



Application for Licence Amendment

Division 3, Part V *Environmental Protection Act 1986*

Licence Number	L8501/2010/2
Licence Holder	Global Advanced Metals Greenbushes Pty Ltd
ACN	125 585 284
File Number	2012/007163-1~1
Premises	<p>Global Advanced Metals Greenbushes Maranup Ford Road GREENBUSHES WA 6000</p> <p>Being Sub-leases of Mining Tenements M01/06 and M01/03 as shown in Schedule 1 of L8501/2010/2</p>
Date of Report	23 December 2019
Status of Report	Final

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1. Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
Decision Report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EP Regulations	<i>Environmental Protection Regulations 1987 (WA)</i>
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of, and during this Review (L8501/2010/2)
GAMG	Global Advanced Metals Greenbushes Pty Ltd
Licence Holder	Global Advanced Metals Greenbushes Pty Ltd
m ³	cubic metres
Minister	the Minister responsible for the EP Act and associated regulations
mtpa	million tonnes per annum
NEPM	National Environmental Protection Measure
Noise Regulations	<i>Environmental Protection (Noise) Regulations 1997 (WA)</i>
Occupier	has the same meaning given to that term under the EP Act.
PM	Particulate Matter
PM ₁₀	used to describe particulate matter that is smaller than 10 microns (µm) in diameter
Prescribed	has the same meaning given to that term under the EP Act.

Premises	
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Primary Activities	as defined in Schedule 2 of the Revised Licence
Review	this Licence review
Revised Licence	the amended Licence issued under Part V, Division 3 of the EP Act following the finalisation of this Review.
Risk Event	As described in <i>Guidance Statement: Risk Assessment</i>
mg/m ³	milligrams per cubic metre

2. Purpose and scope of assessment

Global Advanced Metals Greenbushes Pty Ltd (GAMG) applied on 25 July 2019 for an amendment to L8501/2010/2, for the installation of a 3 tph rotary gas-fired dryer at the GAMG secondary processing plant at their Greenbushes site. This will replace the former dryer located at the primary plant.

2.1 Application details

Table 2 lists the documents submitted during the assessment process.

Table 2: Documents and information submitted during the assessment process

Document/information description	Date received
Email: Global Advanced Metals Greenbushes Pty Ltd - DWER L8501/2010/2 amendment - proposed gas-fired dryer (DWERDT182650)	25/7/19
Email: L8501 Amendment - concentrate storage questions (A1837277)	31/10/19
Email: Revised Map (A1840515)	5/11/19

2.2 Other changes to be made in this amendment

Existing Licence L8501/2010/2 contains an improvement program (Condition 4.1.1) which is now complete. This condition will now be removed and additional monitoring conditions added to the licence, as follows:

Improvement reference	Documentation submitted	Compliance	Resulting changes to the licence
IR1	<ul style="list-style-type: none"> Correspondence received 10 May 2019 - 3 bores installed MB19/01S, I, D – (GAM 2019) 	DWER accepts the submission and considers IR1 has been met	<ul style="list-style-type: none"> IR1 removed Groundwater monitoring condition 3.4 added to the licence
IR2	<p>Ektimo (2019) <i>Report Number R997823 Air quality assessment report for arsenic and particulate emissions to air from Global Advanced Metals Pty Ltd, Greenbushes WA</i> (Ektimo 2019)</p>	Currently under review. Any recommendations will be addressed by a future amendment if required.	IR2 removed

The licence has also been updated to the current format. There are no Amendment Notices requiring amalgamation into this licence.

3. Background

Global Advanced Metals Greenbushes Pty Ltd (GAMG) owns an underground mine, a crushing plant and two mineral processing plants at Greenbushes. Tantalum concentrate products are produced. Tin ingots are also produced from the tantalum process using an electric arc furnace.

GAMG's operations are located within the mining tenements granted to Talison Lithium Australia Pty Ltd (Talison). Sub-leases have been granted to GAMG by Talison for a primary production plant and a secondary production plant, via a contractual arrangement between the two companies.

GAMG is not currently conducting any mining activities. The underground mine is in a period of care and maintenance and sealed to prevent access. The primary tantalum processing facility has also been placed into care and maintenance, however some equipment is maintained to facilitate the drying of concentrate. The crushing plant and associated ROM (run of mine) pad and fine ore stockpile are licensed to Talison. The secondary tantalum plant is operated to process mineral concentrates that are either produced by Talison for GAMG; or obtained by GAMG from other sources.

Table 3 lists the prescribed premises categories on L8501.

Table 3: Prescribed Premises Categories in the Existing Licence

Classification of Premises	Description	Approved Premises production or design capacity or throughput
Category 44	Metal smelting or refining: Premises on which metal ore, metal ore concentrate or metal waste is smelted, fused, roasted, refined or processed.	10 000 tonnes per annual period

4. Overview of Premises

GAMG is proposing to construct a new rotary gas fired dryer at the secondary tantalum processing plant. This will replace that which currently exists at the primary plant (which will be decommissioned). This new dryer is expected to greatly improve efficiency, with drying of the tantalum concentrate to be located immediately adjacent to the secondary processing plant.

4.1 Operational aspects

The concentrate will be transported in bulk bags to site by semi-trucks with a moisture content of 9-12% and stored in a designated bag loading area before being dried (in the new gas dryer) and processed (at the secondary plant).

Associated infrastructure to be installed includes 2 x 7.5 kL capacity LPG bullets (tanks) and a below ground LPG pipeline to feed the gas burner. Approval of the LPG bullets is being sought from DMIRS, and is not included in this assessment.

The location of the new dryer within the existing Prescribed Premises is shown in Figure 1. Design drawings of the dryer and concentrate storage area are provided in Figures 5 to 7 of the Revised Licence.

