# Concurrent application for Works Approval and Licence

## Division 3, Part V *Environmental Protection Act 1986*

| | |
|---|---|
| **Works Approval Number** | W6028/2017/1 |
| **Licence Number** | L9029/2017/1 |
| **Applicant** | Avoca Mining Pty Ltd |
| **ACN** | 108 547 217 |
| **File Number** | DER2017/000121 (Works Approval)<br>DER2017/000122 (Licence) |
| **Premises** | Mt Henry Project<br>M63/515, L63/64 and G63/7<br>NORSEMAN<br>Shire of Dundas |
| **Date of Initial Report** | 14 July 2017 |
| **Revised Report** | 22 March 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 |
|---|---|
| AACR | Annual Audit Compliance Report |
| ACN | Australian Company Number |
| AER | Annual Environment Report |
| Category/ Categories/ Cat. | categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations |
| CS Act | *Contaminated Sites Act 2003* (WA) |
| DWER | Department of Water and Environmental Regulation |
| Decision Report | refers to this document. |
| Delegated Officer | an officer under section 20 of the EP Act. |
| DMIRS | Department of Mines, Industry Regulation and Safety |
| EPA | Environmental Protection Authority |
| EP Act | *Environmental Protection Act 1986* (WA) |
| EP Regulations | *Environmental Protection Regulations 1987* (WA) |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* (Cth) |
| Licence Holder | Avoca Mining Pty Ltd |
| $m^3$ | cubic metres |
| mtpa | million tonnes per annum |
| Noise Regulations | *Environmental Protection (Noise) Regulations 1997* (WA) |
| Occupier | has the same meaning given to that term under the EP Act |
| Prescribed Premises | has the same meaning given to that term under the EP Act |
| 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 |
| riparian | relating to or living or located on the bank of a natural watercourse (such as a river); sometimes of a lake or a tidewater |

| | |
|---|---|
| Risk Event | As described in *Guidance Statement: Risk Assessment* |
| TDS | Total Dissolved Solids |
| µg/L | micrograms per litre |

# 2. Purpose and scope of assessment

Avoca Mining Pty Ltd (the Applicant) submitted an Application for a Works Approval and Licence under prescribed premises category 6, to discharge groundwater (mine dewater) from the Mt Henry open pit to Lake Dundas. The Application was received by the Department of Environment Regulation on 12 January 2017.
Avoca Mining Pty Ltd is a wholly owned subsidiary of Westgold Resources Limited.

## 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 |
|---|---|
| *actis* Environmental Services (2016) Proposed Short-term Dewatering Discharge Mt Henry. Unpublished report for Higginsville Gold Operations, Metals X Ltd, July 2016 | 12 January 2017 |
| Groundwater Development Services (GDS) Pty Ltd (2015) *H1 Desktop Hydrogeological Assessment Mt Henry Open Pits,* unpublished report for Higginsville Gold Operations, October 2015 | 12 January 2017 |
| Wetland Research & Management (2013) *Lake Dundas Sediment Rehydration, Water Quality & Aquatic Fauna Surveys Final Report*; unpublished report for Panoramic Resources Ltd, February 2013 | 16 May 2017 |
| Compliance Document and Monitoring Scope:<br>Westgold Resources Limited (2018) Avoca Mining Pty Ltd - Mt Henry Dewatering Project, W6028/2017/1 Compliance Document, September 2018<br>Westgold Resources Limited (2018b) Avoca Mining Pty Ltd Mt Henry Project, Monitoring Scope for Works Approval W6208/2017/1 | 6 November 2018 |
| Emailed photos of the constructed dewatering pipeline:<br>Westgold Resources Limited (2019), *Mt Henry Project – L9023/2017/1 & W6028/2017/1 - Photographic evidence in support of compliance document* | 8 February 2019 |

# 3. Background

Table 3 lists the prescribed premises categories that have been applied for.

**Table 3: Prescribed Premises Categories in the Existing Licence**

| Classification of Premises | Description | *Approved Premises production or design capacity or throughput* |
|---|---|---|
| Category 6 | Mine dewatering: premises on which water us extracted and discharged into the environment to allow mining of ore | 400 000 tpa |

# 4. Overview of Premises

## 4.1 Operational aspects

Mt Henry Project is a gold mining project located approximately 20 km south of Norseman, adjacent to Lake Dundas, in an area known as the Dundas Hills. Gold was discovered in the region in 1892 and the town of Dundas was established in 1893, with Norseman established in 1894 (Metals X 2016). The mining tenements surrounding and including Mt Henry were previously owned by the Central Norseman Gold Corporation (from 1935 to 1980). Mining occurred at the Mt Henry open pit and underground from 1982 – 1988 by Australis Mining NL.

Avoca Mining Pty Ltd has been granted approval to commence open pit mining at Mt Henry Pit by the Department of Mines, Industry Regulation and Safety (DMIRS). No processing of ore will be conducted on site, with ore transported to the Higginsville Gold Operations (located 70 km to the north) for processing.

In order to access ore at depth within Mt Henry Pit, groundwater must be removed from the pit and discharged elsewhere. Avoca Mining is seeking approval under Part V of the EP Act to discharge the excess groundwater from Mt Henry Pit to Lake Dundas.

## 4.2 Infrastructure

The Mt Henry Project infrastructure, as it relates to Category 6 activities, is detailed in Table 4 and as shown in Figure 1 following (also attached in the Works Approval).

Table 4 lists infrastructure associated with each prescribed premises category.

**Table 4: Mt Henry Project Category 6 infrastructure**

| | **Infrastructure** |
|---|---|
| | **Prescribed Activity Category 6** |
| Transfer groundwater to Lake Dundas from Mt Henry Open Pit via pipeline to Lake Dundas | |
| 1 | Pipework from pit to lake |
| 2 | Pipeline telemetry |
| 3 | Pipeline bunding |
| | **Directly related activities** |
| Authorisation of abstraction of groundwater for mining is under the *Rights in Water and Irrigation Act 1914* | |
| 1 | Install and operate dewatering pumps and bores |
| | **Other activities** |
| 1 | Grade access track from pit to lake (track ends at lake edge). |

