <p>Risk Rating <i>Consequence:</i> Minor – given the soil types, expected effluent quality and the size of the irrigation areas the consequence has been determined as minor. <i>Likelihood:</i> Rare – an adverse risk event may occur in exceptional circumstances. <i>Risk Rating:</i> Low – no regulatory controls are required.</p>				Expected Effluent Quality		Source of Contribution and Flow Rate				Accommodation Village	Westralia MSA	Jupiter MSA	Total			158,000 (L/day)	18,000 (L/day)	7,500 (L/day)	183,500 (L/day)	Biological Oxygen Demand	20mg/L	3.160 kg/day	0.360 kg/day	0.150 kg/day	3.670 kg/day	Total Suspended Solids	30mg/L	4.740 kg/day	0.540 kg/day	0.225 kg/day	5.505 kg/day	Total Nitrogen	5mg/L	0.790 kg/day	0.09 kg/day	0.037 kg/day	0.917 kg/day	E/Coli	1,000 CFU / 100mL	0.158 ML/day	0.018 ML/day	0.0075 ML/day	0.1835 ML/day	
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DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
Fugitive emissions	W – conditions L – conditions	<p>Construction, Commissioning and Operation <i>Emission:</i> Dust or total suspended particulate matter (TSP).</p> <p>Dust may be generated during the construction and commissioning phases of the Mt Morgans Gold Project. It may also be generated during the operation of the mine from vehicle movement, crushers, stockpiles and TSFs.</p> <p><i>Impact:</i> Dust may be harmful to human health, the environment and can have amenity impacts. The type and size of a dust particle determines how harmful the dust is. Dust particles small enough to be inhaled (PM₁₀ or PM_{2.5}) may cause irritation of the eyes, coughing, sneezing and asthma attacks. Prolonged exposure may result in chronic health impacts</p> <p>Due to the proximity of receptors (Mount Margaret community) situated downwind of the premises, there is a potential risk of fugitive dust emissions during mine construction works and subsequent mining operations having human health impacts. In addition to dust generating activities at the mine itself, the haul road is approximately 800 m from Mount Margaret Community.</p> <p><i>Controls:</i> The Application Supporting Document included an Air Quality Modelling report on dust as PM₁₀.</p> <p>The proponent has committed to the following controls to manage dust emissions during construction and operation:</p> <ul style="list-style-type: none"> • The use of water carts as required on unsealed surfaces; • Dust collection system; • During high winds, topsoil stripping and spreading activities will be restricted if dust cannot be adequately controlled; • Vehicle and mining equipment to be kept to designated roads; • Vehicle speed limits to be applied; 	<p>Application supporting documentation</p> <p>General provisions of the <i>Environmental Protection Act 1986</i></p>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<ul style="list-style-type: none"> Sprays will be fitted to the tipping area of the crusher; Upon completion of tailings deposition, the TSF will be rehabilitated to negate generation of dust; Regular inspections will be undertaken to evaluate dust control measures <p><u>Risk Assessment</u> <i>Consequence:</i> Moderate – dust can cause short-term adverse health impacts and mid-level amenity impacts to off-site receptors. <i>Likelihood:</i> Possible – given the proximity of the community to the operation, it is possible the consequence may occur at some time. <i>Risk Rating:</i> Medium</p> <p><u>Regulatory Controls</u></p> <p>As a precautionary measure, controls will be imposed in the Works Approval and Licence for dust management, particularly on haul roads to mitigate this risk. Controls are consistent with commitments made by the application with respect to dust management. In addition, monitoring of dust as PM₁₀ is required for both the Works Approval and the Licence, including an alarm system to warn operators of possible exceedances. A limit of 50 µg/m³ (24 hour average) has been determined using reference to the Air NEPM. Although DWER does not consider the Air NEPM to be an appropriate regulatory standard, it is considered to be an equivalent standard in the absence of an environmental standard for the subject area.</p> <p>The provision for an exceedance of the specified limit has also been included in the Works Approval which ensures in the event of an exceedance an investigation is undertaken and proof can be provided to demonstrate the exceedance is not attributed to operations on the premises.</p> <p>The conditions imposed on the Works Approval are proposed to be duplicated on the</p>	