There is no change in the throughput of the secondary plant (10,000 tpa) proposed as part of this amendment.

4.2 Infrastructure

The GAMG secondary plant infrastructure relevant to this assessment, is detailed in Table 4 and with reference to the Site Plan (Figure 1)

Table 4: GAMG secondary plant Category 44 infrastructure related to this assessment

	Infrastructure	GAMG premises map reference
1	Rotary Dryer	Gas Dryer (all in shed on concrete pad)
2	Screw Feeder	
3	Dryer burner (LPG combustion heater)	
4	Dust Cyclone	
5	Dryer Baghouse (186 m ² Bag House Filter)	
6	Dryer Discharge Elevator (Bucket Elevator)	
7	Draught Fan	
8	Bag Lifting Hoist (3 t overhead monorail)	
9	Dry Product Sampler	
10	LPG Storage (Kleenheat Free issued Bullets – assessed by DMIRS, not under this assessment)	LPG storage
11	Dryer Exhaust Stack (12m)	Emission point 3
12	Concentrate bag storage area, comprising a compacted road base hardstand of approximately 9m x 17m in area, graded towards the dryer away from vegetation.	Bag loading area

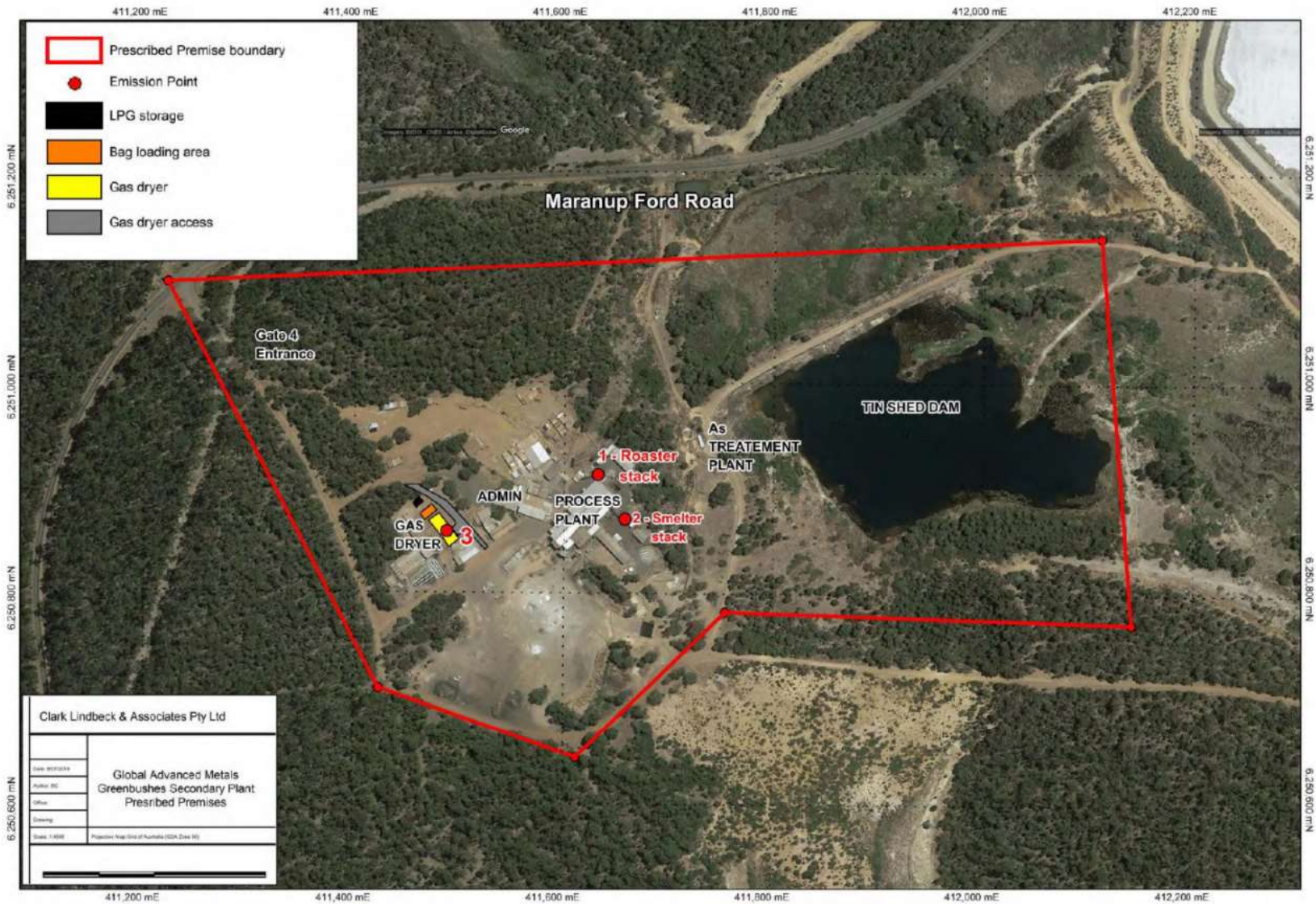


Figure 1: GAMG premises map

5. Legislative context

Table 5 summarises approvals relevant to the assessment.

Table 5: Relevant approvals and tenure

Legislation	Number	Company	Approval
<i>Mining Act 1978</i>	Mining Tenements M01/3 and M01/6	Tenements held by Talison Lithium Australia Pty Ltd – subleased to Global Advanced Metals Greenbushes Pty Ltd	Sub-lease giving legal access to the premises.
<i>Dangerous Goods Safety Act 2004</i>	Dangerous Goods Licence DGS021423	Global Advanced Metals Greenbushes Pty Ltd	For new gas storage facility

5.1 Other relevant approvals

GAMG holds a Dangerous Goods licence (DGS021423) to operate the gas storage facility to comply with the requirements of the *Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007*.