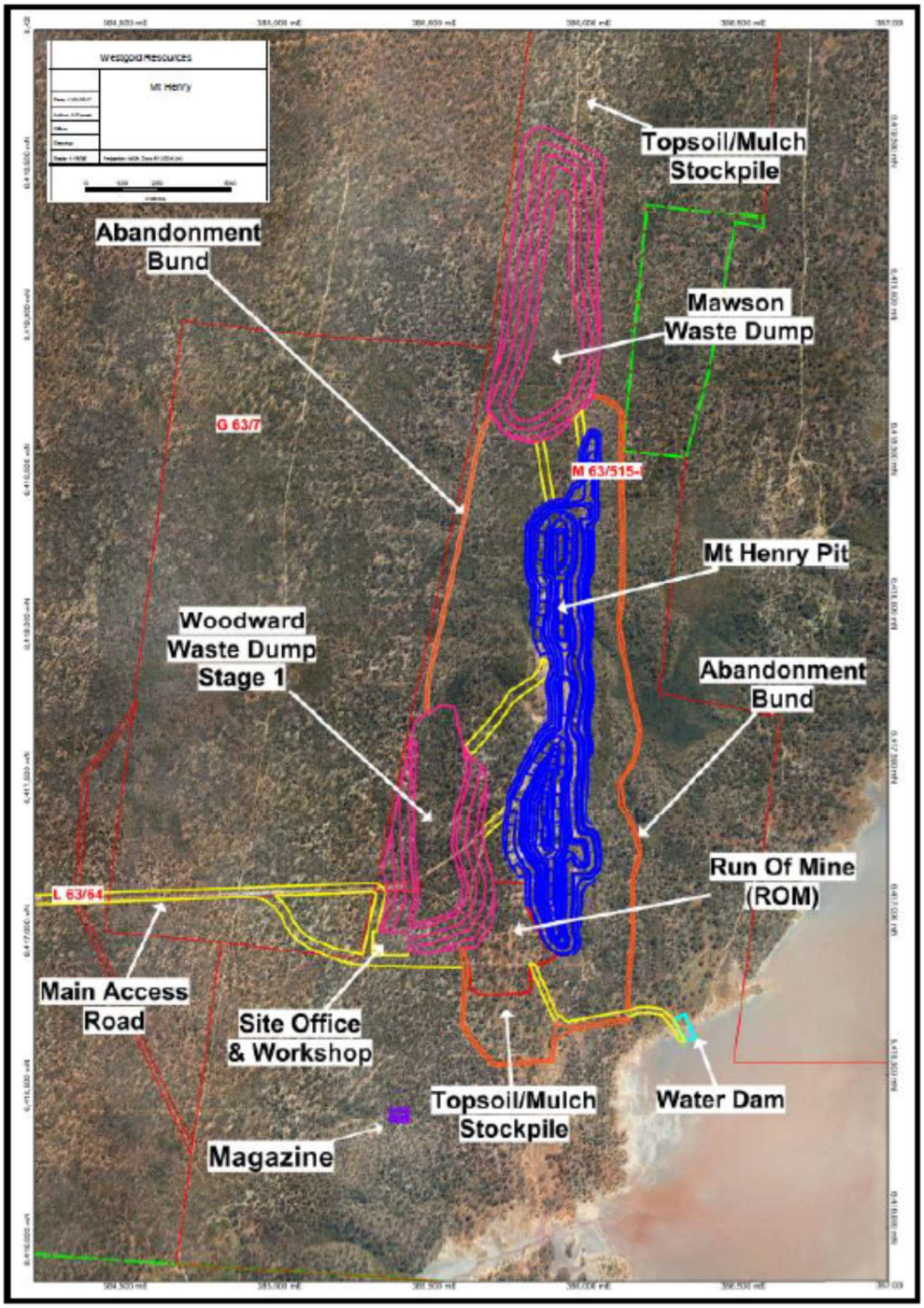


**Figure 1: Mt Henry Project Site Layout**

## 4.3 Exclusions to the Premises

Activities relating to the mining of the ore, placement of waste rock/overburden, materials handling and stockpiling are excluded from the Premises. Abstraction of groundwater (also known as mine dewater) at the Premises is also excluded, as this activity is regulated by the Department of Water under the *Rights in Water and Irrigation Act* 1914.

The Applicant should note that the works approval and licence is related to activities subject to category 6 and does not provide a legal defence to environmental impacts arising from other activities conducted within the Premises.

# 5. Legislative context

Table 5 summarises approvals relevant to the assessment.

**Table 5: Relevant approvals and tenure**

| Legislation | Number | Subsidiary | Approval |
|---|---|---|---|
| *Rights in Water and Irrigation Act 1914* | GWL 181866(1) | Avoca Mining Pty Ltd | Approval to take groundwater |
| *Mining Act 1978* | Mining Proposal Reg ID 58395 | Avoca Mining Pty Ltd | Approval to conduct mining operations |
| *Environmental Protection Act 1986,* Division 2, Part V (Clearing of Native Vegetation) | CPS #6823-2 | Avoca Mining Pty Ltd | Approval to clear 546.35 ha within M63/515 and G63/7 |

## 5.1 Contaminated sites

The Premises has not been reported under the *Contaminated Sites Act 2003*.

## 5.2 Other relevant approvals

### 5.2.1 Department of Mines, Industry Regulation and Safety

A Mining Proposal under the *Mining Act 1978* has been approved for the Project by DMIRS, Registration ID 58395.

### 5.2.2 Department of Water

A groundwater extraction licence under section 5C of the *Rights in Irrigation and Water Act 1914* has been approved by the Department of Water, Licence GWL181866(1).

## 5.3 Part V of the EP Act

### 5.3.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations. DWER guidance statements which inform this assessment are:

- *Guidance Statement: Regulatory Principles (July 2015)*
- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Land Use Planning (February 2017)*
- *Guidance Statement: Licence Duration (August 2016)*
- *Guidance Statement: Publication of Annual Audit Compliance Reports (May 2016)*
- *Guidance Statement: Decision Making (November 2016)*
- *Guidance Statement: Risk Assessments (November 2016)*

### 5.3.2 Clearing

A Clearing Permit CPS #6823-2 has been granted for the Premises by DMIRS, under delegation.

# 6. Location and siting

## 6.1 Siting context

The Premises is located to the west of a northern branch of Lake Dundas, approximately 20km south of the town of Norseman. Refer to Figure 2.

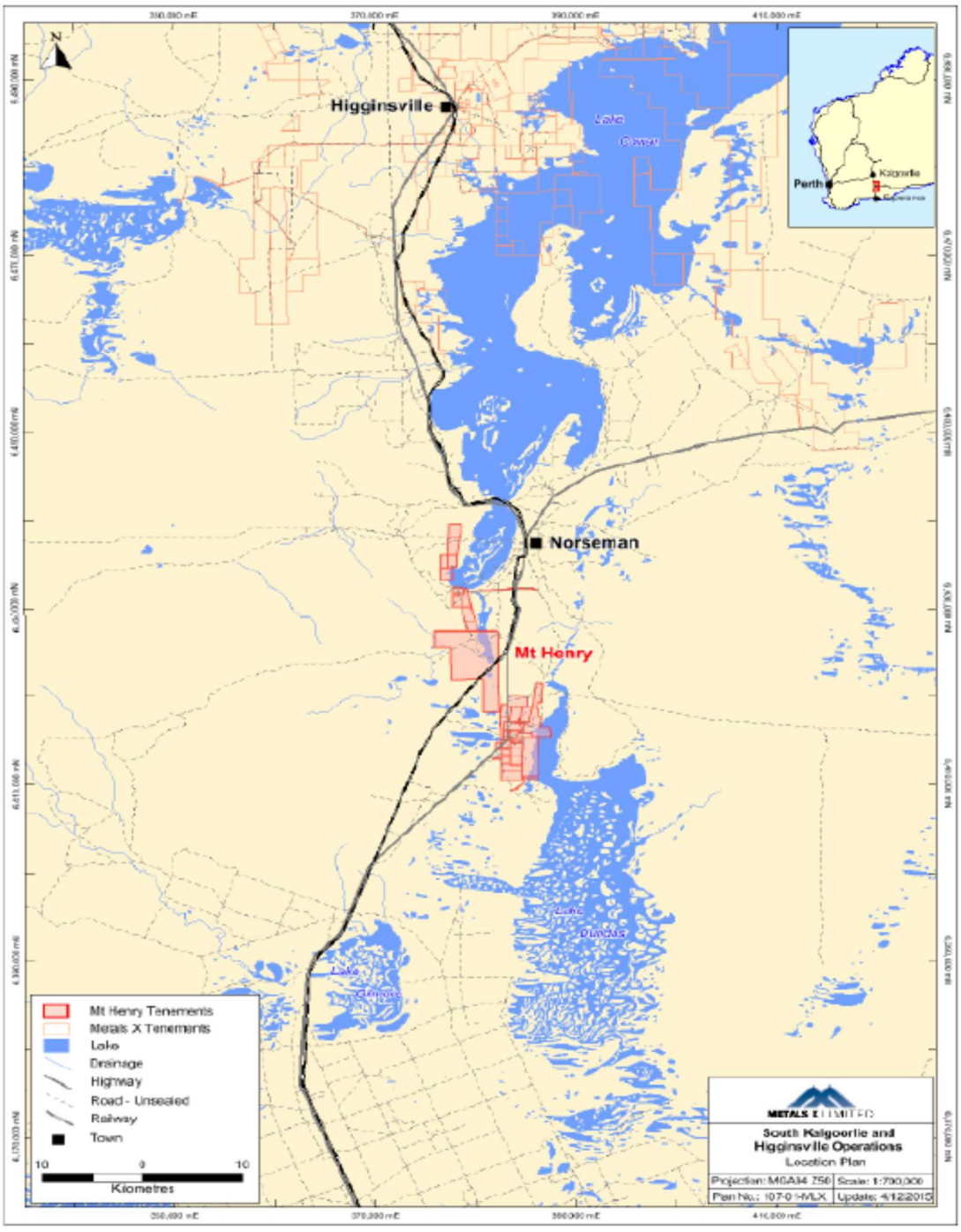


**Figure 2: Regional location of Mt Henry Project**

## 6.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 6.

**Table 6: Receptors and distance from activity boundary**

| Sensitive Land Uses | Distance from Prescribed Activity |
|---|---|
| Residential Premises – Town of Norseman | 20 km |

## 6.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of emissions and discharges occurring from activities conducted at the Premises. The distances to specified ecosystems are shown in Table 7. Table 7 also identifies the distances to other significant and relevant ecosystem values.

