Government of Western Australia
Department of Environment Regulation

Works Approval

Works Approval Number	W6030/2017/1
Works Approval Holder	Matsa Gold Pty Ltd
ACN	613 060 352
Registered business address	Suite 11 139 Newcastle St PERTH WA 6000
File Number	DER2016/002253
Duration	22/05/2017 to 20/05/2018
Date of issue	18/05/2017
Prescribed Premises	Category 6: Mine Dewatering Authorised throughput: 950 000 tpa
Premises	Lake Carey Project Mining Tenements M39/709, M39/710 and M39/1065 Shire of Menzies

This Works Approval is granted to the Works Approval Holder, subject to the following conditions, on 18 May 2017, by:

Date signed: 18 May 2017

Tim Gentle
Manager Licensing (Resource Industries)

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

Explanatory notes

These explanatory notes do not form part of this Works Approval.

Defined terms

Definition of terms used in this Works Approval can be found at the end of this Works Approval. Terms which are defined have the first letter of each word capitalised throughout this Works Approval.

Department of Environment Regulation

The Department of Environment Regulation (DER) is 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 *Environmental Protection Act 1986* (WA) (EP Act). The Department also monitors and audits compliance with licences and works approvals, takes enforcement action and develops and implements licensing and industry regulation policy.

Works Approval

Section 52 of the EP Act provides that an occupier of any premises commits an offence if any work is undertaken on, or in relation to, the premises which causes the premises to become, or to become capable of being, Prescribed Premises, except in accordance with a works approval.

Section 56 of the EP Act provides that an occupier of Prescribed Premises commits an offence if Emissions are caused or increased or permitted to be caused or increased, or Waste, noise, odour or electromagnetic radiation is altered or permitted to be altered from Prescribed Premises, except in accordance with a works approval or licence.

Categories of Prescribed Premises are defined in Schedule 1 of the *Environment Protection Regulations 1987* (WA) (EP Regulations).

This Works Approval does not authorise any activity which may be a breach of the requirements of another statutory authority including, but not limited to, the following:

- conditions imposed by the Minister for Environment under Part IV of the EP Act;
- conditions imposed by DER for the clearing of native vegetation under Part V, Division 2 of the EP Act;
- any requirements under the *Waste Avoidance and Resource Recovery Act 2007;*
- any requirements under the *Environmental Protection (Controlled Waste) Regulations 2004*; and
- any other requirements specified through State legislation.

It is the responsibility of the Works Approval Holder to ensure that any action or activity referred to in this Works Approval is permitted by, and is carried out in compliance with, statutory requirements.

The Works Approval Holder must comply with the Works Approval. Contravening a Works Approval Condition is an offence under s.55 of the EP Act.

Responsibilities of Works Approval Holder

Separate to the requirements of this Works Approval, general obligations of Works Approval Holders are set out in the EP Act and the regulations made under the EP Act. For example, the Works Approval Holder must comply with the following provisions of the EP Act:

- the duties of an occupier under s.61; and

- restrictions on making certain changes to Prescribed Premises unless the changes are in accordance with a Works Approval, Licence, closure notice or environmental protection notice (s.53).

Strict penalties apply for offences under the EP Act.

Reporting of incidents

The Works Approval Holder has a duty to report to the Department all Discharges of Waste that have caused or are likely to cause Pollution, Material Environmental Harm or Serious Environmental Harm, in accordance with s.72 of the EP Act.

Offences and defences

The EP Act and its regulations set out a number of offences including:

- Offence of emitting an Unreasonable Emission from any Premises under s.49.
- Offence of causing Pollution under s.49.
- Offence of dumping Waste under s.49A.
- Offence of discharging Waste in circumstances likely to cause Pollution under s.50.
- Offence of causing Serious Environmental Harm (s 50A) or Material Environmental Harm (s.50B).
- Offence of causing Emissions which do not comply with prescribed standards (s.51).
- Offences relating to Emissions or Discharges under regulations prescribed under the EP Act, including materials discharged under the *Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA).*
- Offences relating to noise under the *Environmental Protection (Noise) Regulations 1997 (WA).*

Section 53 of the EP Act provides that a Works Approval Holder commits an offence if Emissions are caused, or altered, from a Prescribed Premises unless done in accordance with a Works Approval, Licence or the requirements of a closure notice or an environmental protection notice.

