Government of Western Australia
Department of Water and Environmental Regulation

Amendment Notice 3

Licence Number	L9155/2018/1
Licence Holder	Avoca Mining Pty Ltd
ACN	108 547 217
File Number:	DER2018/001153
Premises	Higginsville Gold Operations (HGO) Shire of Coolgardie Legal description – M15/351, M15/289, M15/225, M15/642, M15/348, M15/31, M15/786, M15/506, M15/507, M15/620, M15/629, M15/639, M15/640, M15/580, M15/581, M15/597, L15/225, L15/288, L15/302, G15/19, G15/23, M15/528, M15/231, M15/748, M15/512, M15/352, M15/610, M15/375, M15/338, M15/1790, M15/1814, L15/282 and L15/347
Date of Amendment	30 August 2019

Amendment

The Chief Executive Officer (CEO) of the Department of Water and Environmental Regulation (DWER) has amended the above Licence in accordance with section 59 of the *Environmental Protection Act 1986* (EP Act), as set out in this Amendment Notice. This Amendment Notice constitutes written notice of the amendment in accordance with section 59B(9) of the EP Act.

Tim Gentle
Digitally signed by Tim Gentle
Date: 2019.08.30 17:34:57 +08'00'

Tim Gentle

Manager, Resource industries

an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA).

Definitions and interpretation

Definitions

In this Amendment Notice, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
Amendment Notice	refers to this document
Department	means the department established under section 35 of the *Public Sector Management Act 1994* 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	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
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
Licence Holder	Avoca Mining Pty Ltd

Amendment Notice

This amendment is made pursuant to section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the Licence issued under the EP Act for a prescribed premises as set out below. This notice of amendment is given under section 59B(9) of the EP Act.

The following guidance statements have informed the decision made on this amendment:

- *Guidance Statement: Regulatory Principles* (July 2015)
- *Guidance Statement: Setting Conditions* (October 2015)
- *Guidance Statement: Land Use Planning* (February 2017)
- *Guidance Statement: Decision Making* (February 2017)
- *Guidance Statement: Risk Assessment* (February 2017)
- *Guidance Statement: Environmental Siting* (November 2016)

Amendment description

The Licence Holder has applied to amend L9155/2018/1 to allow for the discharge of mine tailings into the Vine Pit void, located on M15/610. The amendment will also include the construction of a tailings and return water pipeline located within M15/610 and M15/375.

The Vine Pit is located on M15/610, approximately 2.5 km south of the Higginsville processing plant. Infrastructure associated with development of the Vine in-pit TSF includes a tailings pipeline corridor and TSF monitoring bores. Approximately 1.38 km of new tailings pipeline infrastructure will be constructed on M15/610 and M15/375. Three monitoring bores are to be constructed in the vicinity of the in-pit TSF to monitor local groundwater conditions.

Construction requirements involve earthworks associated with the establishment of the pipeline corridor and piping and pumping required for slurry and water return systems. The total disturbance area associated with the project is approximately 7.1 hectares (ha). Given that an existing pit void (5.7 ha) will be utilised to store tailings and that the pipeline corridor (1.4) will follow existing transport corridors, the actual area of new disturbance is only 0.4 ha.

The Licence Holder has commissioned CMW Geosiences (CMW Geosiences 2019) to develop a design report for the Vine in-pit tailings disposal in general accordance with the following guidelines:

- Department of Mines and Petroleum (2013), '*Code of practice: tailings storage facilities in Western Australia'*; and
- Department of Mines and Petroleum (2015), *'Guide to the preparation of a design report for tailings storage facilities (TSFs)'*.

Tailings will be delivered to the TSF from the plant via a HDPE line. Tailings deposition will be into the southern end of the pit from single point discharges. Surface water will initially be removed from TSF by a decant pump deployed from the pit ramp at the northern end of the pit. Return water will be pumped directly to the process plant for reuse. The decant pump will be moved up the ramp as tailings and water levels rise (CMW Geosiences 2019).