The table has also been modified to align with the *Guidance Statement: Environmental Siting.*

**Table 7: Environmental values**

| Specified ecosystems | Distance from the Premises |
|---|---|
| Ramsar Sites in Western Australia | Toolibin Lake is the nearest Ramsar site. It is approximately450 km south west from the Premises. |
| Important wetlands – Western Australia | The nearest listed wetland is Lake Ballard, approximately 350 km to the north of the Premises. |
| Brockway Timber Reserve: Class 'C' conservation reserve | Immediately to the north of the Premises; also a section of M63/515 overlaps part of the Brockway Timber Reserve |
| Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) | No TECs or PECs located within the Premises boundary (NVS 2016). |
| **Biological component** | **Distance from the Premises** |
| Threatened/Priority Flora | No threatened flora located within the Premises. The following priority flora have been recorded within the Premises:<br>• *Eucalyptus jimberlanica* (P1);<br>• *Philotheca apiculata* (P1);<br>• *Cyathostemon* sp. Salmon Gums (P3);<br>• *Eremophila purpurascens(P3);*<br>• *Eucalyptus brockwayi* (P3);<br>• *Goodenia laevis* subsp. *laevis* (P3); and<br>• *Allocasuarina eriochlamys* subsp. *grossa* (P3).<br>(NVS 2016 as quoted in Decision Report for CPS#6823-2)). |
| Threatened/Priority Fauna | No threatened or priority fauna recorded.<br>One nesting burrow of Rainbow Bee-Eater (*Merops ornatus*) located on Premises (Western Wildlife 2013 as quoted in Decision Report for CPS#6823-2) |

| Other relevant ecosystem values | Distance from the Premises |
|---|---|
| Great Western Woodlands | The Premises is sited within an area of vegetation known as the Great Western Woodlands |

## 6.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 8. Regional hydrogeology is characterized by three flow systems being:

- Tertiary palaeochannel sands (Wollubar sandstone);
- Calcrete units that overlie palaeochannel deposits; and
- Shallow alluvium.

Groundwater is recharged by direct rainfall infiltration or by stream flow during episodic rainfall events. The groundwater moves from catchment divides to discharge into salt lakes along palaeo-drainages.

At Mt Henry there is connectivity between Lake Dundas and the shallow groundwater system

Groundwater salinity of the Mt Henry Pit ranges from 10 000 mg/L TDS in the north to 121 000 mg/L TDS in the south.

**Table 8: Groundwater and water sources**

| Groundwater and water sources | Distance from Premises | Environmental value |
|---|---|---|
| Public drinking water source areas | Not present | N/A |
| Major watercourses/waterbodies – Lake Dundas | At Premises boundary. Part of M63/515 is granted over a section of Lake Dundas. | Environmental receptor |
| Saline to hypersaline groundwater (TDS 10 000 – 121 000 mg/L Mt Henry Pit; 239 000 – 274 000 mg/L North Scotia Pit). | Within Mt Henry Pit at groundwater encountered at 250 m AHD to 275 m AHD (~ 10 mbgl to 35 mbgl from south to north);<br>At North Scotia Pit groundwater level is at 245 – 246 m AHD (~ 7 – 6 mbgl). | Water is used for mining and dust suppression during road construction (not suitable for livestock).<br>Nearest groundwater bores are 4km south of the Premises (GDS 2015). |

## 6.5 Meteorology

### 6.5.1 Rainfall and temperature

The nearest Bureau of Meteorology weather monitoring station is located at Norseman. The climate is semi-arid, with a mean annual rainfall at Norseman is 288 mm. Annual evaporation rate is estimated at 2000 mm - 2200 mm (*actis* 2016).

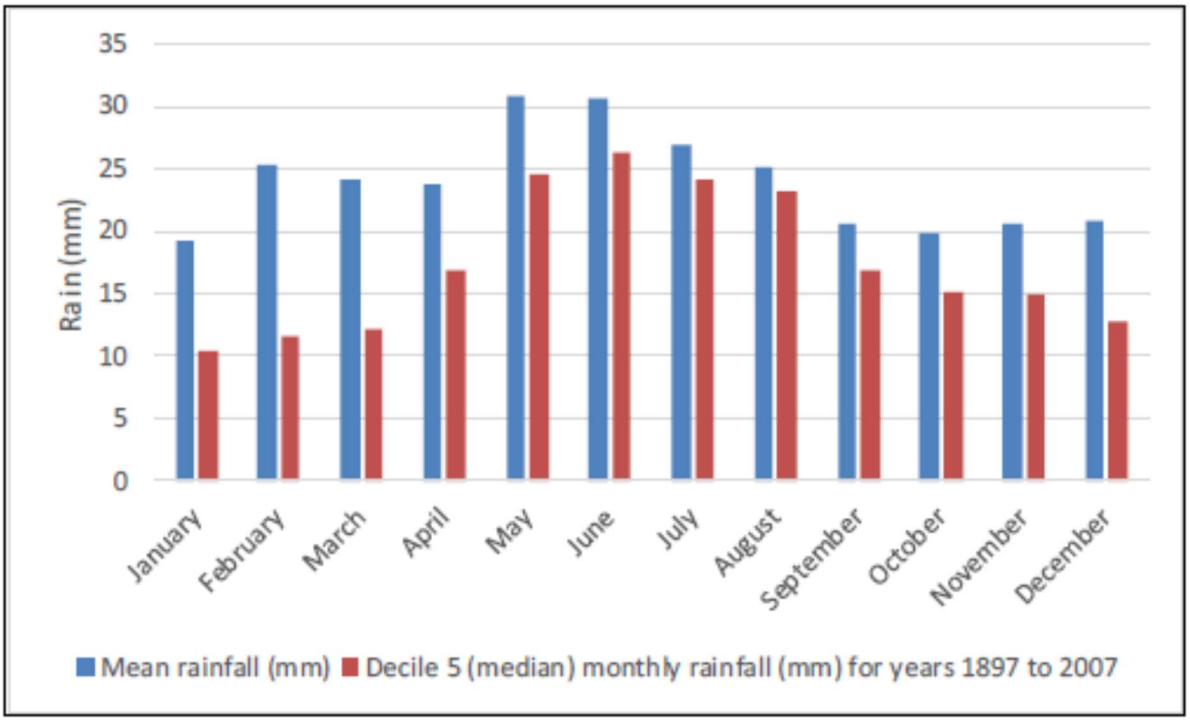


**Figure 3: Mean and median rainfall data for Norseman (*actis* 2016)**

# 7. Baseline monitoring data

## 7.1 Receptor Baseline Information

Monitoring of sites on Lake Dundas and neighbouring Lake Gregory was conducted in November 2012 and following a rainfall event in February 2013 for water quality, metals in lake sediment and aquatic invertebrates. Sites at Lake Dundas were located above the northern causeway (denoted LDNC1 – LDNC3), within the northern basin (LDNB1 – LDNB5), and within the main basin (LDMB1- LDMB3). Three sites were also sampled at the adjacent Lake Gregory (LG1 – LG3). The northern basin of the Lake is the area that will be impacted by the proposed discharge, with LDNB3 being closest to the discharge location. Refer to Figure 4 for site locations following.