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>Licence.</p> <p><u>Residual Risk</u> <i>Consequence:</i> Moderate <i>Likelihood:</i> Unlikely <i>Risk Rating:</i> Medium</p>	
Odour	No conditions	<p>Construction and Commissioning No odour emissions will occur during construction and commission at the Mt Morgans Gold Project.</p> <p>Operation <u>Emission Description</u> <i>Emission:</i> Odour emissions from the landfills and waste water treatment plants may occur. Odour may also be emitted from the carbon regeneration kiln.</p> <p><i>Impact:</i> Possible impact on human residents in nearby community, however the nearest resident to the landfills and the WWTPs are over 2 km away at the Mt Margaret Community.</p> <p><i>Controls:</i> The locations of the landfills and WWTPs will more than 2 km from areas where any odours may cause a nuisance.</p> <p><u>Risk Assessment</u> <i>Consequence:</i> Minor – a low level impact to amenity may occur. <i>Likelihood:</i> Rare – given the distance between the source and receptors, it is rare the consequence will occur. <i>Risk Rating:</i> Low – no regulatory controls are required.</p> <p><u>Regulatory Controls</u> Given the remote location of the facilities, the Delegated Officer is satisfied that odour should not cause any amenity impacts to the Mt Margaret Community.</p>	Applicant 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
Noise	No conditions	<p>Construction, Commissioning and Operation</p> <p><i>Emission:</i> There is may be potential for excess noise emissions during construction and operation at the mine. Noise from construction will be generated from mining equipment such as:</p> <ul style="list-style-type: none"> • Front end loaders; • Construction cranes; • Concrete trucks; • Concrete pump stations; • Compressor; • Generators • Rollers; • Excavators; and • Road noise from trucks. <p>Operational noise will include:</p> <ul style="list-style-type: none"> • Crushers and processing plant activities; • Road noise from haul trucks; • Generator noise; • Open pit and underground blasting noise and vibration; • Mobile mining equipment (including loaders, diggers, trucks, drill rigs etc.). <p><i>Impact:</i> Noise impacts can affect health by increasing stress levels and reduced quality of life and health for human populations, particularly when the source is located near sensitive receptors. Frequency, intensity, duration, meteorological conditions and distance to receptors are all factors which may affect the impact of noise emissions on sensitive receptors.</p> <p>The nearest sensitive receptor for noise is the Mt Margaret Community. Based on the</p>	<p>Applicant supporting documentation</p> <p><i>Environmental Protection (Noise) Regulations 1997</i></p>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>layout of the proposed plant, the community is 2.6 km from the primary crusher and 3-4 kms from the operating pits at Jupiter.</p> <p><i>Controls:</i> The proponent commissioned a Noise Assessment which was carried out by Herring Storer Acoustics. The modelling concluded that cumulative noise will comply with the <i>Environmental Protection (Noise) Regulations 1997</i> at the nearest sensitive receptor (Mt Margaret Community). The assessment includes construction noise and operational noise.</p> <p>The proponent will also implement the following controls:</p> <ul style="list-style-type: none"> • Will ensure that the sound power level of the power station does not exceed 100dB (A). Should it exceed this level, noise attenuation will be constructed to reduce noise; • All vehicles and plant equipment will be regularly maintained to ensure they are operating efficiently and are not unduly noisy; • Where possible, mufflers and other noise attenuating equipment will be installed and maintained on plant, vehicles and equipment so as to reduce exposure to occupation noise; • A Noise Management Plan will be developed for the construction period in accordance with Regulation 13 of the <i>Environmental Protection (Noise) Regulations 1997</i>. <p><u>Risk Assessment</u> <i>Consequence:</i> Moderate – the consequence of exceeding assigned noise levels at noise sensitive premises during construction and operation would be mid-level impact on amenity. <i>Likelihood:</i> Unlikely – given the results of the modelling and the proposed controls by the proponent, the likelihood of the event is unlikely. <i>Risk Rating:</i> Medium</p>	