Defences to certain offences may be available to a Works Approval Holder and these are set out in the EP Act. Section 74A(b)(iii) provides that it is a defence to an offence for causing Pollution, in respect of an Emission, or for causing Serious Environmental Harm or Material Environmental Harm, or for discharging or abandoning Waste in water to which the public has access, if the Works Approval Holder can prove that an Emission or Discharge occurred in accordance with a Works Approval.

This Works Approval specifies the Emissions and Discharges, and the limits and Conditions which must be satisfied in respect of specified Emissions and Discharges, in order for the defence to offence provision to be available.

Authorised Emissions and Discharges

The specified and general Emissions and Discharges from the Works authorised through this Works Approval are authorised to be conducted in accordance with the Conditions of this Works Approval.

Amendment of Works Approval

The Works Approval Holder can apply to amend the Conditions of this Works Approval under s.59 of the EP Act. An application form for this purpose is available from DER.

The CEO may also amend the Conditions of this Works Approval at any time on the initiative

of the CEO without an application being made.

Duration of Works Approval

The Works Approval will remain in force for the duration set out on the first page of this Works Approval or until it is surrendered, suspended or revoked in accordance with s.59A of the EP Act.

Suspension or revocation

The CEO may suspend or revoke this Works Approval in accordance with s.59A of the EP Act.

Definitions and interpretation

Definitions

In this Works Approval, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
Approved Policy	has the same meaning given to that term under the EP Act.
Books	has the same meaning given to that term under the EP Act.
CEO	means Chief Executive Officer. CEO for the purposes of notification means: Director General Department Administering the *Environmental Protection Act 1986* Locked Bag 33 Cloisters Square PERTH WA 6850 info@der.wa.gov.au
Condition	means a condition to which this Works Approval is subject under s.62 of the EP Act.
Department	means the department established under s.35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
Department Request	means a request for Books or other sources of information to be produced, made by an Inspector or the CEO to the Works Approval Holder in writing and sent to the Works Approval's address for notifications, as described at the front of this Works Approval, in relation to: (a) compliance with the EP Act or this Licence; (b) the Books or other sources of information maintained in accordance with this Licence; or (c) the Books or other sources of information relating to Emissions from the Premises.
Discharge	has the same meaning given to that term under the EP Act.
Emission	has the same meaning given to that term under the EP Act.
Environmental Harm	has the same meaning given to that term under the EP Act.
EP Act	means the *Environmental Protection Act 1986* (WA).
EP Regulations	means the *Environmental Protection Regulations 1987* (WA).
Implementation Agreement or	has the same meaning given to that term under the EP Act.

Decision	
Inspector	means an inspector appointed by the CEO in accordance with s.88 of the EP Act.
Material Environmental Harm	has the same meaning given to that term under the EP Act.
NATA	National Association of Testing Authorities
Pollution	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Licence applies, as specified at the front of this Licence and as shown on the map in Schedule 1 to this Licence.
Prescribed Premises	has the same meaning given to that term under the EP Act.
Serious Environmental Harm	has the same meaning given to that term under the EP Act.
Unreasonable Emission	has the same meaning given to that term under the EP Act.
Waste	has the same meaning given to that term under the EP Act.
Works	refers to the Works described in Schedule 2, at the locations shown in Schedule 1 of this Works Approval to be carried out at the Premises, subject to the Conditions.
Works Approval	refers to this document, which evidences the grant of the works approval by the CEO under s.54 of the EP Act, subject to the Conditions.
Works Approval Holder	refers to the occupier of the Premises being the person to whom this Works Approval has been granted, as specified at the front of this Works Approval.

Interpretation

In this Licence:

(a) the words ‘including’, ‘includes’ and ‘include’ will be read as if followed by the words ‘without limitation’;

(b) where any word or phrase is given a defined meaning, any other part of speech or other grammatical form of that word or phrase has a corresponding meaning;

(c) where tables are used in a Condition, each row in a table constitutes a separate Condition;

(d) any reference to an Australian or other standard, guideline or code of practice in this Works Approval means the version of the standard, guideline or code of practice in force at the time of granting of this Works Approval and includes

any amendments to the standard, guideline or code of practice which may occur from time to time during the course of the Works Approval; and

(e) unless specified otherwise, any reference to a section of an Act refers to that section of the EP Act.

Conditions

Infrastructure and equipment

1. The Works Approval Holder must install and undertake the Works for the infrastructure and equipment:

(a) specified in Column 1;

(b) to the requirements specified in Column 2; and

(c) at the location specified in Column 3

of Table 2 below.