No additional approvals are required.

5.2 Part V of the EP Act

5.2.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

The guidance statements which inform this assessment are:

- *Guidance Statement: Regulatory Principles (July 2015)*
- *Guidance Statement: Setting Conditions (October 2015)*
- *Guideline: Decision Making (June 2019)*
- *Guidance Statement: Risk Assessments (February 2017)*
- *Guidance Statement: Environmental Siting (November 2016)*

5.2.2 Works approval and licence history

Table 6 summarises the works approval and licence history for the premises.

Table 6: Works approval and licence history

Instrument	Issued	Nature and extent of works approval, licence or amendment
L8501/2010/1	01/07/2010	New application for tantalum operations conducted by newly formed company Global Advanced Metals; activities were previously authorised by Licence L4247/1991/12 as part of the Talison Lithium Greenbushes operations.
L8501/2010/2	14/12/2013	Licence re-issue

L8501/2010/2	23/06/2016	Amendment notice to extend the expiry date to 13/12/2026
L8501/2010/2	15/04/2019	Licence amendment to update conditions following major amendment of Talison Lithium Australia's Licence L4247/1991/13.

6. Location and siting

6.1 Siting context

The GAM Greenbushes secondary processing plant is located in the Greenbushes State Forest, approximately 3km from the Greenbushes town site. The nearest rural residential receptors are just over 2km from the Premises.



Figure 2: Regional location of GAM Greenbushes (showing Greenbushes townsite and rural residential receptors)

6.2 Residential and sensitive receptors

The distances to residential and sensitive receptors are detailed in Table 7.

Table 7: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Residential Premises	Closest residence (rural residential dwelling) is just over 2km south southwest of the Premises. Several residences and the town of Greenbushes are located within 5km of the Premises.

6.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are shown in Table 8. Table 8 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem.

Table 8: Environmental values

Specified ecosystems	Distance from the Premises
Ramsar Sites in Western Australia	Closest is Vasse-Wonnerup Wetland System – 60 km northwest of Project
DBCA Managed Lands and Water	Located in Greenbushes State Forest
Biological component	Distance from the Premises
Threatened/Priority Flora	Threatened species <i>Caladenia harringtoniae</i> , located 1.2 km southwest of the secondary plant.
Threatened/Priority Fauna	Threatened fauna recorded in the surrounding bush – White-tailed black cockatoo, red-tailed black cockatoo Western brush wallaby, Phascogale, Quenda (see Figure 3)

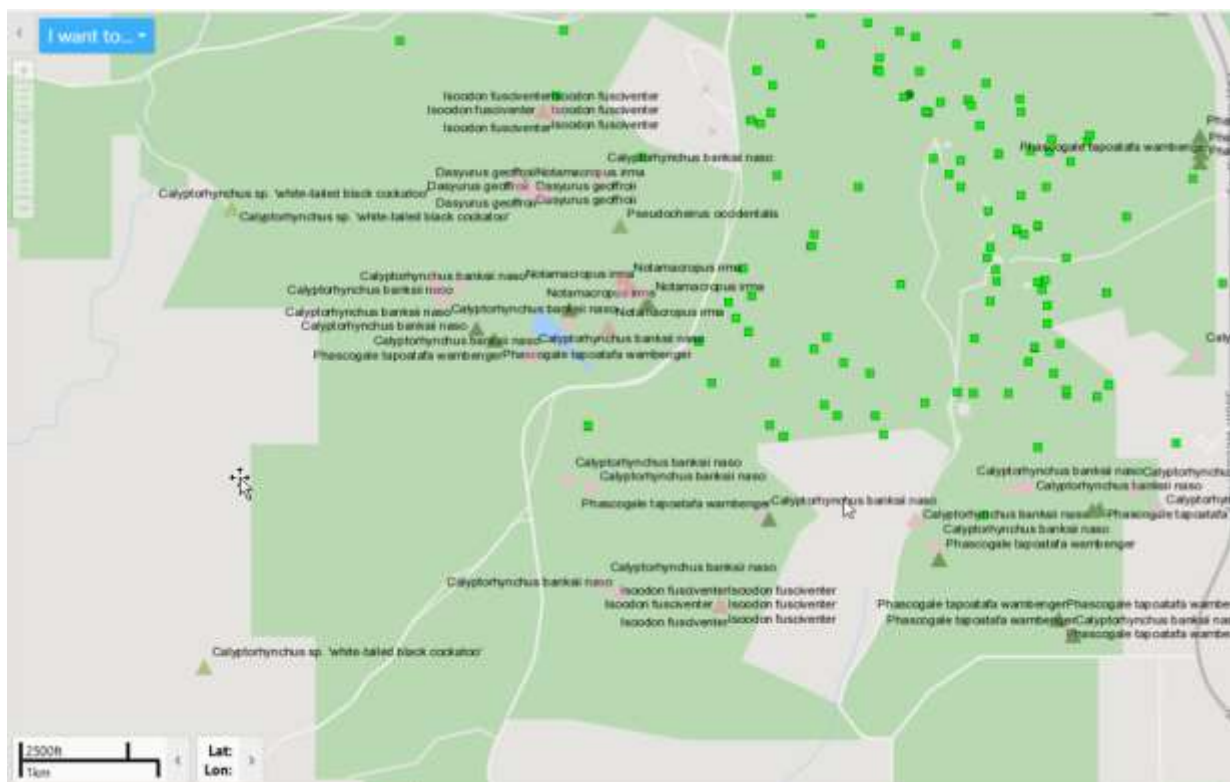


Figure 3: Priority Fauna in the vicinity of GAM Greenbushes

6.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 9.