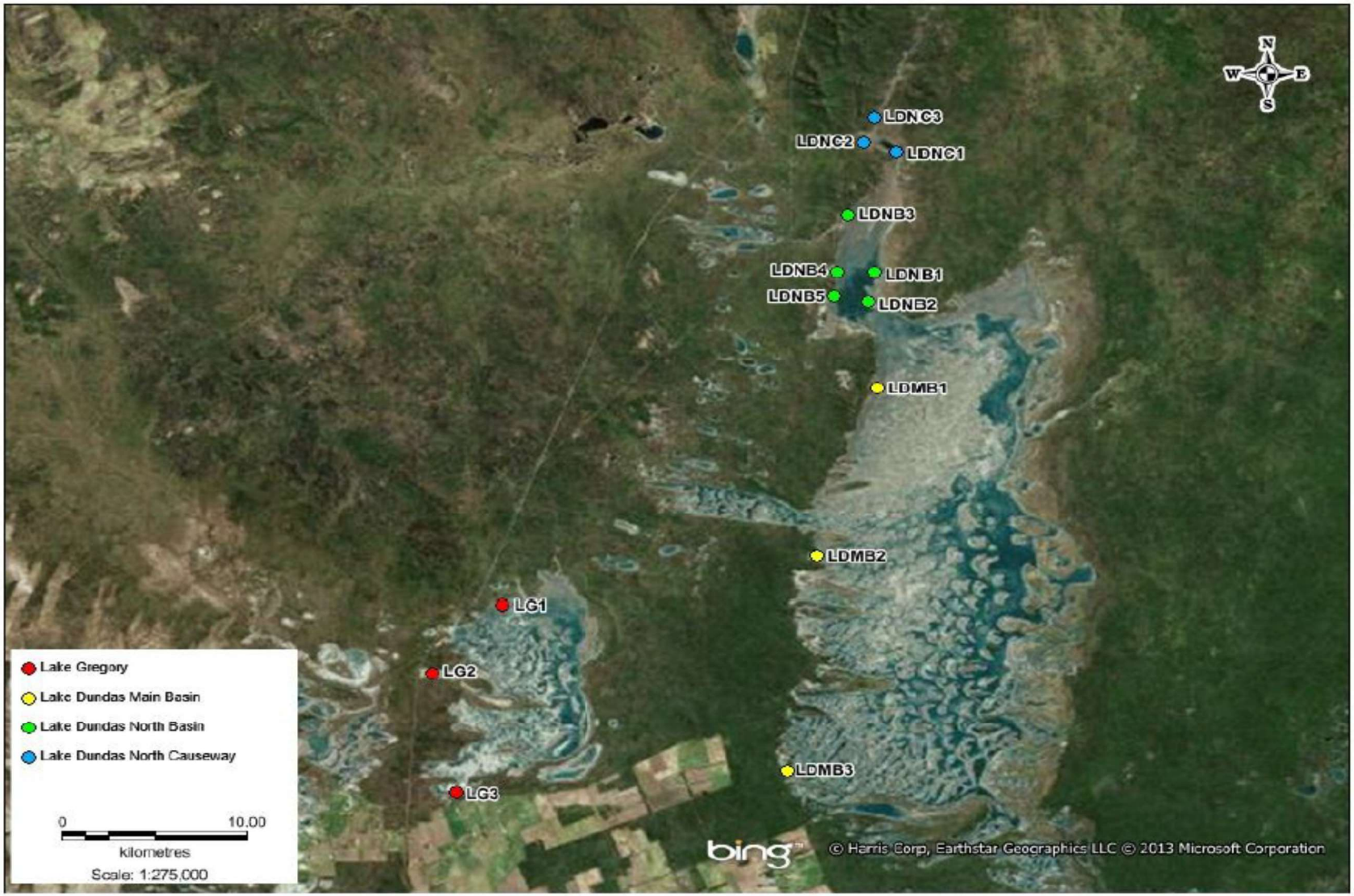


**Figure 4: Baseline monitoring sites on Lake Dundas and Lake Gregory (WRM 2013)**

### 7.1.1 Lake Dundas surface water quality

Values for surface water quality as monitored in Lake Dundas in February 2013, approximately 20 days following a significant rainfall event. The metals/metalloids below are dissolved concentrations.

These values have been compared to ANZECC (2000) guidelines trigger values for protection of 95 % of species in marine environments. It is noted that this value is conservative. Values in red bold represent concentrations above the trigger value. Those in red are potentially above the trigger value, but this is unable to be determined due to the elevated level of detection for these samples.

**Table 9: Surface water quality parameters Lake Dundas - February 2013 (WRM 2013)**

| Parameter | Units | LDNC1 | LDNC2 | LDNB1 | LDNB2 | ANZECC Protection of 95% Marine sp |
|---|---|---|---|---|---|---|
| pH | - | 9.2 | 8.6 | 7.3 | 7.3 | |
| Electrical conductivity | µs/cm | 91 800 | 87 400 | 225 000 | 224 000 | |
| Dissolved Oxygen | % | 113.9 | 120.2 | 48.6 | 69.9 | |
| Carbonate | mg/L | 26 | 18 | 0.5 | 0.5 | |
| Chloride | mg/L | 36 800 | 36 300 | 199 000 | 198 000 | |
| Sulfate | mg/L | 3 330 | 3 030 | 12 100 | 10 900 | |
| Sodium | mg/L | 22 600 | 20 300 | 103 000 | 103 000 | |
| Magnesium | mg/L | 1 830 | 1 630 | 9 680 | 10 300 | |
| Potassium | mg/L | 108 | 110 | 1 270 | 1 320 | |
| Calcium | mg/L | 718 | 661 | 575 | 559 | |
| Total Nitrogen | mg/L | 1.9 | 1.4 | 3.5 | 3.7 | |
| Total Phosphorus | mg/L | 0.005 | 0.005 | 0.04 | 0.01 | |
| Aluminium | mg/L | <0.025 | <0.025 | <0.025 | 0.075 | |
| Arsenic | mg/L | <0.020 | <0.020 | <0.050 | <0.050 | |
| Boron | mg/L | 2.4 | 2.3 | 2.6 | 2.5 | |
| Barium | mg/L | 0.16 | 0.14 | 0.28 | 0.28 | |
| Cadmium | mg/L | <0.002 | <0.002 | <0.005 | <0.005 | 0.0055 |

| Parameter | Units | LDNC1 | LDNC2 | LDNB1 | LDNB2 | ANZECC Protection of 95% Marine sp |
|---|---|---|---|---|---|---|
| Cobalt | mg/L | <0.002 | <0.002 | <0.005 | <0.005 | 0.001 |
| Chromium | mg/L | <0.01 | <0.01 | <0.025 | <0.025 | 0.0044[1] |
| Copper | mg/L | <0.002 | **0.0026** | <0.005 | <0.005 | 0.0013 |
| Iron | mg/L | <0.025 | <0.025 | <0.025 | 0.073 | |
| Manganese | mg/L | 0.006 | 0.005 | 0.22 | 0.063 | |
| Molybdenum | mg/L | <0.020 | <0.020 | <0.050 | <0.050 | |
| Nickel | mg/L | <0.020 | <0.020 | <0.050 | <0.050 | 0.07 |
| Lead | mg/L | **0.0026** | <0.0020 | <0.0050 | <0.0050 | 0.0044 |
| Selenium | mg/L | <0.020 | <0.020 | <0.050 | <0.050 | 0.002[2] |
| Uranium | mg/L | <0.0020 | <0.0020 | <0.0050 | <0.0050 | |
| Vanadium | mg/L | <0.0020 | 0.0026 | <0.0050 | 0.0054 | |
| Zinc | mg/L | **0.04** | <0.020 | <0.050 | <0.050 | 0.015 |

Note 1: ANZECC Guidelines (2000) for Chromium VI concentration

Note 2: Selenium trigger value taken from Lemly (2002) in absence of an ANZECC guideline value. This approach is consistent with other assessments for prescribed premises discharging to salt lakes.

### 7.1.2 Lake Dundas metals/metalloids in sediment

Below is the data from sediment sampling conducted in December 2012 (WRM 2012). These values have been compared against the ANZECC (2000) Interim Sediment Quality Guideline High Trigger Value (there is also a low trigger value). Values in red bold represent concentrations above the high trigger value.