The Licence Holder has commissioned Rockwater Pty Ltd to undertake a hydrogeology assessment of the groundwater surrounding the Vine Pit (Rockwater 2019). Since the completion of mining in 2012, the water level in Vine Pit has risen by 18 m, from the base of the pit at 240 mAHD, to 258 mAHD. As a result of evaporation from the pit lake (estimated to be about 1.13 m/yr), the lake is still about 10 m lower than the regional water level. Groundwater in the area is considered to be hypersaline and not suitable for human or stock consumption.

Residual water within the Vine Pit will be pumped out to the processing mill before deposition of tailings commences. At a deposition rate of 1.3 Mtpa (148 t/hr) and a settled tailings density of 1.5 t/m3, it will take about 16 months for the pit to fill to the predicted level. Within 50 m of the pit crest, the water table elevation from mounding is predicted to be 290 mAHD, which is 15 m below that of the land surface and not expected to impact on the health of the native vegetation (Rockwater 2019).

The new pipeline will connect to the existing pipeline network that runs from the processing plant and extends in a southerly directly past the Vine pit (Figure 1 below). The pipeline will run within roadside “V” drains that will be bunded and directed to purpose-built sumps, 500 metres apart (pipeline corridor shown in Figure 1 below). Pipelines will also be fitted with telemetry flow meters to monitor flows. This will be constantly monitored to detect any potential leaks. The identified key risk for the project is potential pipeline leakage and the Licence Holder has proposed a number of control measures that will be implemented as part of their TSF Operations Manual, which is used for other in-pit TSF disposals previously approved by DWER.

Geochemical testing of the tailings produced at Higginsville indicates a relatively high level of sulphides and arsenic in the tailings. However, due to a high negative average value for the Net Acid Producing Potential (NAPP), the tailings are unlikely to be acid forming and therefore there is only a low risk of metals leaching from the tailings. The alkalinity of the tailings is also relatively high (averaging 8 pH).

Groundwater bores will be established to ensure the operation of the Vine in-pit TSF does not adversely affect the surrounding groundwater levels to possibly impact on surrounding vegetation. The groundwater contours and the location of the monitoring bores are shown in Figure 2 below.