Table 9: Groundwater and water sources

Groundwater and water sources	Distance from Premises	Environmental value
Public drinking water source areas	>3km North of premises	
Groundwater	Two aquifers are present at the GAM site – a shallow surficial aquifer located with water depth at 3mbgl and a deeper bedrock aquifer approx. 22 mbgl – 27 mbgl (GAM 2019).	Groundwater in the shallow aquifer is impacted by seepage from the Talison Tailings Storage Facility and also from Tin Shed Dam seepage. Elevated in lithium, rubidium, caesium, arsenic, manganese and uranium.

7. Risk assessment

7.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DWER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 10 and Table 11.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Table 10 and Table 11 below.

Table 10. Identification of emissions, pathway and receptors during construction

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
Earthworks, construction of new building, infrastructure and vehicle movements	Earthworks and vehicle movements on unsealed access roads	Dust	Residences, Flora and vegetation	Air / wind dispersion	Aesthetic and respiratory impacts to people; deposition reducing plant vigour	No	Earthworks are not significant and likely to generate less dust than neighbouring premises. Any effects to site personnel are addressed under occupational health legislation, and not considered in this assessment. The nearest residential receptor is over 2km away and unlikely to be impacted by dust from works of this scale. The Licence holder has outlined reasonable control measures and the risk does not warrant additional regulatory controls
	Equipment, machinery and vehicles used during construction works	Noise	Residences	Air	Amenity impacts	No	Noise at this premises is regulated under the <i>Environmental Protection (Global Advanced Metals Greenbushes Operation Noise Emissions) Approval 2015</i> .

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
	Various construction activities	Light emissions	Residences	Direct incidence	Amenity impacts	No	Nearest residence 2km away. Construction activities will be during day shift only.

Table 11: Identification of emissions, pathway and receptors during commissioning and operation

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
Transport and storage of concentrate	Spills from split concentrate bags in storage of, or transport to or from storage area.	Tantalum concentrate	Soil and vegetation adjacent to the area; surface water and groundwater	Contaminated stormwater runoff	Contamination of soil, surface water and groundwater. May lead to vegetation and human health impacts	Yes	See section 7.4
			Residences; vegetation	Air / wind dispersion	Adverse impacts to human health and amenity; vegetation health		
Transfer of concentrate to the dryer chute	Concentrate dust escaping during transfer to dryer chute (enclosed in shed)	Concentrate in stormwater	Soil and vegetation adjacent to the area; surface water and groundwater	Contaminated stormwater runoff	Contamination of soil, surface water and groundwater. May lead to vegetation and human health impacts	No	This activity is within a partially enclosed shed, which will contain most fugitive dust. Any effects to site personnel are addressed under occupational health legislation, and not considered in this assessment. Any runoff within the dryer area is contained by the bunding, and directed to sumps to be recovered for process water. Sumps will be inspected daily during operation of the dryer to ensure adequate capacity.
		Concentrate dust	Residences; vegetation	Air / wind dispersion	Adverse impacts to amenity; vegetation health		

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Operation of gas dryer	Fugitive dust; or Spillage of concentrate through leaks or failure of equipment.	Concentrate dust	Residences; vegetation	Air / wind dispersion	Adverse impacts to amenity; vegetation health	No This activity is within a partially enclosed shed, which will contain most fugitive dust. Any effects to site personnel are addressed under occupational health legislation, and not considered in this assessment. Any runoff within the dryer area is contained by the bunding, and directed to sumps to be recovered for process water. Sumps will be inspected daily during operation of the dryer to ensure adequate capacity.
		Concentrate in stormwater	Soil and vegetation adjacent to the area; surface water and groundwater	Contaminated stormwater runoff	Contamination of soil, surface water and groundwater. May lead to impacts	
	Gaseous and particulate emissions from dryer stack	Gas combustion products and Tantalum concentrate particulates	<ul style="list-style-type: none"> Residences - nearest is 2km from Premises Greenbushes town (3km North) Vegetation adjacent to the dryer 	Air / wind dispersion	Reduced local air quality due to particulate emissions, and metals, notably arsenic.	Yes See section 7.5
	Noise from dryer operation	Noise	<ul style="list-style-type: none"> Residences - nearest is 2km from Premises Greenbushes town (3km North) 	Air	Amenity impacts	No Closest sensitive receptor (rural residential dwelling) is located approximately 2km south southwest of the secondary plant. Noise emissions from the project are unlikely to change as a result of dryer operations. Noise for this operations is regulated under the <i>Environmental Protection (Global Advanced Metals Greenbushes Operation Noise Emissions) Approval 2015</i> .
	Light from dryer operation	Light pollution				No No additional light emissions anticipated as a result of installation and operation of the dryer.

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
Transfer of concentrate from dryer to secondary plant	Fugitive dust; or spill of concentrate from dryer during transfer to kibble and/or transfer to secondary plant	Concentrate in stormwater	Soil and vegetation adjacent to the area; surface water and groundwater	Contaminated stormwater runoff	Contamination of soil, surface water and groundwater. May lead to vegetation impacts	Yes	See section 7.6
		Concentrate dust	Residences; vegetation	Air / wind dispersion	Adverse impacts to amenity and/or vegetation health		

7.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 12 below.

Table 12: Risk rating 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

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 13 below.

Table 13: Risk criteria table

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

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

"onsite" means within the Prescribed Premises boundary.

7.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment Table 14 below:

Table 14: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

7.4 Risk Assessment – Tantalum concentrate spilled in storage area, entering the environment and causing impact

7.4.1 Description of tantalum concentrate spilled in storage area, entering the environment and causing impact

Commissioning and operating phase

Tantalum concentrate will be brought to the secondary processing plant in bulk bags by semi-trucks and stored in a designated bag loading area before being dried (in the gas dryer) and processed (at the secondary plant).