**Table 10: Metals/metalloids in Lake Dundas sediment - December 2012 (WRM 2013)**

| Parameter | Units | LDNC1 | LDNC2 | LDNB1 | LDNB2 | ANZECC Interim Sediment Quality Guideline High Trigger Value |
|---|---|---|---|---|---|---|
| Aluminium | mg/kg | 46 500 | 25 900 | 7 110 | 4 790 | |
| Arsenic | mg/kg | 17 | 13 | 2.1 | 1.8 | 70 |
| Boron | mg/kg | 79 | 60 | 16 | 11 | |
| Barium | mg/kg | 41 | 51 | 36 | 25 | |
| Beryllium | mg/kg | 0.98 | 0.67 | 0.14 | 0.09 | |
| Bismuth | mg/kg | 0.2 | 0.16 | 0.06 | <0.05 | |
| Calcium | mg/kg | 2 900 | 1 200 | 130 000 | 130 000 | |
| Cadmium | mg/kg | 0.1 | <0.05 | 0.1 | 0.07 | 10 |
| Cobalt | mg/kg | 30 | 27 | 7.5 | 8.2 | |
| Chromium | mg/kg | 160 | 110 | 18 | 12 | 370 |
| Copper | mg/kg | 50 | 37 | 9.7 | 6.2 | 270 |
| Gallium | mg/kg | 12 | 8.3 | 2.3 | 1.5 | |
| Iron | mg/kg | 61 000 | 46 000 | 7 200 | 4 800 | |
| Lead | mg/kg | 7.1 | 5.2 | 4.5 | 2.9 | 220 |
| Magnesium | mg/kg | 36 000 | 23 000 | 8 700 | 6 700 | |
| Manganese | mg/kg | 400 | 310 | 120 | 180 | |
| Mercury | mg/kg | 0.05 | 0.33 | 0.37 | 0.47 | 1 |
| Molybdenum | mg/kg | 0.6 | 0.47 | 1 | 0.78 | |
| Nickel | mg/kg | **90** | **58** | 11 | 6.9 | 52 |
| Selenium | mg/kg | 0.41 | 0.32 | 0.13 | 0.1 | |
| Silica | mg/kg | 100 | 140 | 150 | 160 | |
| Silver | mg/kg | 0.46 | 0.11 | 0.11 | 0.07 | 3.7 |

| Parameter | Units | LDNC1 | LDNC2 | LDNB1 | LDNB2 | ANZECC Interim Sediment Quality Guideline High Trigger Value |
|---|---|---|---|---|---|---|
| Tin | mg/kg | 0.5 | <0.5 | <0.5 | <0.5 | |
| Titanium | mg/kg | 130 | 120 | 50 | 41 | |
| Uranium | mg/kg | 0.83 | 0.53 | 0.51 | 0.33 | |
| Vanadium | mg/kg | 75 | 70 | 15 | 10 | |
| Zinc | mg/kg | 67 | 46 | 10 | 7 | 410 |

### 7.1.3 Lake Dundas aquatic invertebrates

Tables 11 and 12 following summarise the invertebrate species sampled at sites on Lake Dundas. WRM (2013) noted that the majority of these species are widely distributed. None of these species are unique (endemic) to Lake Dundas. The two anostracan (brine shrimp) *Paratemia serventyi* and *P.veronicae* were of interest; both species are common in alkaline, hypersaline salt lakes. WRM noted that *Parartemia* typically occurs in ephemeral saline lakes than are less than 1.5m deep when full and covered by a salt crust when dry.

It is noted that these samples do not represent a comprehensive list of species presented as not all fauna emerge from resting stages at the same time and under the same conditions.

**Table 11: Invertebrate species from rehydrated sediments collected December 2012 (WRM 2013)**

| Phylum / Class / Order | Family | Lowest Taxon | LDNB-1 | LDNB-2 | LDNB-3 | LDNB-4 | LDNB-5 |
|---|---|---|---|---|---|---|---|
| CHLOROPHYTA | | flagellates | 4 | 4 | 4 | 4 | 4 |
| PROTISTA | | | | | | | |
| CILIOPHORA | | Ciliophora spp. (indet.) | 4 | 4 | 4 | 4 | 4 |
| ARTHROPODA | | | | | | | |
| CRUSTACEA | | | | | | | |
| OSTRACODA | Cyprididae | *Australocypris bennetti* | | | | | |
| | | *Diacypris* sp. | | | | | |

**Table 12: Invertebrate species recorded in-situ Lake Dundas February 2013 (WRM 2013)**

| Phylum / Class / Order | Family | Species | LDNB-1 | LDNB-2 | LDNC-1 | LDNC-2 |
|---|---|---|---|---|---|---|
| CRUSTACEA | | | | | | |
| OSTRACODA | Cyprididae | *Australocypris bennetti* | 0 | 1 | 3 | 3 |
| | | *Diacypris* sp. | 0 | 0 | 3 | 3 |
| COPEPODA | | *Meridiecyclops baylyi* | 0 | 0 | 0 | 3 |
| ANOSTRACA | Parartemiidae | *Parartemia serventyi* | 3 | 2 | 0 | 0 |
| | | *Parartemia veronicae* | 3 | 3 | 0 | 2 |
| | | *Parartemia sp. (Indet.)* | 5 | 3 | 2 | 3 |
| INSECTA | | | | | | |
| COLEOPTERA | Hydrophilidae | *Berosus* sp. (L) | 0 | 0 | 3 | 3 |
| DIPTERA | | | | | | |
| | Ceratopogonidae | Ceratopogoninae spp. | 0 | 0 | 2 | 2 |
| | Dolichopodidae | Ceratopogonidae spp. (P) | 0 | 0 | 0 | 2 |
| | Chironomidae | Dolichopodidae spp. | 0 | 0 | 0 | 1 |
| | Chironomidae | *Procladius paladicola* | 0 | 0 | 2 | 0 |
| | | *Tanytarsus barbitarsis* | 0 | 0 | 0 | 1 |
| | | **Taxa richness** | **3** | **4** | **6** | **10** |

### 7.1.4 Lake Dundas salt loading

*actis* Environmental conducted samples of the top 5cm of the playa of the lake near the discharge location to derive an estimate of the existing salt loading. The salt load was estimated to be between 3.75 kg/m$^2$ and 6.0 kg/m$^2$ , with an average of 4.6 kg/m$^2$ (*actis* 2016).

**Key findings:**

1. Background surface water quality may be naturally elevated for chromium, copper, lead, selenium and zinc for sites in the Lake Dundas northern basin (area subject to the discharge).
2. With the exception of nickel for sites north of the causeway (noting those sites will not be affected by the discharge due to the causeway) sediment samples did not exceed the high trigger values for ANZECC interim sediment quality guideline.
3. A range of aquatic invertebrate species typical of salt lakes were recorded from the sampling conducted in 2012/2013. These species are an important part of the food chain and provide food for birds.

# 8. Consultation

The application for works approval and licence was advertised on 13 March 2017. The application was referred to the Shire of Dundas and the Department of Water for consultation. A response was received from the Shire of Dundas indicating that they had no objection to the application (Dundas 2017).

Advice was sought from the Department of Mines, Industry Regulation and Safety (DMIRS) in relation to an existing trench that had been dug within Lake Dundas at the proposed discharge point (DER 2017a). Advice received from DMIRS was that this land disturbance had been approved through the Program of Work approval for exploration activities. Photos from a subsequent site visit by DWER on 8 June 2017 were referred to DMIRS as the trench appeared to be larger than indicated in a photo included in the Works Approval/Licence Application (DER 2017b).

# 9. Risk assessment

## 9.1 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 13 and Table 14.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Table 13 and Table 14 below.

**Table 13: 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** | | |
| **Construction, mobilisation and positioning of infrastructure** | In-pit dewater pipelines to Lake Dundas | Noise | No residences or other sensitive receptors in proximity | Air / wind dispersion | None | No | No receptor present |
| | | Dust | | | None | No | No receptor present |

## Table 14: Identification of emissions, pathway and receptors during operation

| Risk Events | | | | | | Continue to detailed risk assessment | Reasoning |
|---|---|---|---|---|---|---|---|
| **Sources/Activities** | | **Potential emissions** | **Potential receptors** | **Potential pathway** | **Potential adverse impacts** | | |
| **Category 6**<br>**Mine dewatering: Premises on which water is extracted and discharged into the environment to allow mining of ore** | Discharge to Lake Dundas | Saline/ hypersaline dewater to surface water (lake surface) | Riparian vegetation (possibly including priority 1 and priority 3 flora species) | Direct inundation/ spread by wind | Decline/death of vegetation from salt spray/ salt inundation | Yes –refer to section 9.4 | Potential impact to vegetation receptors |
| | | | Aquatic biota (algae and invertebrate fauna species) | Direct discharge; change to lake hydroperiod; increase in metals in sediment; increase in salt loading/ salt crust formation | Reduction in species abundance and diversity | Yes – refer to section 9.5 | Potential impact to receptors |
| | | | Birds ,bats or other native fauna | Ingestion of saline water with elevated metal/metalloid concentrations | Poor health in birds/ bats/ wildlife | No | Research conducted on birds and bats in the context of gold mines in the Goldfields (and cyanide toxicity) has determined that birds will not drink hypersaline solutions (i.e. above 50 000 mg/L TDS) (Adams M.D., *et al* 2008) |
| | | | Riparian vegetation and aquatic biota | Discharge to the trench within the lake | Increased suspended solids, turbidity and potential flooding at the shoreline from discharging into an existing disturbance on the lake. | No | Following consultation with DWER, the Applicant has given an undertaking to not discharge into the existing trench cut into the lake. |
| | Pipeline failure | Saline water discharge | Native vegetation (possibly including priority 1 and priority 3 species) | Spill to land | Decline/death of vegetation and soil contamination | Yes – refer to section 9.6 | Potential impact to vegetation receptors |