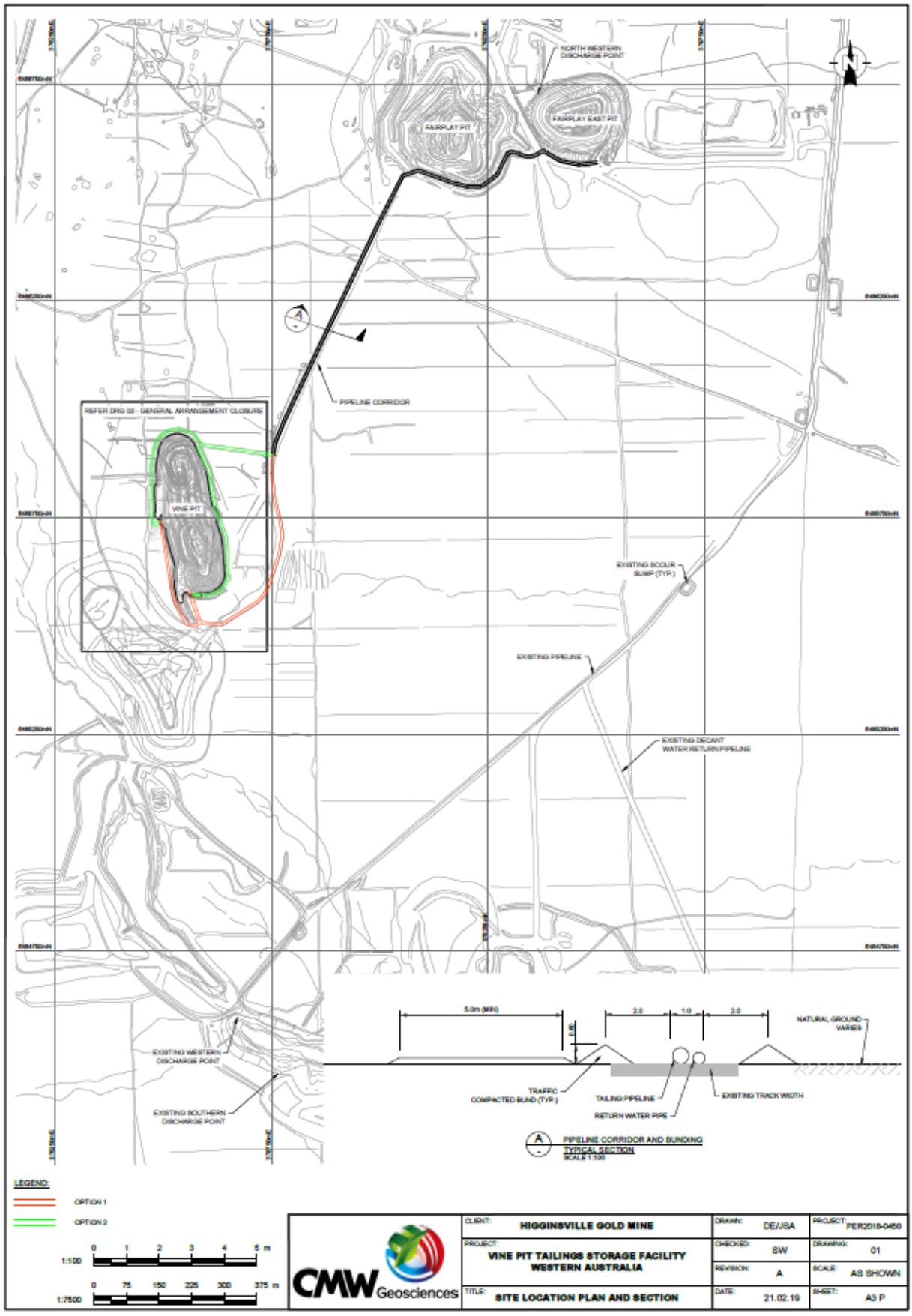


Figure 1: Vine Pit and proposed pipeline route (Drawing no. PER2018-0450)