If a bag splits while unloading, during storage, or during transfer to the dryer chute. This could result in a spill of concentrate to the ground.

7.4.2 Identification and general characterisation of emission

Tantalum concentrate contains a number of metal oxides that may cause environmental or health impacts if ingested or taken up by vegetation, including arsenic trioxide (As_2O_3). During normal operations, there should be no spillage of concentrate in storage and handling. In the case of a split bag though, up to $1m^3$ of concentrate may be spilled. This could be greater if multiple bags are impacted.

7.4.3 Description of potential adverse impact from the emission

If tantalum concentrate is collected by stormwater and washed off the premises, this could result in contamination of soil, surface watercourses, groundwater and possible uptake by vegetation.

If spilled tantalum concentrate is dispersed by wind, there is potential for amenity impacts.

7.4.4 Applicant/Licence Holder controls

The Licence Holder states that bulk bags containing the concentrate for the dryer are sealed, so there should be no release except in the case of accidental bag breakage.

The Licence Holder states the concentrate storage area will be compacted road base hard stand, and graded towards the dryer away from areas of native vegetation. Stormwater runoff, as for the rest of the secondary processing plant will be channelled to settling sumps which overflow to the Tin Shed Dam for recycling as process water.

Daily inspections of concentrate storage area will be undertaken. Concentrate spills will be cleaned up promptly with shovels and brooms and the top 20mm layer of compacted base removed in addition. All operators will be trained in this procedure (Cook 2019).

7.4.5 Consequence

Given the small quantities of concentrate that could reasonably be expected to be spilled, and the measures in place to prevent and clean up spills before wind dispersion or contamination of stormwater can occur, the Delegated Officer has determined that the impact of tantalum concentrate being wind dispersed or contaminating stormwater will be low level on-site impacts and minimal off-site impacts. Therefore, the Delegated Officer considers the consequence of tantalum concentrate dust impacting on adjacent vegetation, soils or groundwater to be **Minor**.

7.4.6 Likelihood of Risk Event

The Delegated Officer has determined that given the controls in place, the likelihood of tantalum concentrate contaminating soils or groundwater or impacting vegetation may happen only in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

7.4.7 Overall rating of tantalum concentrate spilled in storage area, entering the environment and causing impact

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk of tantalum concentrate contaminating stormwater is **Low**.

7.5 Risk Assessment – Gaseous and particulate emissions from the dryer stack

7.5.1 Description of gaseous and particulate emissions from the dryer stack

Commissioning and operating phase

Exhaust gases from the dryer will be emitted from the dryer stack (emission point 3 in Figure 1). These will include combustion gasses and tantalum concentrate particulates.

7.5.2 Identification and general characterisation of emission

GAMG states in the application that:

As the technology being used in the new dryer is much improved from the old dryer, GAM would expect lower concentrations of target compounds even taking into account the increased throughput, however, this would be totally dependent on the constituent of the ore body and will be assessed during commissioning and ongoing during operations.

There is limited emission data available from the existing (primary plant) dryer. However the Delegated Officer considers it appropriate to use what data is available for this assessment.

Monitoring requirements will be added to the licence to determine actual emissions during commissioning and operation. Additional controls may be required if warranted by monitoring results.

GAMG has provided mass emission rates in their 2019 annual fee calculations (Hill 2019). For the primary plant dryer, these comprise 2 sets of stack testing, performed in 2012 and 2014. For the purpose of this screening analysis, it is assumed that all stacks are running 100% of the time, though this will overestimate actual emissions. Comparison of particulate, combustion product and metal emissions across the five GAMG stacks (Figure 4 and Figure 5) show that for all sampled elements except copper, the dryer stack is a minor contributor by emission to total site emissions. It is therefore not considered that regulatory controls in excess of those for existing stacks (previously assessed) will be required.