## 9.2 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 14 below.

**Table 15: 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 16 below.

**Table 16: 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 | • **onsite impacts**: catastrophic<br>• **offsite impacts local scale**: high level or above<br>• **offsite impacts wider scale:** mid-level or above<br>• Mid to long-term or permanent impact to an area of high conservation value or special significance^<br>• Specific Consequence Criteria (for environment) are significantly exceeded | • Loss of life<br>• **Adverse health effects:** high level or ongoing medical treatment<br>• Specific Consequence Criteria (for public health) are significantly exceeded<br>• **Local scale impacts:** permanent loss of amenity |
| Likely | The risk event will probably occur in most circumstances | Major | • **onsite impacts**: high level<br>• **offsite impacts local scale**: mid-level<br>• **offsite impacts wider scale**: low level<br>• Short-term impact to an area of high conservation value or special significance^<br>• Specific Consequence Criteria (for environment) are exceeded | • **Adverse health effects:** mid-level or frequent medical treatment<br>• Specific Consequence Criteria (for public health) are exceeded<br>• **Local scale impacts**: high level impact to amenity |
| Possible | The risk event could occur at some time | Moderate | • **onsite impacts**: mid-level<br>• **offsite impacts local scale**: low level<br>• **offsite impacts wider scale**: minimal<br>• Specific Consequence Criteria (for environment) are at risk of not being met | • **Adverse health effects:** low level or occasional medical treatment<br>• Specific Consequence Criteria (for public health) are at risk of not being met<br>• **Local scale impacts:** mid-level impact to amenity |
| Unlikely | The risk event will probably not occur in most circumstances | Minor | • **onsite impacts**: low level<br>• **offsite impacts local scale**: minimal<br>• **offsite impacts wider scale**: not detectable<br>• Specific Consequence Criteria (for environment) likely to be met | • Specific Consequence Criteria (for public health) are likely to be met<br>• **Local scale impacts:** low level impact to amenity |
| Rare | The risk event may only occur in exceptional circumstances | Slight | • **onsite impact**: minimal<br>• Specific Consequence Criteria (for environment) met | • **Local scale**: minimal to amenity<br>• Specific Consequence Criteria (for public health) met |

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

* 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.

## 9.3 Acceptability and treatment of risk event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment Table 17 below:

**Table 17: 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.<br>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. |

## 9.4 Risk Assessment – Impact to riparian vegetation from dewater discharge

### 9.4.1 Description of risk event

Discharge of saline to hypersaline mine dewater to Lake Dundas, causing inundation of shoreline (riparian) vegetation.

### 9.4.2 Identification and general characterisation of emission

400 000 kL per annum of saline to hypersaline groundwater discharged to Lake Dundas for an approximate four year period. Groundwater quality from bores within the North Scotia (denoted 'SCO…'), Selene (denoted 'SEL…') and Mt Henry Open pits ('MTH…') are shown below in Table 18. Values shown in red bold are above the ANZECC (2000) guideline for 95% protection of species in marine environments. Values in red may also be above the relevant guideline value; however it cannot be determined due to the elevated level of detection for those samples.

**Table 18: Water quality parameters for groundwater sampled at the Premises (indicative of the discharge dewater quality) (GDS 2015)**

| Parameter[1] | Units | Bore SCOWE01 | Bore SCOWE02 | Bore SCOWE03 | Bore SELWE04 | Bore MTHWE02 | Bore MTHWE03 | Bore MTHWE04 | Bore MTHWE07 |
|---|---|---|---|---|---|---|---|---|---|
| pH | - | 6.5 | 7 | 6.1 | 6.8 | 7.3 | 7.5 | 7.7 | 7.1 |
| Total Dissolved Solids | mg/L | 274 000 | 239 000 | 243 000 | 251 000 | 10 000 | 17 400 | 18 200 | 121 000 |
| Total alkalinity as CaCO3 | mg/L | 38 | 120 | 6 | 32 | 190 | 260 | 380 | 140 |
| Chloride | mg/L | 140 000 | 140 000 | 140 000 | 150 000 | 4 100 | 5 700 | 6 900 | 63 000 |
| Sulfate | mg/L | 13 000 | 12 000 | 12 000 | 12 000 | 2 200 | 5 100 | 5 000 | 9 200 |
| Nitrate | mg/L | <0.05 | 0.06 | 0.08 | 0.84 | <0.05 | <0.05 | 0.06 | <0.05 |
| Aluminium | mg/L | <1 | <1 | <1 | <1 | <0.02 | <0.02 | <0.1 | <1 |
| Arsenic | mg/L | <1.0 | <1.0 | <1.0 | <1.0 | <0.02 | <0.02 | <0.1 | <1 |
| Calcium | mg/L | 620 | 720 | 590 | 740 | 290 | 370 | 490 | 450 |
| Cobalt | mg/L | <0.5 | <0.5 | <0.5 | <0.5 | **0.01** | **0.02** | <0.05 | <0.05 |
| Copper | mg/L | <0.25 | <0.25 | **0.49** | <0.25 | <0.005 | <0.005 | <0.025 | <0.25 |
| Iron | mg/L | <1 | <1 | <1 | <1 | 6.5 | <0.02 | <0.1 | <1 |
| Magnesium | mg/L | 11 000 | 10 000 | 10 000 | 9 900 | 550 | 800 | 1 000 | 5 700 |

| Parameter[1] | Units | Bore SCOWE01 | Bore SCOWE02 | Bore SCOWE03 | Bore SELWE04 | Bore MTHWE02 | Bore MTHWE03 | Bore MTHWE04 | Bore MTHWE07 |
|---|---|---|---|---|---|---|---|---|---|
| Manganese | mg/L | 1.4 | 2 | 2 | 3.1 | 2.5 | 2.6 | 1.7 | 4.1 |
| Nickel | mg/L | **0.42** | **0.35** | **0.34** | **0.46** | 0.024 | **0.099** | 0.062 | **0.39** |
| Potassium | mg/L | 890 | 820 | 790 | 790 | 64 | 84 | 100 | 370 |
| Sodium | mg/L | 97 000 | 83 000 | 87 000 | 91 000 | 2 600 | 5 000 | 5 500 | 40 000 |
| Zinc | mg/L | <0.5 | <0.5 | **0.74** | <0.5 | **0.03** | **0.09** | <0.05 | <0.05 |

Note 1: It appears that the samples from bores in North Scotia (SCOWE01 –SCOWE03) were analysed at a higher level of detection than the Mt Henry bores' samples (MTHWE02 – MTHWE07) however this is not clear from the source report: GDS 2015.

### 9.4.3 Description of potential adverse impact from the emission

The change to the Lake Dundas hydroperiod (cycle of drying and wetting within the lake) from the discharge of up to 400 000 kL per annum was not modelled; however, given the gross amounts, *actis* Environmental estimated that the daily discharge may cover between 15 ha and 62 ha depending on evaporation rates (*actis* 2016).

*actis* Environmental also noted that the shoreline at the proposed point of discharge was 'relatively steep' which would reduce the likelihood that the samphires (*Tecticornia* species) would be affected by the discharge. However at the site visit in June 2017 DWER officers observed that in some locations the shoreline gradient is actually relatively shallow. Refer to Plate 1 and Plate 2 below.

**Plate 1: Shoreline to the immediate north of the proposed discharge location (DWER 2017).**

**Plate 2: Shoreline to the south of the proposed discharge point (trench in foreground) (DWER 2017).**

A survey of the discharge site was conducted by *actis* Environmental on 15th and 16th May 2016. Vegetation at the discharge point was Mallee over mixed shrubs: *Tecticornia* species (four species), *Maireana glomerifolia, Atriplex nana* and *Frankenia* species were all in good health. All samphire (T*ecticornia*) species recorded are all commonly found at Lake Dundas and elsewhere and none have Priority conservation status (*actis* 2016).