2. Within 60 days of the completion of the Works, the Works Approval Holder must provide to the CEO a compliance document from a suitably qualified professional confirming each item of infrastructure or component of infrastructure specified in Column 1 of Table 2 below has been constructed to the requirements specified in Column 2.

3. The Works Approval Holder shall submit the aquatic biota survey (as required by Condition 5) and report detailing proposed monitoring sites (as required by Condition 6) to the CEO as part of the compliance document required by Condition 2.

Table 2: Infrastructure and equipment requirements table

Column 1	**Column 2**	**Column 3**
Infrastructure/Equipment	**Requirements (design and construction)**	**Site plan reference**
Transfer HDPE pipeline from production bores to settling pond 1	The pipeline shall be bunded where is located outside of any open pit.	As shown in the Site Layout Map in Schedule 1.
Transfer HDPE pipeline from settling pond 2 to discharge outlet	The pipeline shall be located on the existing exploration causeway. The pipeline shall be anchored on the causeway to prevent movement in the event of a large rainfall/storm event. Where the pipeline is located on land the pipeline shall be bunded.	As shown in the Site Layout Map in Schedule 1.
Dewatering pipeline discharge outlet	The outlet shall have either a larger pipe or multiple outlet points to mitigate erosion at the outlet.	As shown in the Site Layout Map in Schedule 1.

Emissions

4. The Works Approval Holder must not cause any Emissions from the Works authorised through this Works Approval except for general Emissions described in Column 1 of Table 3, subject to the exclusions, limitations or requirements

specified in Column 2, of Table 3.

Table 3: Authorised Emissions table

Column 1	**Column 2**
Emission type	**Exclusions/Limitations/Requirements**
General Emissions (excluding Specified Emissions)	
Emissions (for example dust and noise) which arise from undertaking the Works set out in Schedule 2.	Emissions excluded from General Emissions are: • Unreasonable Emissions; or • Emissions that result in, or are likely to result in, Pollution, Material Environmental Harm or Serious Environmental Harm; or • Discharges of Waste in circumstances likely to cause Pollution; or • Emissions that result, or are likely to result in, the Discharge or abandonment of Waste in water to which the public has access; or • Emissions or Discharges which do not comply with an Approved Policy; or • Emissions or Discharges which do not comply with prescribed standard; or • Emissions or Discharges which do not comply with the conditions in an Implementation Agreement or Decision; or • Emissions or Discharges the subject of offences under regulations prescribed under the EP Act, including materials discharged under the Environmental P*rotection (Unauthorised Discharges) Regulations 2004*.

Monitoring

5. The Works Approval Holder shall complete a baseline survey of the aquatic biota present at the discharge outfall site in Lake Carey. The survey should be conducted an appropriately qualified scientist. The survey shall sample the following parameters, with analysis to be completed at a NATA registered laboratory:

(a) Metals/metalloids concentrations in sediments at least two sites (one un-impacted site and one impacted site);

(b) Abundance and species diversity of algae, diatoms and macrophytes present at each site; and

(c) Abundance and species diversity of aquatic invertebrates present at each site (resting stages if no water is present).

The survey report shall include a map of the sample sites, with each site's easting and northing coordinate locations recorded in a table. The presence of priority fauna, as listed under the *Wildlife Conservation Act 1950,* shall be identified and marked on the map.

6. The Works Approval Holder shall nominate at least eight locations to be monitored during operations, four of which are non-impacted sites (two vegetation sites, two aquatic biota sites) and four being sites potentially impacted by the dewater discharge (two vegetation, two aquatic biota sites). The sites shall be marked on a map and the easting and northing coordinates recorded in a table.

Record-keeping

7. The Works Approval Holder must maintain accurate Books including information, reports and data in relation to the Works and the Conditions of this Works Approval, and the Books must:

(a) be legible;

(b) if amended, be amended in such a ways that the original and subsequent amendments remain legible or are capable of retrieval;

(c) be retained for at least 3 years from the date the Books were made;

(d) be available to be produced to an Inspector or the CEO.