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p><u>Regulatory Controls</u> After technical review by the DWER noise specialists, the Delegated Officer is satisfied that noise can be managed adequately and no conditions are required for the licence. The greatest concern from DWER's review for noise emissions was in regards to the haul road at its closest point to the receptor (800 m). However the proponent confirmed that haulage will occur in multi-combination articulated road trains, which are considerably less noisy than a standard haul truck.</p> <p>The <i>Environment Protection (Noise) Regulations 1997</i> apply.</p>	
Monitoring general	W2.1.1 Licence conditions	General monitoring conditions will apply to both the Works Approval and Licence to ensure water samples are collected in accordance with the applicable standard and submitted to a NATA accredited laboratory for analysis.	General provisions of the <i>Environmental Protection Act 1986</i> AS/NZS 5667.1
Monitoring of inputs and outputs	No conditions	No monitoring of inputs and outputs are required for the Works Approval or Licence.	N/A
Process monitoring	W – no conditions Licence conditions	No conditions relating to process monitoring are required to be added to the Works Approval. Conditions will be added to the Licence for the continuous and accurate recording of tailings discharge, including tailings deposition and return water.	N/A
Ambient quality monitoring	W2.1.1 – 2.1.2	Construction and Commissioning MMWM has committed to monitoring ambient groundwater following the drilling of 6 monitoring bores around the TSF prior to the facility becoming operational. The Delegated Officer has formalised MMWM commitment through a works approval condition to ensure a baseline of groundwater quality is recorded.	Application supporting documentation General provisions of the



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
	Licence conditions	Operation DWER's risk assessment is detailed in Appendix A.	<i>Environmental Protection Act 1986</i>
Meteorological monitoring	No conditions	No meteorological monitoring is required for the Works Approval or Licence. (Monitoring of wind strength and direction will however be incorporated in ambient dust monitoring as is standard practice).	N/A
Improvements	No conditions	No improvement conditions are required for the Works Approval or Licence.	N/A
Information	W3.1.1 – 3.1.2 W3.2.1 Licence conditions	Construction and Commissioning Condition 3.1.1 requires the submission of a compliance document following construction of each stage of the works and prior to commissioning and operation. The Works Approval Holder is also required to notify the CEO upon the commencement and completion of each stage of commissioning as well as the results of the ambient groundwater monitoring prior to operation of the TSF. Operations Conditions will be added to the licence requiring the submission of an Annual Environmental Report. Non-annual reporting and notification requirements may also be included.	N/A
Licence Duration	N/A	It is proposed to grant the Works Approval for a period of 10 years to allow for all the stages of the Commissioning Plan. No other statutory approvals have been identified as limiting the duration of the Works Approval.	N/A



5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
22/02/18	Applicant sent a copy of draft instrument	Licence Holder was satisfied with the proposed conditions.	N/A



6 Risk Assessment

Note: This matrix is taken from the DWER'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



Table 2: Risk criteria definitions (taken from DWER’s *Guidance Statement: Risk Assessments*)

Consequence			Likelihood	
The following criteria will be used to determine the consequences of a risk event occurring:			The following criteria will be used to determine the likelihood of the risk event occurring.	
	Environment	Public Health* and Amenity (such as air and water quality, noise, and odour)		
Severe	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	Almost Certain	The risk event is expected to occur in most circumstances
Major	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	Likely	The risk event will probably occur in most circumstances
Moderate	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	Possible	The risk event could occur at some time
Minor	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Specific Consequence Criteria (for public health) are likely to be met Local scale impacts: low level impact to amenity 	Unlikely	The risk event will probably not occur in most circumstances.
Slight	<ul style="list-style-type: none"> on-site impact: minimal Specific Consequence Criteria (for environment) met 	<ul style="list-style-type: none"> Local scale: minimal impacts to amenity Specific Consequence Criteria (for public health) criteria met 	Rare	The risk event may only occur in exceptional circumstances

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

* In applying public health criteria, DER may have regard to the Department of Health’s, *Health Risk Assessment (Scoping) Guidelines*

“on-site” means within the prescribed premises boundary



Appendix A

Normal Operations - TSF

Emission Description

Emission: Tailings are deposited in the TSF as a waste product from gold processing including cyanide, metals and metalloids. Seepage from the TSF into the surrounding groundwater is expected to occur over time as tailings are deposited into the facility.