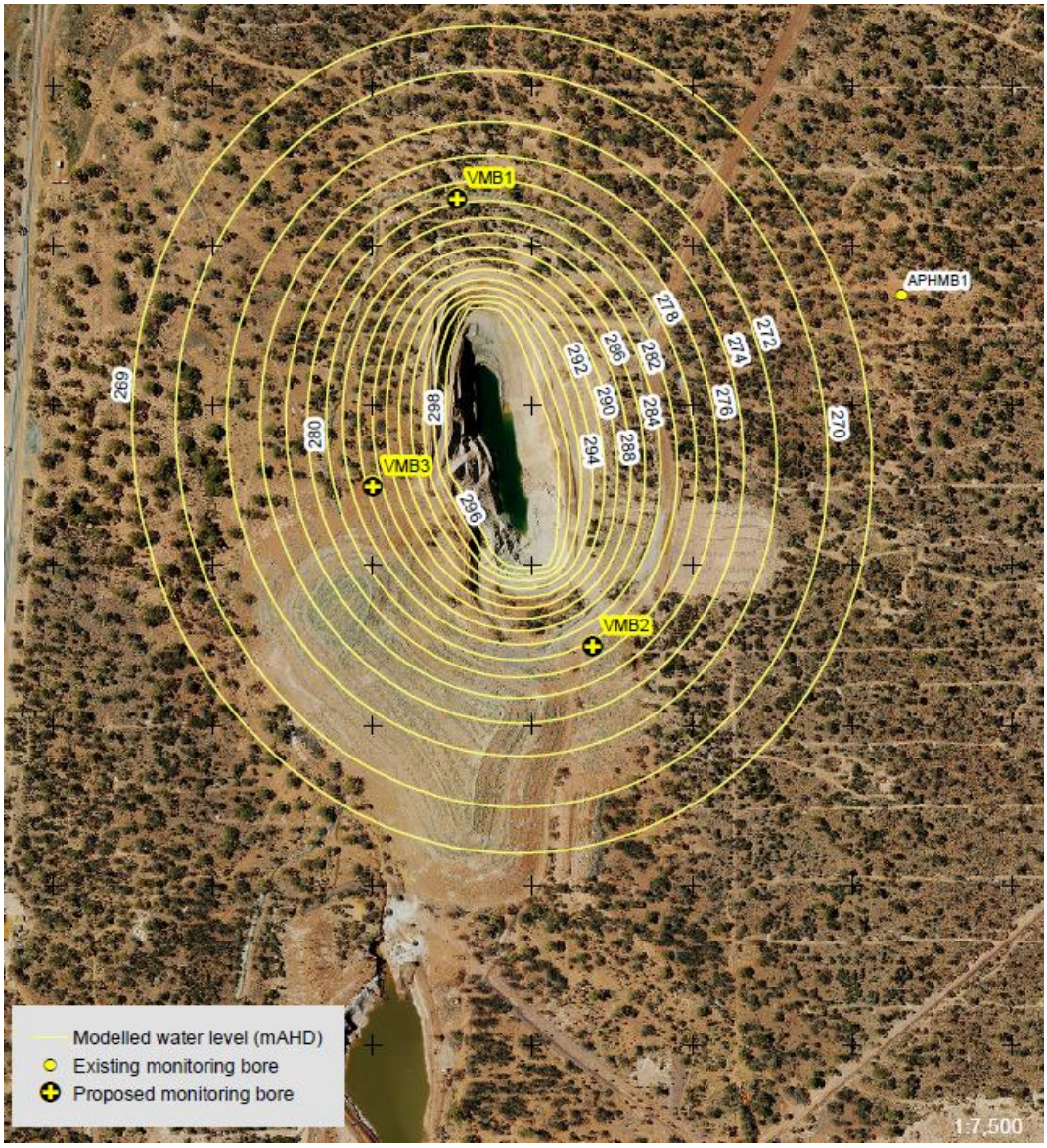


Figure 2: Vine pit groundwater contours and proposed monitoring bore coordinates (Drawing no. 497.1/19/2-4)

Amendment history

Table 2 provides the amendment history for L9155/2018/1 and its previous Licence L8146/2007/2.

Table 2: Licence amendments

Instrument	Issued	Amendment
W4688/2010/1	23 July 2010	Category 6 dewatering works approval from Chalice Pit to Aphrodite Pit.
L8146/2007/2	19 October 2010	Licence amendment
W4759/2010/1	5 November 2010	Category 6 dewatering works approval from Chalice Pit to Chalice West Lake.
L8146/2007/2	22 September 2011	Licence amendment

W5198/2012/1	9 October 2012	Category 5 works approval for TSF lifts for cells 3 and 4
L8146/2007/3	23 May 2013	Licence re-issue
L8146/2007/3	13 November 2014	Licence amendment to allow for mine dewatering to be discharged into Chalice West Lake
L8146/2007/3	11/06/2015	Licence amendment to include new tenements to prescribed boundary and Challenge pit dewatering operation.
L8146/2007/3	21/04/2016	Licence amendment for TSF3 and TSF4 lifts from RL 1312.5 m to RL 1315m.
L9155/2018/1	21/09/2018	New licence issued – previous licence ceased.
L9155/2018/1	21/12/2018	Amendment Notice 1 - to include the Fairplay East Pit as a Tailings Storage Facility, construct a new seepage pond at the TSF and include the current monitoring bores at the Aphrodite in-pit TSF. Add category 64 to the Licence.
L9155/2018/1	4/05/2019	Amendment Notice 2 – Add dewatering from Baloo Pit to Lake Cowan as a discharge and amend the Premises boundary to include the tenement in which Baloo open pit is located.
L9155/2018/1	***	Amendment Notice 3 – Include Vine Pit void as a Tailings Storage Facility.