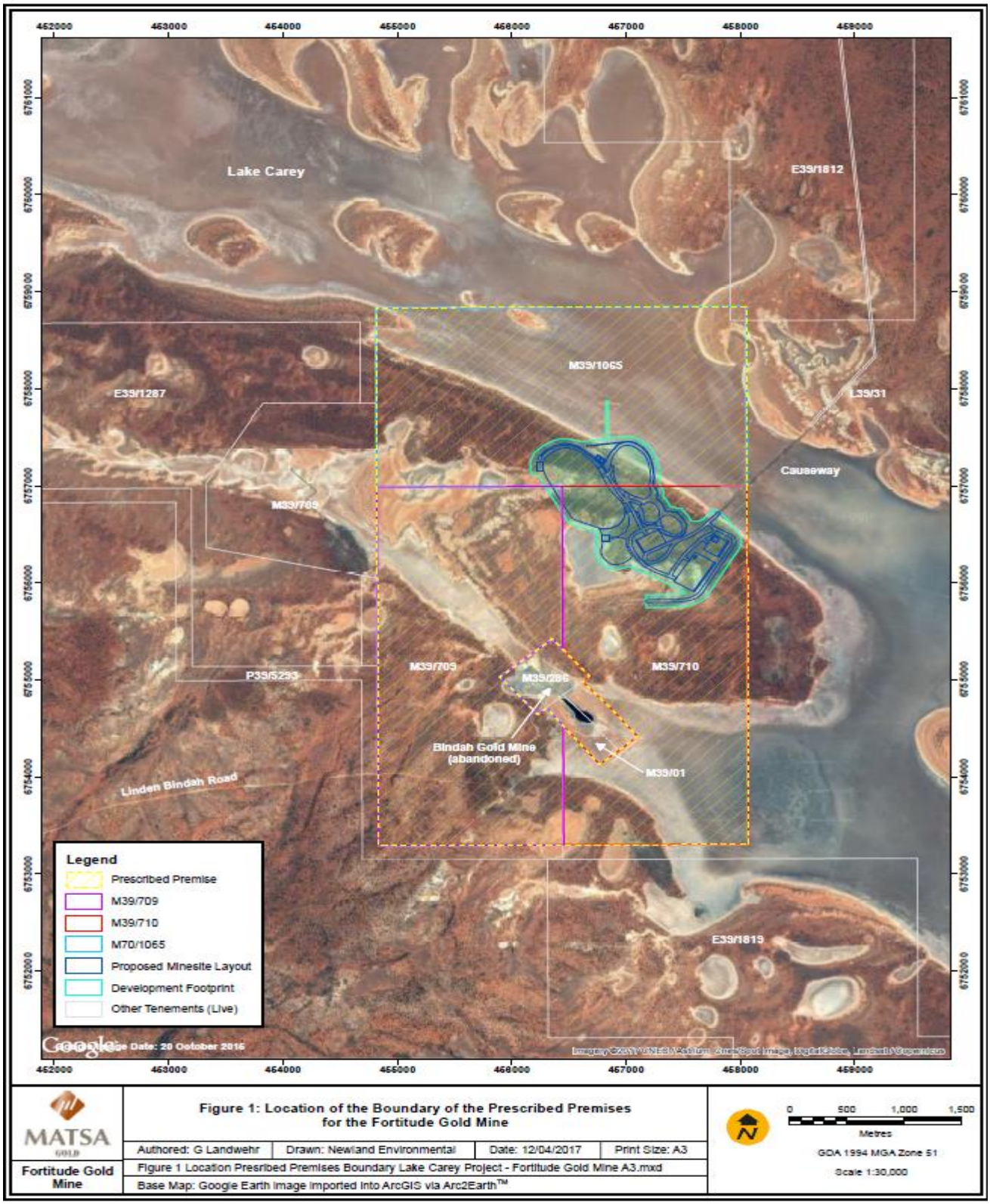
Requests for Information

8. The Works Approval Holder must comply with a Department Request within 14 days from the date of the Department Request or such other period as agreed to by the Inspector or the CEO.

Schedule 1: Maps

Premises map

The Premises are shown in the map below, with the Premises boundary shown in dashed yellow line. Note the Premises excludes mining tenements M39/01 and M39/286.



MATSA GOLD

Fortitude Gold Mine

Figure 1: Location of the Boundary of the Prescribed Premises for the Fortitude Gold Mine

Authored: G Landwehr	Drawn: Newland Environmental	Date: 12/04/2017	Print Size: A3

Figure 1 Location Prescribed Premises Boundary Lake Carey Project - Fortitude Gold Mine A3.mxd