Impact: Contamination of surrounding land, surface water and groundwater with metals, metalloids, sulphide minerals (if present) and cyanide affecting soil and groundwater quality and potentially causing vegetation stress or deaths.

Hydrogeology in the project area consists of fractured rock aquifers generally of low and very low permeability within the basaltic rock mass. A locally significant calcrete aquifer lies to the north east of the plant and TSF site (depicted in Figure 1). The aquifer is low in the drainage system where the water table is shallow (<5 mbgl). This aquifer is utilised by borefields for the project. The quality of this water is approximately 17,000 mg/L TDS.



Figure 1: Location of Calcrete Aquifer in vicinity to the project area

The water quality in the immediate vicinity of the project is hypersaline, generally > 200,000 mg/L TDS. Depth to groundwater is shallow, between 0.5 m and 3.4 m below ground level (mbgl).



The supporting documents indicate that the proposed TSF site is immediately underlain by surficial deposits that are comprised of sandy clays and clays that range in thickness from about 0.3 to 1.6 metres. These materials in turn overlie a clayey weathered profile developed on basaltic bedrock. This weathered profile appears to be relatively thin, as most of the test pits that were excavated to investigate the site terminated in partially weathered bedrock (saprock). These investigations indicated that the water table was intercepted at depths of about 0.5 to 3.5 metres beneath the site.

The shallow water table and the limited saturated thickness of the regolith have the potential to increase the complexity of water management in the TSF, particularly in parts of the proposed facility where the natural water table is less than about one metre deep. This is because there is an increased risk that groundwater mounding near the TSF would cause the water table to reach the ground surface in these areas, potentially causing waterlogging and vegetation die-back in these areas.

The proposed location of the TSF intercepts with the northern section of a tributary of Lake Carey and within a floodplain area. Lake Carey has been determined to have significant ecological value, particularly following major flood events when it can become a highly productive ecosystem (Outback Ecology *et al*, 2013). The presence of priority flora or fauna as listed under the Wildlife Conservation Act 1950 is justification to designate a receiving environment as a 'Specified Ecosystem' according to DWER's *Guidance Statement: Environmental Siting*. The wider extent of Lake Carey is a Specified Ecosystem due to the presence of a Priority 1 invertebrate species, *Branchinella simplex* (MWH 2015). A Priority 1 plant species, *Tecticornia mellaria*, has also been recorded in the lake's riparian zone. As previously noted, the lake is also habitat for migratory shore birds protected under international conventions. If seepage were to occur from the TSF, this would cause elevated metals, metalloids, sulphides (if present), cyanide and suspended solids which are inhospitable for aquatic biota.

Controls: The TSF has been designed by MMWM to comply with the following:

- *Code of Practice for Tailings Storage Facilities in Western Australia*, Department of Mines, Industry Regulation and Safety;
- Australian National Committee on Large Dams (ANCOLD) May 2012 *Guidelines on tailings dams planning, design, construction and closure*; and
- Department of Mines, Industry Regulation and Safety *Guidelines for preparing a TSF design report*, August 2015.

The embankments have been designed to have a cut-off trench (compacted clayey low permeability) to restrict potential seepage. The underlying residual clays are of low permeability. To provide an additional seepage barrier, the near surface fluvial deposits on the playa surface will be undisturbed and proof compacted at the base of the cells, providing a low permeability foundation of 1×10^{-8} m/s. Proof compacting comprises watering and rolling of the low permeability clayey sand and materials at the playa surface to identify any loose spots that need fixing and to create a natural stratum with uniform density. As the geotechnical investigation concluded that the groundwater level within the TSF embankment footprint is deeper than 1.5 m, the depth of the trench within the flat topography will be limited to 1.5 m to avoid intersecting the shallow groundwater.