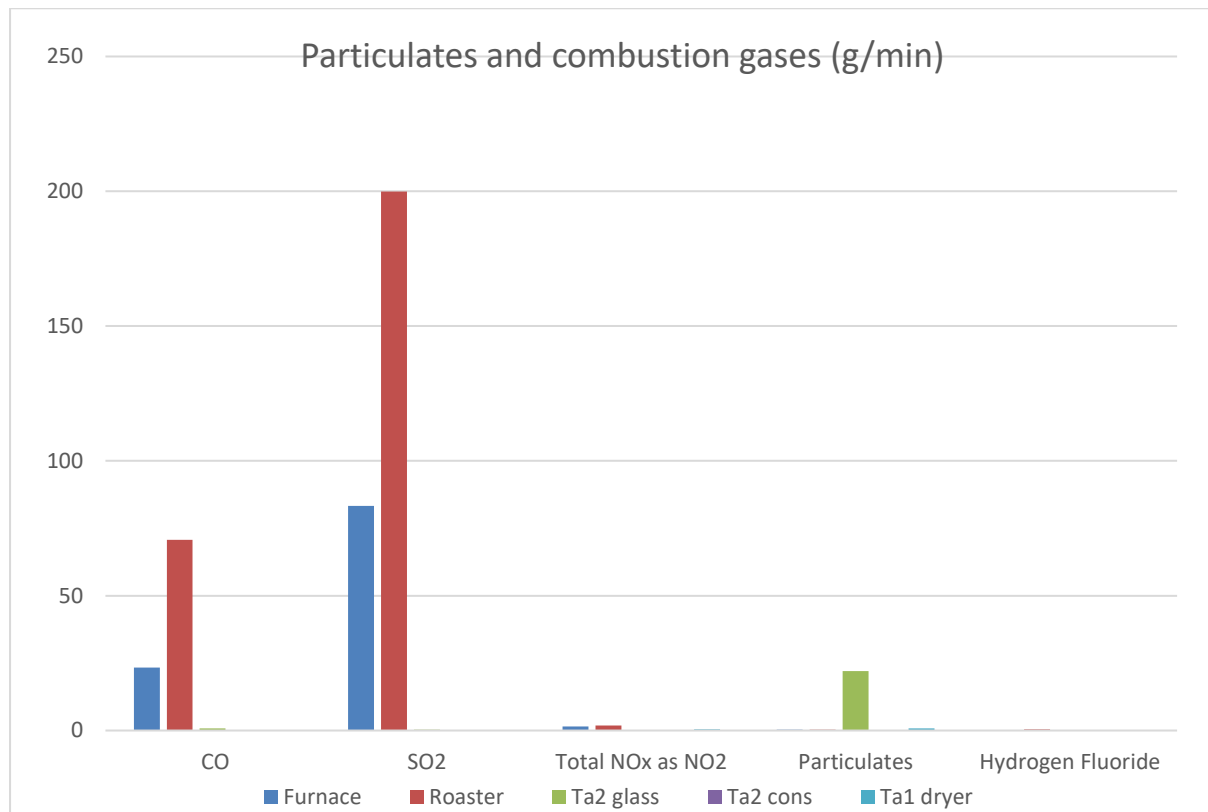


Figure 4: Particulate and combustion product emissions from the existing (primary) dryer stack, compared to other stacks at the GAMG secondary processing plant

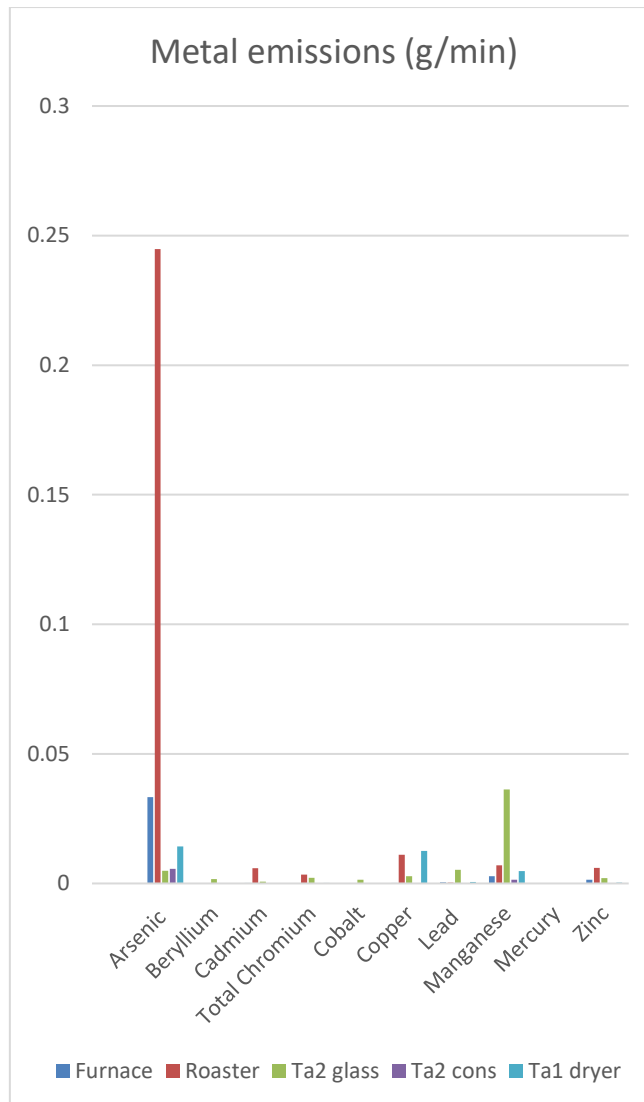


Figure 5: Metal emissions from the existing dryer stack, compared to other stacks at the GAMG secondary processing plant

Further consideration was given to the copper emission rate as the dryer stack is expected to contribute around half of the sitewide copper emissions. However note that this will only be relocating (further from Greenbushes town), not increasing the emissions from dryer stacks as the dryer at the primary plant is being removed from the licence.

The calculated emission of copper from previous stack testing is 0.012605 g/min, which equates to 0.19 mg/m³ at the measured flow rate of 66 m³/min. Using the emissions screening tool outlined in the draft Guideline: Air emissions (DWER 2019b), this emission is considered insignificant (DWER 2019c).

Arsenic emissions were also further considered. The screening tool (DWER 2019b) does not consider these insignificant. However:

- Human receptors are more than 2km away
- The new dryer does not increase the risk as it is replacing an existing dryer with newer technology, and moving it from within 1km of the town of Greenbushes, to about 3km from Greenbushes and 2km from the nearest residential receptor.

- The data provided from the old dryer equates to 0.014g/min of Arsenic. This was measured at a flow rate of 66m³/min, giving 0.22mg/m³. The NSW *Protection of the Environment Operations (Clean Air) Regulations 2010* give a limit for new stacks of 1mg/m³ for combined Type 1 and 2 elements (defined in Table 15). Data is not available for all of these elements, but those available are all significantly lower than arsenic concentrations (Figure 5). It is therefore likely that the stack limit of 1mg/m³ will be met for this stack
- The arsenic levels from the dryer are expected to be around 5% of those from the existing roaster stack. Dispersion modelling of arsenic emissions from the roaster and furnace (not including the dryer) and potential impacts on residential receptors has recently been undertaken, and is currently under assessment by DWER. This modelling will require updating to include the new dryer emissions, once operating. This will be conditioned in the Revised Licence. Any other requirements arising out of the assessment of this modelling will be addressed in a future licence amendment.