Base Map: Google Earth Image imported into ArcGIS via Arc2Earth™

0 500 1,000 1,500

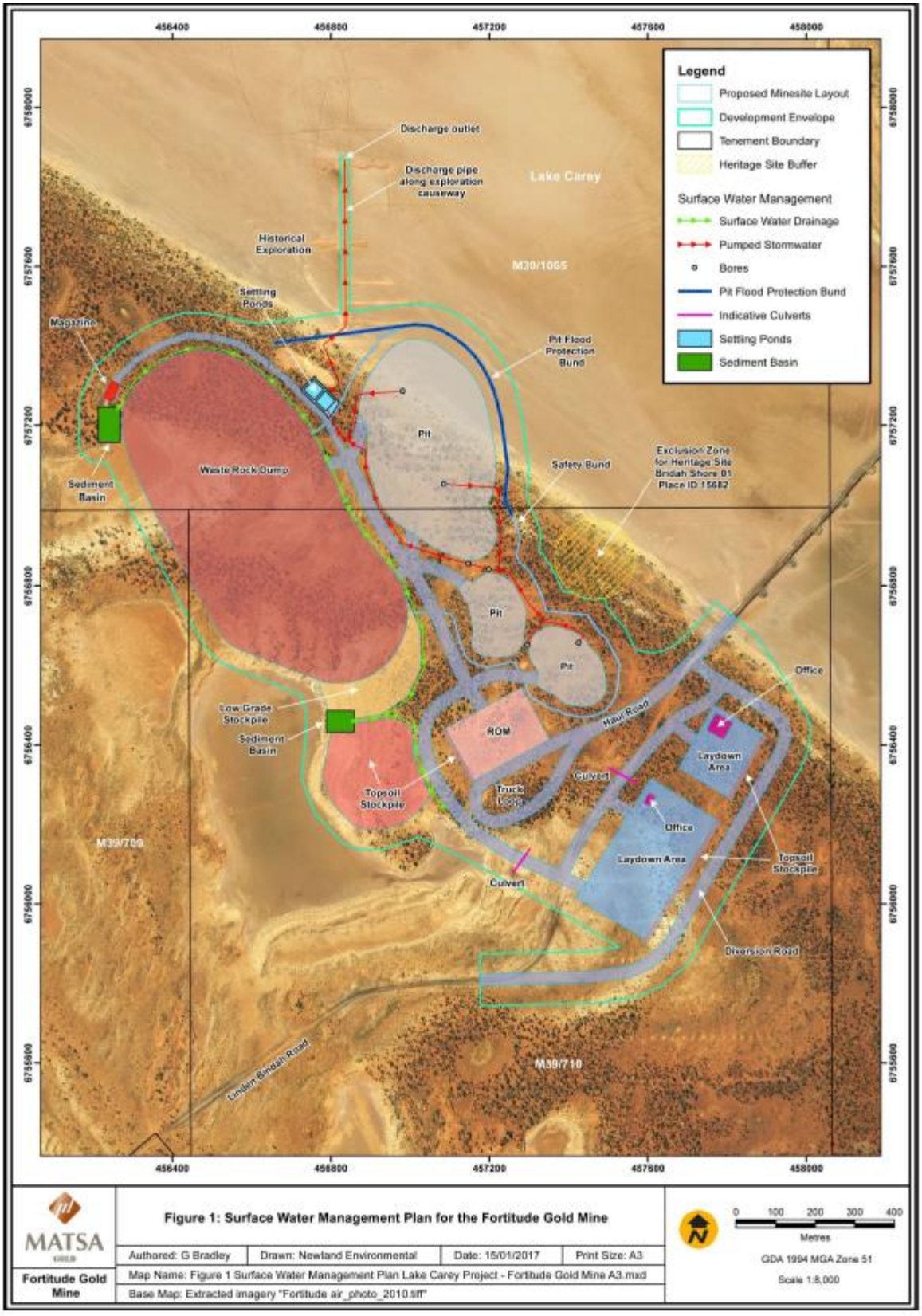
Metres

GDA 1994 MGA Zone 51

Scale 1:30,000

Site layout map

The infrastructure and equipment are set out on the Premises in accordance with the site layout specified in the Site Layout Map below.



Schedule 2: Works

At the time of assessment, Emissions and Discharges from the Works listed in Table 4 were considered in the determination of the risk and related Conditions for the Works Approval.