A geochemical analysis of simulated tailings samples from the processing ore indicated the materials are classified as Non Acid Forming, except the sample from the Morgans ore, which were classified as Potentially Acid Forming. Liquor extracts were also taken from the tailings samples and analysed for pH, EC, alkalinity, major ions and water soluble metals and metalloids. Results showed the liquor to be alkaline with pH ranging from 9.2 – 9.7.

The following operational commitments have been made by MMWM:



- The discharge point, return water pump, beach and decant pond level will be visually inspected on a daily basis to validate operation is in accordance with design and operational expectations and check for any evidence of instability.
- The tailings delivery line and return water pipes will be visually inspected daily for any visible leaks, bursts or damage.
- An annual geotechnical inspection audit will be undertaken by a qualified geotechnical specialist.
- Emergency procedures will be developed to facilitate an efficient response to any uncontrolled release of tailings or water, failure of the TSF walls or potential accidents which could occur.
- Groundwater monitoring to be carried out in accordance with licence conditions.

Six groundwater monitoring bores will be installed around the TSF and will be monitored prior to commencement of deposition to provide baseline data. Should seepage be detected beyond the toe of the perimeter flood protection bund, shallow seepage collection trenches will be excavated to intercept the seepage, which will be returned to the cells.

Modelling was carried out which indicated the following during normal operating conditions:

- The tailings beach where embankment raises are proposed to be founded will not be saturated;
- Lateral seepage through the embankment construction is not anticipated;
- Lateral seepage rates beneath the perimeter embankment of the TSF are likely to be low (less than 1 m³/day)
- Vertical seepage rates from the operating cell are likely to be low (less than 5 m³/day).

A subterranean fauna desktop study was also carried out to determine the likelihood of the presence of any groundwater dependent ecosystems. The conclusions of the study were that in the Westralia project area stygofauna could persist in relatively good quality of groundwater, however, the low permeability aquifers and fine grained geological units limit the habitat potential. In the Jupiter project area, it was concluded there is a very low likelihood due to the hydraulic conductivity and hypersaline groundwater.

Risk Assessment

Consequence: Moderate

Due to the shallow depth of the water table near the proposed TSF site, groundwater mounding has the potential to impact vegetation in the area due to the effects of increased soil salinity and waterlogging. The shallow depth of the water table and low permeability of the regolith could also make the management of groundwater mounding difficult using interception trenches.

Seepage from the proposed TSF could contain a range of chemical constituents of potential environmental concern.

The most immediate impacts are likely to be associated with the high total dissolved solids (TDS) content of seepage water and the impacts of salinity and increasing water table elevations on the health of vegetation. Other chemical constituents of environmental concern that could be present under the near-neutral pH conditions that are likely to be present in pore-water in the TSF include (MEND, 2004; Smith, 2007): antimony; arsenic; cadmium; chromium; cobalt; copper; manganese; mercury; nickel; selenium; sulfate; thallium; and zinc.

Likelihood: Possible

These chemical constituents are unlikely to be transported in groundwater flow to Lake Carey due to the low permeability of regolith materials in the area. However, the chemical constituents could be



periodically washed in surface runoff to the lake if they were discharged to the soil surface with a rising water table. Potential environmental receptors in Lake Carey include aquatic invertebrates that are periodically present in the lake including insect larvae and brine shrimp, and bird populations that periodically feed on these invertebrates. Pore-water in the TSF is also likely to contain elevated concentrations of cyanide compounds, but these are likely to be degraded by exposure to sunlight and oxygen if seepage water were to be discharged to the soil surface in areas with a shallow water table.

Risk Rating: Medium

Regulatory Controls

There is currently no groundwater monitoring data in the vicinity of the TSF. This has been made a condition of the Works Approval as explained in the Decision Table. Once these results have been made available to DWER, a further risk assessment can be carried out to determine appropriate water quality criteria. The Works Approval also requires the depth of root zone to be determined as background information for future vegetation protection.