Location and receptors

Table 3 below lists the relevant sensitive land uses in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 3: Receptors and distance from activity boundary

Residential and sensitive premises	Distance from Prescribed Premises
Widgiemooltha community	Approximately 30 km north west of the Higginsville operations
Norseman Town site	Approximately 50 km south of the Higginsville operations

Table 4 below lists the relevant environmental receptors in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 4: Environmental receptors and distance from activity boundary

Environmental receptors	Distance from Prescribed Premises
Binaronca Rock Nature Reserve	Approximately 4.5 km north west of the Higginsville operations.

Risk Assessment Methodology

The risk assessment following utilises the risk rating matrix as shown in Table 5, in accord with DWER's *Guidance Statement: Risk Assessments (November 2016)* (DER 2016a). The risk criteria used in the matrix below is further defined in Table 6.

Table 5: 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

Table 6: Risk criteria definitions (taken from DWER's *Guidance Statement: Risk Assessments*)

Consequence		
The following criteria will be used to determine the consequences of a risk event occurring:		
	Environment	**Public Health* and Amenity (such as air and water quality, noise, and odour)**
Severe	• **on-site impacts**: catastrophic • **off-site impacts local scale**: high level or above • **off-site impacts wider scale:** mid level or above • Mid to long term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • **Adverse health effects:** high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • **Local scale impacts:** permanent loss of amenity
Major	• **on-site impacts**: high level • **off-site impacts local scale**: mid level • **off-site impacts wider scale**: low level • Short term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• **Adverse health effects:** mid level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • **Local scale impacts**: high level impact to amenity
Moderate	• **on-site impacts**: mid level • **off-site impacts local scale**: low level • **off-site impacts wider scale**: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• **Adverse health effects:** low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • **Local scale impacts:** mid level impact to amenity
Minor	• **on-site impacts**: low level • **off-site impacts local scale**: minimal • **off-site impacts wider scale**: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • **Local scale impacts:** low level impact to amenity
Slight	• **on-site impact**: minimal • Specific Consequence Criteria (for environment) met	• **Local scale**: minimal impacts to amenity • Specific Consequence Criteria (for public health) criteria met

Likelihood	
The following criteria will be used to determine the likelihood of the risk event occurring.	
Almost Certain	The risk event is expected to occur in most circumstances
Likely	The risk event will probably occur in most circumstances
Possible	The risk event could occur at some time
Unlikely	The risk event will probably not occur in most circumstances.
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

Risk assessment

Tables 7 and 8 below describe the Risk Events associated with the amendment consistent with the *Guidance Statement: Risk Assessments*. Both tables identify whether the emissions present a material risk to public health or the environment, requiring regulatory controls.

Table 7: Risk assessment for proposed amendments during construction

Risk Event						Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**				
Category 5 Processing or beneficiation of metallic and non-metallic ores	Construction of tailings and return water pipeline for Vine pit	Noise	No residences in proximity (nearest is 30km).	Air / wind dispersion	Health and amenity impacts	N/A	N/A	N/A	Dust and Noise emissions for pipeline construction will be short term and limited to vehicle movements and minor earthworks. No receptors nearby will be affected by construction activities.
		Dust	No residences in proximity (nearest is 30km), vegetation adjacent to pipeline route.		Health and amenity impacts	N/A	N/A	N/A	