Table 15: Substance types defined in the NSW *Protection of the Environment Operations (Clean Air) Regulations 2010*

Type 1 substance	Type 2 substance
The elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements	The elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements.

7.5.3 Description of potential adverse impact from the emission

If significant concentrations of tantalum concentrate particulates and combustion gases are released to air, there is potential for human health and amenity impacts.

7.5.4 Applicant/Licence Holder controls

The exhaust gas handling system, comprising a 186 m² baghouse, cyclone and draught fan, will remove particulates entrained in the process off-gas and reduce emissions from the stack.

The cyclone will remove the bulk of the larger particulates with the underflow to be discharged into drums which will then be fed into the process plant.

The baghouse was designed for use with tantalite concentrate. The efficiency of the bags to contain >0.1 µm is more than 99%. It has the following design specifications:

- Adequately sized to cater for the maximum expected air volume - will have a maximum processing air flow of 13,400 m³/h.
- Filter bags to be used are capable of resisting 130°C, while the expected air temperature through baghouse will be less than 100°C.
- Designed to reduce particulate emissions to less than 50 mg/m³ (STP dry) during normal conditions.
- Fitted with a system for detection and isolation of broken bags, without requiring a bag filter system bypass situation to exchange or replace broken bags
- Fitted with gauges to provide differential pressure across the baghouse, to identify performance issues
- Fitted with means for automatically cleaning of filter elements - use of a pulse valve to control/release the compressed air to clean the bags , with all the dust gathered at the bottom of the baghouse and be discharged by the Star Unloader

- Alarms to alert operators to potential issues such as emission control infrastructure malfunction
- Alarms relating to risk of emissions and functioning of baghouses

The dryer stack will be fitted with stack monitoring ports that meet the requirements of AS 4323.1 and are sufficient in diameter to accommodate apparatus used for stack emission testing.

7.5.5 Consequence

Delegated Officer has determined that the dryer stack is not a significant contributor to total site emissions for most substances of potential concern. The exception is copper, but this emission is screened out as insignificant. With reference to data from the existing dryer, arsenic concentrations are significantly less than the other point sources at the secondary plant (roaster and furnace). The dryer stack is likely to meet stack limits given in *NSW Protection of the Environment Operations (Clean Air) Regulations 2010*. Given the efficiency of the gas treatment system and the low rate of particulate and other emissions, it is not considered that there is a significant risk to residential receptors, which are more than 2km away. However the cumulative impacts from arsenic emissions at the roaster, smelter and dryer stacks will be reassessed based on modelling actual emissions data during operations. Therefore, the consequence of gaseous and particulate emissions from the dryer stack is **Moderate**.

7.5.6 Likelihood of Risk Event

Given the controls in place, the likelihood of gaseous and particulate emissions from the dryer stack in concentrations leading to health or environmental impact will probably not occur in most circumstances. Therefore, the likelihood of this Risk Event occurring is **Possible**.

7.5.7 Overall rating of gaseous and particulate emissions from the dryer stack

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (**Table 12**) and determined that the overall rating for the risk of gaseous and particulate emissions from the dryer stack is **Medium**.

7.6 Risk Assessment – Tantalum concentrate dust or stormwater contamination during transfer to secondary plant

7.6.1 Description of tantalum concentrate dust or stormwater contamination during transfer to secondary plant

Commissioning and operating phase

During transfer from the dryer to the kibble and/or transfer to secondary plant, there is potential for spill of concentrate to ground, and some fugitive dust.

7.6.2 Identification and general characterisation of emission

Tantalum concentrate contains a number of metal oxides that may cause environmental or health impacts if ingested or taken up by vegetation, including arsenic trioxide (As_2O_3). However the dust emitted is likely to be predominantly contained within the shed, and any health impacts to site personnel are not considered in this assessment.

7.6.3 Description of potential adverse impact from the emission

If spilled tantalum concentrate is dispersed by wind, there is potential for human health and amenity impacts.

If tantalum concentrate is collected by stormwater and washed off the premises, this could result in contamination of soil, surface watercourses and possible uptake by vegetation.

7.6.4 Applicant/Licence Holder controls

The dryer will be located on a concrete pad with bunding around the perimeter of at least 150mm. All runoff will be directed to sumps which recover water for process water. The sumps will be inspected daily during operation of the dryer to ensure there is adequate capacity.

Daily inspections of dryer area will be undertaken to identify any dust or spillage issues and where identified, rectified as soon as practicable.

A level sensor will be installed and utilised to prevent overflow of the dried concentrate out of the kibble.

7.6.5 Consequence

Given the shed and bunding infrastructure that will contain dust and runoff, the Delegated Officer has determined that there will be minimal on-site impacts from tantalum concentrate dust being wind dispersed or contaminating stormwater. Therefore, the consequence of tantalum concentrate dust during transfer to the secondary plant will be **Minor**.

7.6.6 Likelihood of Risk Event

The Delegated Officer has determined that given the controls in place, the likelihood of Tantalum concentrate contaminating stormwater or entering the atmosphere in concentrations leading to environmental impact may happen only in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood of this risk to be **Rare**.

7.6.7 Overall rating of tantalum concentrate dust or stormwater contamination during transfer to secondary plant

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (**Table 12**) and determined that the overall rating for the risk of tantalum concentrate contaminating stormwater is **Low**.

7.7 Summary of acceptability and treatment of Risk Events

A summary of the risk assessment and the acceptability or unacceptability of the risk events set out above, with the appropriate treatment and control, are set out in Table 16 below. Controls are described further in section 11.