Groundwater quality monitoring will be required as a condition of the licence. The following groundwater parameters, including metals and metalloids, are deemed appropriate by the Delegated Officer after consideration of technical advice from DWER Contaminated Sites specialists and will be required to be monitored on a quarterly basis:

- Total Dissolved Solids
- pH
- Standing Water Level
- WAD Cyanide
- Arsenic (As)
- Antimony (Sb)
- Cadmium (Cd)
- Chromium (Cr)
- Cobalt (Co)
- Copper (Cu)
- Iron (Fe)
- Lead (Pb)
- Manganese (Mn)
- Mercury (Hg)
- Nickel (Ni)
- Selenium (Se)
- Sulfate
- Thallium (Tl); and
- Zinc (Zn)

The TSF will be listed as Containment Infrastructure through a licence condition. Conditions relating to inspections of the infrastructure will be added as well as freeboard requirements.

In addition a condition will be applied requiring a water balance is maintained to track all water inputs (in tailings pore-water and rainfall), outputs (recovery of tailings water and evaporative losses) and storage (in compacted tailings within the TSF) on a monthly basis to enable seepage to be detected and quantified where there are significant mismatches between water inputs and outputs.

Residual Risk

Consequence: Moderate

Likelihood: Unlikely

Risk Rating: Medium



Emergency situation - TSF

Emission: Overtopping of the TSF releasing tailings supernatant or tailings slurry to surrounding land and surface water either during a storm event or due to operator error.

Impact: Contamination of surrounding soils with metals, metalloids, sulphide minerals (if present), and cyanide affecting soil and groundwater quality and causing vegetation stress or deaths.

Controls: The TSF is designed to withstand the volume of water that would be generated during a 1:100 (Annual Exceedance Probability), 72 hour rainfall event, with a 0.5 m total freeboard.

Risk Assessment

Consequence: Major – overtopping of tailings would cause high-level on-site impacts, with potential for Specified Consequence Criteria not being met.

Likelihood: Rare – given the controls in place it is considered rare the event will occur.

Risk Rating: Medium

Regulatory Controls

The Licence Holder's commitment to maintain a 500 mm freeboard will be made binding through a licence condition. The condition will require 12 hourly visual monitoring to ensure this is not breached.

Residual Risk

Consequence: Major

Likelihood: Rare

Risk Rating: Medium

Abnormal operation - TSF

Emission: Tailing (the waste product from gold processing which includes cyanide, arsenic and metals) is transported in pipelines through areas of native vegetation. Emissions will occur if the pipelines were to rupture and/or leak.

Transfer dams are also used for temporary storage of mine water. Hypersaline water is transported in pipelines for the purpose of mine dewatering. An emission may occur if the dams or pipelines were to spill or seep.

Impacts: Contamination of surrounding soils with toxic metals, cyanide and dissolved solids affecting soil and groundwater quality and causing vegetation stress or deaths.

Controls: MMWM has committed to visually inspecting the tailings delivery and return water pipelines as well as the containment corridor on a daily basis for any visible leakage or damage. The pipelines will be banded, flow sensors will be fitted, there will be double casing on the pipeline that traverses the Lake Carey tributary and the causeway will be raised and banded. The pipelines will also be welded to industry standards in accordance with the Plastic Industry and Pipe Association (PIPA) of Australia guidelines.

MMWM has committed to maintaining a minimum freeboard of 0.5 m in all water storage/transfer dams. They are also to be lined with a low permeability liner.



Risk Assessment

Consequence: Moderate – leakage or spills of pipelines would cause mid-level on-site impacts, with potential for Specified Consequence Criteria not being met.

Likelihood: Unlikely – given the controls in place it is unlikely the consequence will occur.

Risk Rating: Medium

Regulatory Controls

The Delegated Officer will formalise the commitments made by MMWM for pipeline management into conditions. This will include inspections of pipelines and a condition ensuring the pipes have either telemetry or sufficient secondary containment for a spill event. A condition regarding freeboard for the containment infrastructure will also be included. The proponent committed to daily inspections of the pipelines, however, given the risk rating of medium, the Licence condition will require the pipelines to be inspected 12 hourly, along with the appropriate record keeping of all inspections.