Table 4: Authorised Works

Works	Specifications/Drawings
Transfer HDPE (high density polyethylene) pipelines from production bores to settling pond 1.	Site Layout Map in Schedule 1
Two settling ponds sized 35m x 35m x 1.5m	Site Layout Map in Schedule 1
Transfer HDPE pipeline from settling pond 2 to discharge outlet.	Site Layout Map in Schedule 1
Discharge outlet structure consisting of a larger pipe or multiple outlet points to mitigate erosion at the outlet	Site Layout Map in Schedule 1

Decision Report

Application for Works Approval and Licence

Division 3, Part V *Environmental Protection Act 1986*

Applicant:	**Matsa Gold Pty Ltd**
ACN:	**613 060 352**
Works Approval:	**W6030/2017/1**
Licence:	**L9031/2017/1**
File Number:	**DER2016/002253 (Works Approval) & DER2016/002254 (Licence)**
Premises:	**Lake Carey Project** **Mining Tenements M39/709, M39/710 and M39/1065** **Shire of Menzies**
Date of report:	**18/05/2017**

Table of Contents

Definitions of terms and acronyms

Term	Definition
AACR	Annual Audit Compliance Report
AER	Annual Environment Report
Applicant	Matsa Gold Pty Ltd
Application	The application submitted to DER by Matsa Gold Pty Ltd, consisting of reference document Matsa 2016
Category/Categories (Cat.)	categories of prescribed premises as set out in Schedule 1 of the EP Regulations
CS Act	*Contaminated Sites Act 2003* (WA)
DER	Department of Environment Regulation
Decision Report	this document
Delegated Officer	An officer under section 20 of the EP Act.
DPaW	Department of Parks and Wildlife
DoW	Department of Water
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)
ha	hectare
HDPE	High density polyethylene
mg/L	milligrams per litre
Noise Regulations	*Environmental Protection (Noise) Regulations 1997* (WA)
Occupier	As defined by the EP Act to mean a person who is in occupation or control of a premises, or part of a premises, whether or not that person is the owner of the premises or part of the premises.
PEC	Priority Ecological Communities
Premises	Lake Carey Project
Prescribed	Premises prescribed under Schedule 1 to the EP Regulations

Premises	
Primary Activities	Are defined in DER's *Guidance Statement: Risk Assessments* to include the primary activities which fall within the description of the category of prescribed premises in Schedule 1 to the EP Regulations.
PDWSA	Public Drinking Water Source Area
riparian	relating to wetlands adjacent to rivers and streams
Risk Event	As described in *Guidance Statement: Risk Assessment*
TEC	Threatened Ecological Communities
TDS	Total dissolved solids
tpa	Tonnes per annum

1. Purpose and scope of assessment

The Department of Environment Regulation (***DER***) received an ***Application*** from Matsa Gold Pty Ltd (the ***Applicant***) for a works approval and licence under Division 3, Part V of the *Environmental Protection Act 1986* on 3 November 2016. The application was to permit discharge of mine dewater (groundwater abstracted for the purposes of mining) from the Lake Carey Project (the ***Premises***) to Lake Carey, an inland salt lake located in the Eastern Goldfields, near the town of Laverton.

Discharging mine dewater causes the ***Premises*** to become Prescribed under category 6 of Schedule 1 of the *Environmental Protection Regulations 1987*. The ***Applicant*** has requested a production capacity of 950 000 tpa water discharged over an approximate timeframe of 26 months.

2. Background

Lake Carey is an inland salt lake located in the Eastern Goldfields of WA, comprising an area of 1 000 km^2, of which approximately 250 km^2 comprises islands and peninsulas (MWH 2014). Lake Carey currently receives mine dewater from three active mines located at the perimeter of the Lake: Sunrise Dam Gold Mine, Wallaby Project (satellite pit of Granny Smith Gold Mine) and Red October Mine. Other mines located in the vicinity of Lake Carey include Devon Gold Mine, Murrin Murrin Operations (nickel), Mt Morgan Project (gold).

The Applicant wishes to develop the Lake Carey Project – Fortitude Gold Mine, a series of three open pits to recover gold ore to be processed elsewhere. The expected mine life is 26 months. The Premises is located approximately 80 km south of Laverton on the south-southwest shore of Lake Carey. Refer to Figure 2 for further detail.

The Premises includes the mining tenements M39/1065, M39/710 and M39/710. M39/1065 is located over part of Lake Carey. The Premises does not include the historic Bindah gold mine open pit, which is located on mining tenement M39/01 approximately 2.5 km south of the proposed Lake Carey Project mine infrastructure. This open pit was last operated in 1985 - 1987, but historic gold mining operations have been recorded at Bindah as early as 1913 (Mindat 2017).

In order to make the pits safe for mining, and to access the ore that is located below the water table, groundwater needs to be abstracted from the three pits. The Applicant is seeking a works approval to install the mine dewatering infrastructure (with the exception of the installation and operation of groundwater production bores which are authorised by the Department of Water) and a licence to discharge the dewater to Lake Carey.