Table 16: Risk assessment summary

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	Source	Pathway/ Receptor (Impact)			
7.4	Concentrate spilled in storage area, entering the environment	Stored concentrate in bulker bags	Wind; stormwater	<ul style="list-style-type: none"> Concentrate stored in sealed bulker bags. Surface will be compacted road base hard stand, and graded towards the dryer away from areas of native vegetation. Stormwater runoff channelled to settling sumps which report to the Tin Shed Dam for reuse as process water. Daily inspections of concentrate storage area. Concentrate spills will be cleaned up promptly and the top 20mm layer of compacted base removed in addition. All operators will be trained in this procedure. 	Minor consequence Rare Low risk	Acceptable
7.5	Gaseous and particulate emissions from the dryer stack	Dryer stack (Emission Point 3 in Figure 1)	Air dispersion to residential receptors (>2km away)	<ul style="list-style-type: none"> The exhaust gas handling system comprising a baghouse, cyclone and draught fan Cyclone will remove the bulk of the larger particulates with the underflow to secondary plant Baghouse design (details in section 7.5.4) 	Moderate consequence Possible Medium risk	Acceptable subject to proponent controls conditioned / outcomes based controls
7.6	Concentrate dust or stormwater contamination during transfer to secondary plant	Concentrate dust in pouring into kibble; or stormwater contamination due to spillage	Air; stormwater	<ul style="list-style-type: none"> Bunded area; runoff directed to sumps for recovery as process water. Sumps inspected daily Daily inspections for dust or spillage; rectified as needed Level sensor on kibble to prevent overflow of concentrate 	Minor consequence Rare likelihood Low Risk	Acceptable

8. Licence controls

Conditions will be placed on the licence requiring the Applicant to construct the dryer and associated infrastructure according to the plans provided, and controls listed. They will also allow for environmental commissioning to ensure that the emission control systems function effectively. These will provide adequate controls for most of the risks listed above.

The dryer stack will be added to the authorised emission points in condition 2.2.1, and emissions testing will be required on the dryer stack during commissioning and operations to validate the assumed emission rates on which this assessment is based. The limit of 50 mg/m³ particulate matter in condition 2.2.2 will be extended to apply to the dryer as well as other existing stacks.

Compliance documentation will be required for both construction and commissioning phases.

Inspection of the dryer stack discharge and concentrate storage/dryer area will be added to the infrastructure inspections table in condition 1.3.4.

A new improvement requirement IR1 will be added requiring the Licence Holder to update the arsenic modelling submitted to DWER on 11 November 2019 (A1842562) to include arsenic emissions from the dryer, once the first stack sampling data under normal operations is available.

9. Applicant's comments

The Licence Holder was provided with the draft Decision Report and draft revised Licence on 19 December 2019. The Licence Holder provided comments which are summarised, along with DWER's response, in Appendix 2.

10. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

Based on this assessment, it has been determined that the Revised Licence will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Tim Gentle
MANAGER, RESOURCE INDUSTRIES
REGULATORY SERVICES

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

Appendix 1: Key documents

	Document title	In text ref	Availability
1.	Licence L8501/2010/2 – Global Advanced Metals Greenbushes	L8501/2010/2	accessed at www.der.wa.gov.au
2.	Email: Global Advanced Metals Greenbushes Pty Ltd - DWER L8501/2010/2 amendment - proposed gas-fired dryer (Belinda Clark, 25 July 2019)	this application	DWER records (DWERDT182650)
3.	Email: L8501 Amendment - concentrate storage questions (Ross Cook, 31 October 2019)	Cook 2019a	DWER records (A1837277)
4.	Email: GAM Annual Fee submission 2019 - 2020 (Katie Hill, 6 November 2019)	Hill 2019	DWER records (A1840609)
5.	Email: GAM New Bore logs, (2019) (received 10 May 2019 from Ross Cook)	GAM 2019	DWER records (A1835526)
6.	Ektimo (2019) <i>Report Number R007823 Air Quality Assessment of Arsenic and Particulate Emissions to Air, Global Advanced Metals Pty Ltd, Greenbushes WA</i> , 15 November 2019	Ektimo 2019	DWER records (A1842562)
7.	<i>New South Wales Protection of the Environment Operations (Clean Air) Regulation 2010</i>	<i>Protection of the Environment Operations (Clean Air) Regulation 2010</i>	Accessed at www.legislation.nsw.gov.au
8.	Email: Copper emissions (DWER, 16 December 2019)	DWER 2019c	DWER records (A1852458)
9.	DER, July 2015. <i>Guidance Statement: Regulatory principles</i> . Department of Environment Regulation, Perth.	DER 2015a	accessed at www.dwer.wa.gov.au
10.	DER, October 2015. <i>Guidance</i>	DER 2015b	

	<i>Statement: Setting conditions.</i> Department of Environment Regulation, Perth.		
11.	DER, November 2016. <i>Guidance Statement: Risk Assessments.</i> Department of Environment Regulation, Perth.	DER 2016b	
12.	DWER, June 2019. <i>Guideline: Decision Making.</i> Department of Water and Environmental Regulation, Perth.	DWER 2019a	
13.	DWER, October 2019. Draft Guideline: Air Emissions. Department of Water and Environmental Regulation, Perth.	DWER 2019b	

Appendix 2: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of Licence Holder comment	DWER response
-	Minor administrative details and confirmations	Updated/corrected
Figures 1 and 3	GAMG relinquished the primary plant sub-lease to Talison as of 13 December 2019. All maps and references to the primary plant should be removed from the license.	Figures 1 and 3 removed. No other amendments to licence necessary
4.3.1	GAMG request a period of 30 days for commissioning be inserted in the license.	Table 4.3.2 updated to allow a 30 day commissioning period
Schedule 1	New Figure provided showing infrastructure, emission points and stormwater drainage pathways	Added to licence as Figure 2B.

Attachment 1: Revised Licence L8501/2010/2