Residual Risk

Consequence: Moderate

Likelihood: Rare

Risk Rating: Medium

Normal Operation - Landfill

Emission: Putrescible and inert waste to be disposed in two landfills, located within the waste rock dumps at Jupiter and Westralia. If landfills are not managed appropriately, emissions can occur via wind-blown waste, contaminated stormwater and leachate to groundwater.

Impact: Groundwater may be impacted through leachate and stormwater can become contaminated if not contained. This can have detrimental effects on surrounding flora and fauna. Contaminants can then also end up in surface water bodies. Wind-blown waste can end up in waterways, causing potential fauna death. Vermin or feral animals may also be attracted if landfills are not managed properly.

Controls: The proponent has committed to manage the landfills in accordance with the *Environmental Protection (Rural Landfill) Regulations 2002*. Any waste blown or washed away will be collected and returned to the tipping area. Waste will be covered monthly with at least 150 mm of cover material and stormwater is to be diverted away from the landfill (via bunding).

Risk Assessment

Consequence: Minor – the impacts of leachate entering the groundwater would be considered low level due to the quality of the water and the lack of beneficial uses in the area.

Likelihood: Unlikely – given the proponent controls the likelihood of the risk event occurring is deemed unlikely.

Risk Rating: Medium

Regulatory Controls

The Delegated Officer will formalise the proponent commitment of waste cover application into a licence condition.

Abnormal Operation - Tyre Landfill

Emission A (Air Emissions during a fire): Rubber tyres are not easily ignitable, however when on fire, burning causes intense radiant heat, the incomplete combustion of tyres can be a health risk from the inhalation of particulates. Tyres are very difficult to extinguish and are dangerous to fire fighters.



Emission B (Liquid emissions during a fire): During a tyre fire, pyrolytic oils containing hydrocarbons, metals and particulate matter can be generated and potentially discharged to the environment.

Impact A: If a fire were to occur at the Premises, emissions generated from the combustion of the tyres will contain a number of pollutants including particulate matter (PM), sulfur dioxide (SO₂), polyaromatic hydrocarbons (PAHs) and elemental carbon. These compounds can cause amenity and health impacts to the human population. The closest sensitive receptor to the proposed tyre landfill is Mt Margaret Community approximately 2 km north west of the landfill.

Impact B: The liquid emissions may not break down readily in the environment and can contaminate land, surface water or groundwater. This can then have a negative impact to users of the water or the land.

Controls: Tyres to be disposed of in batches (not exceeding 1000 used car tyre equivalent), tyres to be covered at regular intervals such that no more than 1000 used tyre equivalents are left exposed at any one time, each batch will be separated by at least 100 mm of soil or another dense inert and incombustible material. Mt Morgans Gold Project has a fully equipped 4WD fire appliance with all associated equipment for dealing with an incident involving a fire, with the ability to connect to external water sources such as water carts and static water supplies. MMWM have an emergency response team consisting of 18 members, with all associated PPE. Training is conducted on a regular basis on site. All emergency team members are being trained to the national standard of RII30709 Certificate III in Mine Emergency Response and Rescue.

Risk Assessment

Consequence: Moderate – potential onsite impacts on a mid-level

Likelihood: Unlikely – given the Licence Holder's proposed controls

Risk Rating: Medium – Acceptable, generally subject to regulatory controls

Regulatory Controls

The Delegated Officer has reviewed the information provided and the risk assessment and considers that the proposed controls are sufficient and will be included on the Licence.

Construction, Commissioning and Operation – Bulk storage of fuel

Emission: Potential hydrocarbon spillage to the environment from the diesel storage associated with the power station.

Impact: Hydrocarbons could contaminate the surrounding soils and vegetation, including degradation of fauna habitat and have the potential to contaminate Lake Carey.

Controls: The proponent will store all hydrocarbons in bunded areas or self-bunded tanks. They will be managed in accordance with Australian Standard 1940-2002, *The Storage and Handling of Flammable and Combustible Liquids*. Fuel bowsers and fuel delivery inlets will be located on concrete or HDPE-lined pads to contain any spills. Spill kits will be located around hydrocarbon storage areas.