Table 1: Prescribed Premises Categories

Classification of Premises	**Description**	***Approved premises production or design capacity or throughput***
Category 6	Mine dewatering: premises on which water is extracted and discharged into the environment to allow mining of ore.	950 000 tpa

3. Overview of Lake Carey Project

3.1 Infrastructure

The Premises infrastructure, as it relates to Category 6 activities, is detailed in Table 2 and with reference to the Site Plan (attached in the Works Approval and shown below as Figure 1).

Table 2: Lake Carey Project Category 6 infrastructure

	Infrastructure
	Prescribed Activity Category 6
Transfer of groundwater abstracted from the three open cut pits via pipelines to one of two settling ponds (shown in blue in Figure 1). Settling pond 1 has a spillway connecting it to settling pond 2. Water is then transferred by pipeline via gravity, run along an existing exploration causeway to the discharge outlet The length of the causeway is approximately 400m. The discharge outlet is located 300m from the edge of the lake, within Lake Carey, also within the Premises on mining tenement M39/1065.	
1	Transfer HDPE (high density polyethylene) pipelines from production bores to settling pond 1.
2	Two settling ponds sized 35m x 35m x 1.5m
3	Transfer HDPE pipeline from settling pond 2 to discharge outlet.
4	Discharge outlet structure consisting of a larger pipe or multiple outlet points to mitigate erosion at the outlet
	Directly related Activities
Authorisation of abstraction of the groundwater for mining (and therefore use of production groundwater bores) is by DoW (and therefore outside DER's scope).	
1	Groundwater production bores (locations as shown in Figure 1) (FCWB02, FCWB03, FCWB04, FCWB05, and FCWB07), fitted with submersible pumps and diesel generator unit
	Other activities
Stormwater management around the mining infrastructure is not directly related to category 6 and hence not subject to the works approval and licence.	
1	2 Sediment basins