### 9.4.4 Applicant controls

No specific controls to mitigate the risk to the shoreline vegetation have been proposed by the Applicant. The Applicant has proposed that the pipeline extend 50 m from the shoreline; however in discussions with DWER the Applicant has expressed willingness to extend the length of the pipeline reduce the risk of inundation of the shoreline if required(*pers. comm* K. Forrest).

### 9.4.5 Key findings

**The Delegated Officer has reviewed the information regarding impact of dewater to riparian vegetation and has found:**

1. The resulting lake from daily discharge may vary in size from 15 ha to 62 ha.
2. With a pipeline length of 50 m into the lake, the resulting dewater lake may inundate the shoreline in lower lying areas.
3. Shoreline inundation with hypersaline water would likely kill native vegetation along the lake shore.

### 9.4.6 Consequence

If inundation of the shoreline by dewater occurs, then the impact of vegetation decline or death at that location will be low level impact to an on-site local area, as the shoreline in this location is included in mining tenement M63/515 and therefore within the Premises boundary. A related consideration is that no Priority flora is present at the discharge site and the samphire species presented are well represented elsewhere. Therefore, the consequence is minor.

### 9.4.7 Likelihood of Risk Event

Given the potential size of the resulting lake (discharge plume) and the short length of the pipeline, the likelihood of decline or death of vegetation from dewater inundation occurring is possible.

### 9.4.8 Overall rating of impact of dewater to riparian vegetation

The overall rating for the risk of is medium.

## 9.5 Risk Assessment – Impact to aquatic biota from dewater discharge

### 9.5.1 Description of risk event

Increased salt loading and metals/metalloids in sediment from dewater discharge, impacting on aquatic biota species emergence following rainfall and leading to a reduction in species abundance and diversity.

### 9.5.2 Identification and general characterisation of emission

Refer to Table 18 in section 9.4.2 for approximate water quality of the groundwater to be discharged onto Lake Dundas. Note the metals/metalloids sampled did not include a comprehensive list of metal/metalloids (for example chromium, cadmium, lead, mercury, selenium and thallium were not analysed).

### 9.5.3 Description of potential adverse impact from the emission

Increased salt loading and increased deposition of metals/metalloids onto lake sediments can inhibit the emergence of invertebrates from resting stages following a rainfall event. *actis* estimated the increased salt load from a discharge of 400 000 kL pa over a ten year period as equivalent to an 100% increase of the existing salt load over an average 356 ha; or, dependent on the concentrations of salts in the discharge, (given the varying groundwater quality in Mt Henry pit from 10 000 mg/L – 121 000 mg/L TDS) as resulting in 100% increase in existing salt for an area between 85 ha and 1000 ha. Over the entire 38 000 ha of Lake Dundas the discharge would increase the salt load by 10% (0.438 kg/m$^2$) (*actis* 2016). The ten year period was chosen based on the life of the groundwater abstraction licence.

The metals/metalloids in the dewater discharge are as listed in Table 18 (section 9.4.2), noting that only a few metals were sampled in the discharge. Of the parameters analysed, the groundwater was elevated in cobalt, copper, nickel and zinc, as compared to a conservative trigger value for 95% protection of ecosystems in marine environments (ANZECC 2000).

### 9.5.4 Applicant controls

No specific controls have been proposed by the Applicant to reduce the salt loading or metal/metalloids concentration in the discharge. The Applicant has proposed to use dewater in dust suppression which may reduce the amount of groundwater to be discharged onto the lake.

### 9.5.5 Key findings

**The Delegated Officer has reviewed the information regarding impact to aquatic biota from dewater discharge and has found:**

1. The increased salt loading is significant over the immediate localised area (~360 ha doubling in salt concentrations).
2. The dewater discharge has elevated concentrations of cobalt, copper, nickel and zinc.

### 9.5.6 Consequence

The impact of reducing the emergence of aquatic invertebrates over a ~360 ha represents a low level offsite impact at a local scale, as the invertebrate species are widely distributed within Lake Dundas and other Goldfield salt lakes. Therefore, the consequence is moderate.

### 9.5.7 Likelihood of Risk Event

The likelihood of aquatic biota being impacted by the discharge at an offsite local low level is possible. At this stage the discharge is forecast to occur for a period of between 3 and 5 years (Westgold 2017; Metals X 2016).

### 9.5.8 Overall rating of impact to aquatic biota from dewater discharge

Given the consequence and likelihood ratings described above with the risk rating matrix (Table 15) and determined that the overall rating for the risk is Medium.

## 9.6 Risk Assessment – Dewatering pipeline failure

### 9.6.1 Description of risk event

Failure of the onshore section of the dewatering pipeline, releasing saline – hypersaline water with elevated metals to native vegetation and causing death and/or decline in vegetation health over a localised area.

### 9.6.2 Identification and general characterisation of emission

The groundwater is saline to hypersaline (10 000 mg/L – 121 000 mg/L TDS) and elevated in cobalt, copper, nickel and zinc. Refer to Table 18 in section 9.4.2 for approximate water quality of the groundwater. Approximately 400 000 kL/a will be discharged, which equates to a flow rate of 46$m^3$/hr, if the dewatering is occurring 24 hours per day.

### 9.6.3 Description of potential adverse impact from the emission

NVS (2016) has recorded 8 priority flora species within the Premises footprint (refer to Table 7 in section 6.3 for further detail). It is not clear if any of the priority flora are located adjacent to the pipeline route. Regrowth or rehabilitation of any area subject to spilled saline water is also compromised by the elevated salt, and metals/metalloids in the discharge contaminating the affected soil.

### 9.6.4 Applicant controls

The dewatering pipeline will be run along the existing track to the lake and will be contained within a windrow (bund) at the edge of the track. The gradient of the track runs downhill towards the lake. Minor spills (low velocity leaks/failures) can be expected to flow towards the lake. Catastrophic failures of the pipeline, however, may breach the bund and cause impact to adjacent vegetation.

The pipeline will also have telemetry installed so as to allow detection of a loss of flow (Westgold 2017).

### 9.6.5 Key findings

**The Delegated Officer has reviewed the information regarding the risk of dewatering pipeline failure and has found:**

1. There is a possibility that Priority flora may be impacted from a release of saline – hypersaline water.
2. The risk of vegetation impact is mitigated for low velocity leaks (such as a pinhole leak) by the provision of bunding and the gradient of the pipeline route.
3. Telemetry installed on the pipeline should enable timely detection of spills

### 9.6.6 Consequence

If a dewatering pipeline failure occurs, the impact of releasing the saline – hypersaline water on vegetation will be a mid-level impact to an on-site ecosystem. Therefore, the consequence of dewatering pipeline failure is considered to be Moderate.

### 9.6.7 Likelihood of Risk Event

The likelihood of pipeline failure causing a mid-level vegetation impact is Possible over the life of the operation.

### 9.6.8 Overall rating of dewatering pipeline failure

Given the consequence and likelihood ratings described above with the risk rating matrix (Table 10) the overall rating for the risk of a pipeline failure causing a mid-level vegetation impact is Medium.

## 9.7 Summary of acceptability and treatment of Risk Events, with Regulatory Controls

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 19 below. Controls are described further in section 10.