Risk Assessment

Consequence: Minor – a low level on-site impact would occur.

Likelihood: Rare – given the sufficient proponent controls, the likelihood of the consequence occurring is rare.

Risk Rating: Low

Regulatory Control

With the proponent controls in place, the risk rating for hydrocarbon storage associated with category 73 is considered low. The Delegated Officer deems the controls sufficient and no conditions for the



works approval or licence are required. Hydrocarbon storage is also regulated under Department of Mines, Industry Regulation and Safety legislation.



References

	Document Title	Availability
1	DER, 2015, <i>Guidance Statement: Regulatory Principles</i> . Department of Environment Regulation, Perth.	These Guidance Statements are available from the website: http://www.der.wa.gov.au
2	DER, Sept 2015, <i>Guidance Statement on Setting Conditions</i> . Department of Environment Regulation, Perth.	
3	DER, Nov 2014, <i>Guidance Statement on Licensing Duration</i> . Department of Environment Regulation, Perth.	
4	DER, Sept 2015, <i>Guidance Statement on Licensing and Works Approvals</i> . Department of Environment Regulation, Perth.	
5	Outback Ecology and <i>actis</i> Environmental Services (2013) <i>Lake Carey: A 10 Year Overview</i> , unpublished report prepared for the Lake Carey Catchment Management Group (LCCMG), October 2013.	DER internal
6	MWH Australia Pty Ltd (2015) Desktop Investigation into the Effects of Metals on Aquatic Biota in Lake Carey (Wallaby Project Area), unpublished report prepared for Gold Fields Australia, February 2015.	DER internal
7	MEND, 2004. <i>Review of Water Quality Issues in Neutral pH Drainage: Examples and Emerging Priorities for the Mining Industry in Canada</i> . MEND Report 10.1	The report is available from website: http://mend-nedem.org/mend-report/review-of-water-quality-issues-in-neutral-ph-drainage-examples-and-emerging-priorities-for-the-mining-industry-in-canada/
8	Smith, K.S., 2007. Strategies to predict metal mobility in surficial mining environments, in DeGraff, J.V. (Ed.), <i>Understanding and Responding to Hazardous Substances at Mine Sites in the Western United States. Geological Society of America Reviews in Engineering Geology</i> , v.XVII, 25-45.	The paper is available from website: http://pebblescience.org/Pebble-Mine/acid-drainage-pdfs/GSAREG017-Smith_508.pdf
9	National Environment Protection (Ambient Air Quality) Measure, National Environment Protection Council, 1998	This standard is available from website: http://www.legislation.gov.au
10	Works Approval and Licence supporting documentation October 2016: <ul style="list-style-type: none"> Dacian Gold Ltd, October 2016, <i>Works Approval and Licence Application – Mt Morgans Gold Project</i> – including all appendices, drawings and attachments 	DER internal – A1186505
11	<ul style="list-style-type: none"> Dacian Gold Ltd, December 2016, <i>Commissioning Plan – W6008/2016/1 – Mt Morgans Gold Project</i> 	DER internal – A1336543
12	Further information November 2016: <ul style="list-style-type: none"> Dacian Gold Ltd, 30 November 2016, <i>Response to Request for Information for Mt Morgan Gold Project – Works</i> 	DER internal – A1356269



	<i>Approval and Licence Application</i>	
13	Further information January 2017: <ul style="list-style-type: none">Dacian Gold Ltd, 3 January 2017, <i>Response to Request for Information for Mt Morgan Gold Project – Works Approval and Licence Application</i>	DER internal – A1356272
14	Further information January 2017: <ul style="list-style-type: none">Herring Storer Acoustics, 10 January 2017, <i>Mt Morgans Noise Assessment Response to DER Queries</i>	DER internal – A1356267
15	MMGP_Application Form 2017 10 18	DWER Internal – A1544026
16	Appendix 1_Supporting Document_MMGP Works Approval 2017 10 18	DWER Internal – A1544026