Table 8: Risk assessment for proposed amendments during operation

Risk Event						Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**				
Category 5: Processing or beneficiation of metallic and non-metallic ores	Tailings deposition into Vine pit	Mounding of groundwater from tailings seepage	Adjacent native vegetation	Rising groundwater bringing hypersaline groundwater in contact with vegetation	Hypersaline groundwater inundating plant roots causing plant death	Moderate	Rare	Medium	The low permeability of Vine pit means an expected low seepage from deposition of tailings into the pit. Mounding due to tailings disposal into Vine pit is expected to be low. Monitoring bores will ensure that any mounding will be recorded and managed if outside of the modelling predictions. The operation of the Vine in-pit TSF will be undertaken as per the Licence Holder's "TSF Operations Manual". No additional regulatory controls deemed necessary beyond those already proposed.
	Tailings and tailings return water pipeline transport	Release of tailings or tailings decant water (return water)	Adjacent native vegetation Soil contamination	Pipeline failure	Alkaline saline, arsenic enriched tailings or saline return tailings water causing vegetation death or poor growth or soil contamination	Minor	Rare	Low	All pipeline routes will be within roadside bunds and divert to purpose built sumps, 500 metres apart. All pipelines will be constructed with new materials. The entire pipeline and Vine pit TSF will be inspected on a daily basis by an operator. The operation of the tailings and return water pipelines will be undertaken as per the Licence Holder's "TSF Operations Manual". No additional regulatory controls deemed necessary beyond those already proposed.

Decision

The deposition of tailings to Vine In-pit TSF and installation of associated infrastructure is approved.

Licence Holder's comments

The Licence Holder was provided with the draft Amendment Notice on 20/8/2019. Comments received from the Licence Holder have been considered by the Delegated Officer as shown in Appendix 2.

Amendment

1. Table 1.2.2 of the licence is amended by the insertion of red text in underline below:

Table 1.2.2: Containment infrastructure		
Containment cell or dam number(s)	**Discharge**	**Infrastructure requirements**
Above ground TSF	Tailings	Lined with at least 0.5m of clay with a permeability of $<10^{-7}$ m/s or equivalent
Aphrodite In-pit TSF	Tailings	-
Fairplay East In-pit TSF	Tailings	-
Vine In-pit TSF	Tailings	-
Decant Water Pond	Decant water	Lined with at least 0.5m of clay with a permeability of $<10^{-7}$ m/s or equivalent

2. Table 1.2.5 of the Licence is amended by the deletion of text in strikethrough and the insertion of red text in underline as shown below:

Table 1.2.5: Construction requirements~~1~~		
Column 1	**Column 2**	**Column 3**
Infrastructure/Equipment	**Requirements (design and construction)**	**Site plan reference**
~~Baloo Project dewatering pipeline~~	~~• Install a 1.1 km pipeline fitted with telemetry leak detection;~~ ~~• The dewater pipeline is to be fitted with an energy diffusion device at the discharge point.~~	~~Pipeline to run from Baloo pit to discharge point of easting 393,885.63 m and northing 6,480,253.55 mas shown in point 10 of this Amendment Notice 2.~~
Tailings discharge and return water pipelines to and from the Vine In-pit TSF	• Located within a bunded corridor. • Flowmeters installed on pipelines at the processing plant and at the discharge point with telemetry into the control system.	As per Drawing no. *PER2018-0450* (included in this amendment notice as Figure 1)
Groundwater monitoring bores	• Installation of monitoring bores VMB1, VMB2 and VMB3 to depth of 60m from surface	Indicative locations as per Drawing no. *497.1/19/2-4* (included in this amendment notice as Figure 2)

3. Table 3.4.1 of the Licence is amended by the deletion of the text in strikeout and the insertion of the red text in underline shown below:

Table 3.4.1: Process monitoring					
Monitoring point reference	**Process description**	**Parameter**	**Units**	**Frequency**	**Method**
TSF3 and 4 Aphrodite In-Pit TSF Fairplay East In-pit TSF Vine In-pit TSF	Tailings delivery to TSF	Volume, and mass of tailings deposited into the TSF (figures for wet and dry)	m^3 and tonnes	Monthly	None specified
TSF 3 and 4 Aphrodite In-pit TSF Fairplay East In-pit TSF Vine In-pit TSF	TSF return water	Volumes of water recovered from the TSF	kL	Monthly	None specified
TSF 3 and 4 Aphrodite In-Pit TSF Fairplay East In-pit TSF Vine In-pit TSF	Seepage recovery	Volume of seepage water recovered from the TSF	kL	Monthly	None specified
G1 & G2	Dewatering from mines to Aphrodite East Pit and Poseidon North Pit	Volume of dewatering into Aphrodite Pits, and Poseidon North Pit	kL	Monthly	None specified
Baloo Pit	Dewatering from pit to Lake Cowan	Volume discharged	kL	Monthly	Flowmeter readings

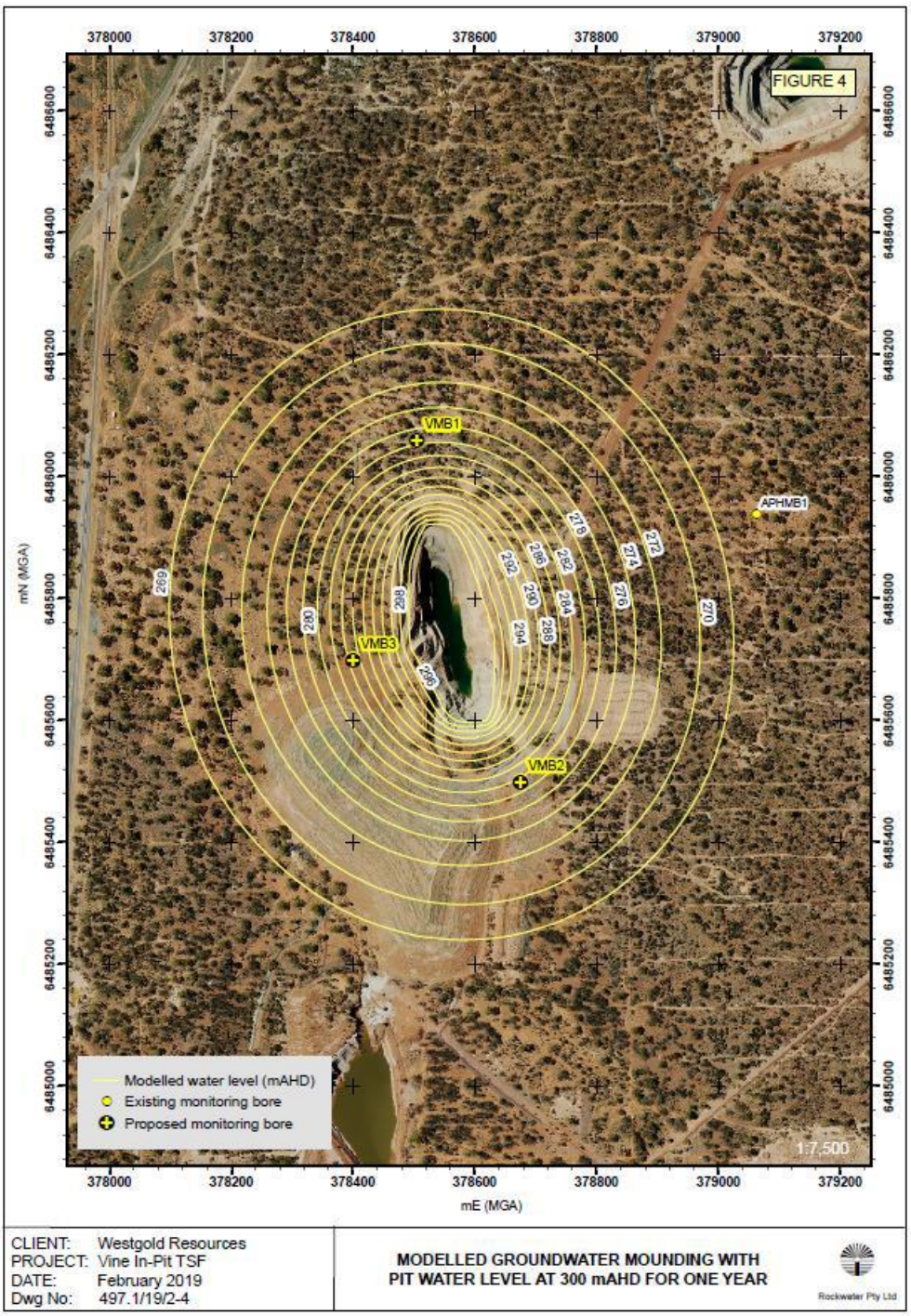
4. Table 3.5.1 of the Licence is amended by the deletion of text in strikethrough and the insertion of the red text in underline shown below:

Table 3.5.1: Monitoring of ambient groundwater quality					
Monitoring point reference and location	**Parameter[1]**	**Limit**	**Units**	**Averaging period**	**Frequency**
Tailings outfall and decant water	pH	-		Spot sample	Monthly when in operation.
	WAD CN	-	mg/L		
Monitoring bores: Above ground TSF: HMB1, HMB3, HMB4, HMB5, HMB6, HMB7, HBM9. Aphrodite In-pit TSF: APHMB1, APHMB2, APHMB3, APHMB4, APHMB5, APHMB6. Fairplay East In-pit TSF FPEMB1, FPEMB2, FPEMB3. Vine In-pit TSF: VMB1, VMB2 and VMB3	SWL	4	mbgl		Monthly when in operation; Six monthly when in care and maintenance.
	pH	-			Monthly when in operation; Six monthly when in care and maintenance
	TDS	-	mg/L		
	Conductivity	-	mS/cm		Quarterly when in operation; Annually when in care and maintenance
	WAD CN	0.5	mg/L		
	aluminium, arsenic, barium, boron, beryllium, bicarbonate, carbonate, cadmium, cobalt, chromium, chloride, copper, iron, mercury, potassium, magnesium, manganese, molybdenum, nickel, lead, selenium, silicon, sulfate, sodium, strontium, thallium, vanadium, zinc	-	mg/L		

Note 1: pH and TDS may be measured in the field

5. *The locations of the emission points defined in Tables 2.3.1 and 2.4.1* as in Schedule 1: Maps is removed and replaced with the map shown below:

6. The locations of monitoring points defined in Table 3.5.1 and as shown by the map in Schedule 1 has the following map inserted:



Appendix 1: Key documents

	Document title	In text ref	Availability
1	Licence L9155/2018/1 – Alcoa Higginsville Gold Mine	L9155/2018/1	accessed at www.dwer.wa.gov.au
2	Westgold Resources Limited, May 2019 – *Supporting Information: Vine In-Pit TSF*	Supporting document	DWER records (DWERDT181555)
3	Rockwater Pty Ltd, February 2019 – *Vine In-Pit TSF, Results of Groundwater Modelling*	Rockwater report	DWER records (DWERDT181337)
4	CMW Geosciences Pty Ltd, April 2019 – *Vine Pit Tailings Storage Facility Design Report*	CMW Report	DWER records (DWERDT181340)
5	DER, July 2015. *Guidance Statement: Regulatory Principles.* Department of Environment Regulation, Perth.	DER 2015a	accessed at www.dwer.wa.gov.au
6	DER, October 2015. *Guidance Statement: Setting Conditions.* Department of Environment Regulation, Perth.	DER 2015b	
7	DER, November 2016. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.	DER 2016b	
8	DER, November 2016. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth.	DER 2016c	

Appendix 2: Summary of Licence Holder comments

The Licence Holder was provided with the draft Amendment Notice on 20/8/2019 for review and comment. The Licence Holder responded on 21/8/2019, waiving the remaining comment period.