**Table 19: Risk assessment summary**

| | Description of Risk Event | | | Applicant controls | Risk rating | Acceptability with controls (conditions on instrument) | Resulting Regulatory Controls |
|---|---|---|---|---|---|---|---|
| | **Emission** | **Source** | **Pathway/ Receptor (Impact)** | | | | |
| 1. | Saline - hypersaline mine dewater | Direct discharge | Inundation of vegetation/ wind spread salt spray causing impact to riparian (shoreline) vegetation | NA | Moderate consequence<br>Possible likelihood<br>**Medium risk** | Acceptable subject to regulatory controls | Works approval to specify:<br>• Extension of discharge pipeline to at least 500m from the shoreline.<br>Licence to specify<br>• Dewatering operations to be carried out such that there is no inundation of the shoreline by the dewater discharge; and<br>• Annual monitoring of riparian vegetation health. |
| 2. | Saline - hypersaline mine dewater | Direct discharge to lake surface and surface water | Increased salt loading and metal/metalloid concentrations in lake sediments and poorer surface water quality resulting in a reduction in aquatic biota species diversity and abundance. | NA | Moderate consequence<br>Possible likelihood<br>**Medium risk** | Acceptable subject to regulatory controls | Licence to specify:<br>• Monitoring of water quality discharged and volumes;<br>• Monitoring of receiving surface water quality and metal/metalloids in sediments on an annual basis; and<br>• Monitoring of aquatic biota (algae, invertebrates (including resting stages)) at the discharge site and at least one control site on an annual basis. |

| | Description of Risk Event | | | Applicant controls | Risk rating | Acceptability with controls (conditions on instrument) | Resulting Regulatory Controls |
|---|---|---|---|---|---|---|---|
| | **Emission** | **Source** | **Pathway/ Receptor (Impact)** | | | | |
| 3. | Saline - hypersaline water | Failure of dewatering pipeline | Death or decline of adjacent native vegetation and soil contamination. | Routing of pipeline along existing access track<br>Bunding (V-drain) | Moderate consequence<br>Possible likelihood<br>**Medium risk** | Acceptable subject to regulatory and applicant controls | Works approval to specify:<br>• Construction of bunding as per applicant controls<br>• A permanent anchoring structure to be installed along the pipeline to prevent movement in the event of a storm/ flood event<br>• Telemetry installed on the pipeline to detect a loss of flow automatically.<br>Licence to specify:<br>• Daily inspections of the pipeline integrity whilst in operation. |

# 10. Regulatory controls

A summary of regulatory controls determined to be appropriate for the Risk Event is set out in Table 19. The risks are set out in the assessment in section 9 and the controls are detailed in this section. DWER will determine controls having regard to the adequacy of controls proposed by the Applicant. The conditions of the Works Approval and Licence will be set to give effect to the determined regulatory controls.

## 10.1 Works Approval controls

### 10.1.1 Dewatering pipeline

The following environmental controls, infrastructure and equipment shall be constructed so as to mitigate potential risks identified in this Decision Report:

1. Where located outside the lake, the pipeline shall be located within a bund. Where pipeline are located within a pit such that spills would be captured within the pit, a bund is not required.
2. The Applicant shall construct the dewatering pipeline to extend at least 500m from the shoreline into the centre of Lake Dundas.
3. The pipeline shall be anchored at regular intervals (including pipeline sections traversing the lake), so as to restrict movement in the event of an extreme rainfall/ flooding event.
4. The pipeline shall have telemetry installed so as to allow a loss of flow to be detected remotely/automatically.

### 10.1.2 Specified actions

The Applicant shall submit a compliance document demonstrating compliance with the Works Approval conditions.

As part of the compliance documents, the Applicant shall submit proposed scopes for monitoring required by the Licence (refer to section 10.2.3 below).

## 10.2 Licence controls

### 10.2.1 Dewatering pipeline operation

The following controls will be prescribed in the Licence for pipeline operation:

1. Daily checks of the integrity of the pipeline when in operation.

### 10.2.2 Specified actions

The Applicant shall ensure that the dewatering discharge to Lake Dundas is carried out so as to avoid inundating the shoreline with mine dewater.

### 10.2.3 Monitoring requirements

The Applicant shall record and report the total volume of water quality discharged. The water quality of the discharge water shall be sampled and analysed at a NATA accredited laboratory on a six monthly basis.

The receiving surface water quality at the discharge point and metal/metalloids in sediments shall be sampled and analysed at a NATA accredited laboratory on an annual basis.

The health of riparian vegetation at and adjacent to the discharge point shall be monitored on annual basis by a qualified botanist with a knowledge of the flora of the Coolgardie bioregion.

Monitoring of aquatic biota (algae, invertebrates (including resting stages)) at the discharge site and a control site shall occur on an annual basis by a scientist with experience in monitoring of aquatic invertebrates and algae of salt lakes.

### 10.2.4 Monitoring reports

The Applicant shall submit an annual report comprising:

- discharged water volumes,
- discharge and receiving water quality data
- an annual assessment of riparian vegetation health compared to baseline vegetation survey (pre-discharge); and
- an annual assessment of aquatic biota species diversity and abundance within the impacted zone with a comparison to species in at least one un-impacted (control) zone.

For reports completed in subsequent years, current monitoring results shall be compared to previous monitoring and baseline data.

# 11. Applicant's comments

The Applicant was provided with the draft Decision Report and draft issued Works Approval on 19 June 2017. The applicant provided clarification on the method of pipeline telemetry proposed.

# 12. 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).

This assessment was also informed by a site inspection by DWER officers on 8 June 2017.

Based on this assessment, it has been determined that the Works Approval and 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. | Adams, M.D., Donato, D.B. Schulz, R.S.and Smith, G.B. (2008) Influences of Hypersaline Tailings on Wildlife Cyanide Toxicosis; MERIWA Project M389(II) 'Cyanide Ecotoxicity at Hyperslaine Gold Operations' Final Report Volume 2 – Definitive Investigation, 26 August 2008. | Adams 2008 | DWER Internal |
| 2. | *actis* Environmental Services (2016) *Proposed Short-term Dewatering Discharge Mt Henry*. Unpublished report for Higginsville Gold Operations, Metals X Ltd, July 2016. | *actis* 2016 | DWER internal record (A1384778) |
| 3. | ANZECC & ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* | ANZECC 2000 | Accessed at: http://www.agriculture.gov.au/water/quality/guidelines /volume-1 |
| 4. | DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth. | DER 2015a | accessed at www.DWER.wa.gov.au |
| 5. | DER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth. | DER 2015b | |
| 6. | DER, August 2016. *Guidance Statement: Licence duration.* Department of Environment Regulation, Perth. | DER 2016a | |
| 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 | |
| 9. | Groundwater Development Services (GDS) Pty Ltd (2015) *H1 Desktop Hydrogeological Assessment Mt Henry Open Pits,* unpublished report for | GDS 2015 | DWER internal record (A1384773) Appendix 3 to the Application |

| | | | |
|---|---|---|---|
| | Higginsville Gold Operations, October 2015. | | |
| 10. | Email from G. Kohobange to DER (2017) Works Approval and Licence – W6028/2017/1 or L9029/2017/1, dated 30 March 2017 4:07 PM. | Dundas 2017 | DWER internal record (zA109668) |
| 11. | Lemly, A.D. (2002) *Selenium Assessment in Aquatic Ecosystems: A Guide for Hazard Evaluation and Water Quality Criteria*, Springer - Verlag | Lemly 2002 | |
| 12. | Metals X (2016) *Mining Proposal for Mt Henry, Part 1. Higginsville Gold Operations,* March 2016. | Metals X 2016 | DWER internal record (A1384776) |
| 13. | Native Vegetation Solutions (2016) *Level 1 Flora and Vegetation Survey of the Mt Henry Project (M63/366, M63/515, M63/516, G63/6 and G63/7)*, Report prepared for Metals X Limited, Avoca Resources Pty Ltd, Higginsville Gold Operation (HGO) December 2016. | NVS 2016 | DWER internal record (as referenced in the Decision Report for Clearing Permit CPS#6823-2) |
| 14. | Westgold Resources Limited (2017) *DER Licence and Works Approval Application for Dewater Mt Henry Project to Dundas Lake,* January 2017. | Westgold 2017 | DWER internal record (A1356893) |
| 15. | Westgold Resources Limited (2018) *Avoca Mining Pty Ltd - Mt Henry Dewatering Project, W6028/2017/1 Compliance Document,* September 2018 | Westgold 2018a | DWER internal record (A1740192) |
| 16. | Westgold Resources Limited (2018) *Avoca Mining Pty Ltd - Mt Henry Project, Monitoring Scope for Works Approval W6208/2017/1* | Westgold 2018b | DWER internal record (A1740192) |
| 17. | Westgold Resources Limited (2019), *Mt Henry Project – L9023/2017/1 & W6028/2017/1 - Photographic evidence in support of compliance document* (email | Westgold 2019 | |
| 18. | Wetland Research & Management (2013) *Lake Dundas Sediment Rehydration, Water Quality & Aquatic Fauna Surveys Final Report*; unpublished report for Panoramic Resources Ltd, February 2013. | WRM 2013 | DWER internal record (A1448031) |

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

| Condition | Summary of Licence Holder comment | DWER response |
|---|---|---|
| Condition 3, table 2 | Applicant provided clarification on type of pipeline telemetry to be used | Minor change to wording |