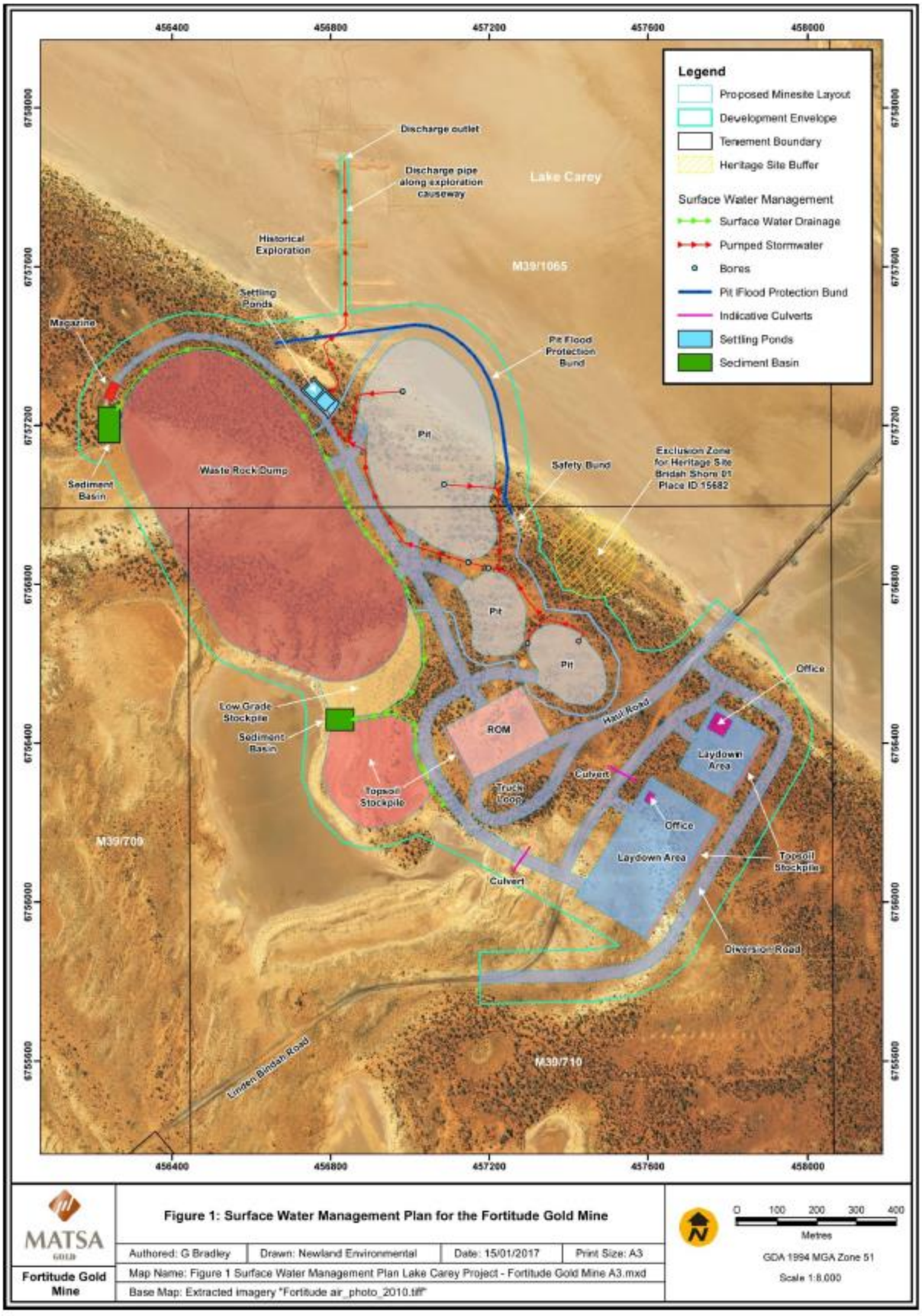


Figure 1: Lake Carey Project Site Plan showing location of proposed mining infrastructure and location dewatering discharge pipeline, discharge point and settling ponds

3.2 Exclusions to the Premises

Activities related to the mining of the ore, placement of waste rock/overburden, materials handling and stockpiling are excluded from the Premises. Abstraction of groundwater (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.

4. Legislative context

4.1 Other relevant approvals

Table 3: Relevant approvals and tenure

Legislation	Number	Subsidiary	Approval
Rights in Water and Irrigation Act 1914	GWL 183220(1)	Matsa Gold Pty Ltd	Approval granted to draw 1 900 000kL/a from palaeochannel aquifer for dewatering for mining purposes
Environmental Protection Act 1986, Division 2, Part V (Clearing of Native Vegetation)	CPS #7336/1	Matsa Gold Pty Ltd	Approval to clear 98 ha of native vegetation
Mining Act 1978	Mining Proposal Reg ID 63781	Matsa Gold Pty Ltd	Approval to conduct open cut mining three pits and construct single waste rock dump.

4.2 Contaminated sites

The Premises is not classified under the *Contaminated Sites 2003 Act,* and has not been reported as a known or suspected contaminated site.

4.3 Part V of the EP Act

4.3.1 Applicable Regulations, Standards and Guidelines

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

DER Guidance Statements which inform this assessment are:

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

- *Guidance Statement: Risk Assessments (November 2016)*
- *Guidance Statement: Environmental Siting (November 2016).*

4.3.2 Clearing

A clearing permit, CPS #7336/1 has been granted by the Department of Mines and Petroleum, under delegation.

5. Consultation

The ***Application*** for works approval and licence was advertised on 6 March 2017. Advice was also sought from the Department of Mines and Petroleum, the Department of Parks and Wildlife and the Shire of Menzies.

The Department of Parks and Wildlife forwarded advice dated 20 March 2017, in relation to the priority flora present within the ***Premises*** (as listed under the *Wildlife Conservation Act 1950*), and a summary of their records of *Tecticornia* species within Lake Carey and also present within Lake Lefroy (located near Kambalda, to the south of Lake Carey).

Advice was also provided in regard to protection of *Tecticornia* species (common name samphire) that are located within the riparian areas of the lake. The Department noted that *Tecticornia* species are highly dependent on micro relief and surface hydrological expression, and that changes to hydrology can result in impacts to *Tecticornia*. Changes induced by dewatering or water discharge within the lake area may also impact on a larger area than just within the disturbance footprint (DPaW 2017). That is impacts may not just be to species surveyed within the Premises footprint, but may also impact on adjacent vegetation.

The Shire of Menzies provided comment dated 19 March 2017, that it had no objection to the proposed works (DPaW 2017).

No comment was received from the Department of Mines and Petroleum.

6. Location and siting

6.1 Siting context

The Premises is located on the southwestern shore of Lake Carey, an inland salt lake located in the Goldfields region of Western Australia. The Premises is located 80 km south-southeast of the town of Laverton, as shown in Figure 2 following.

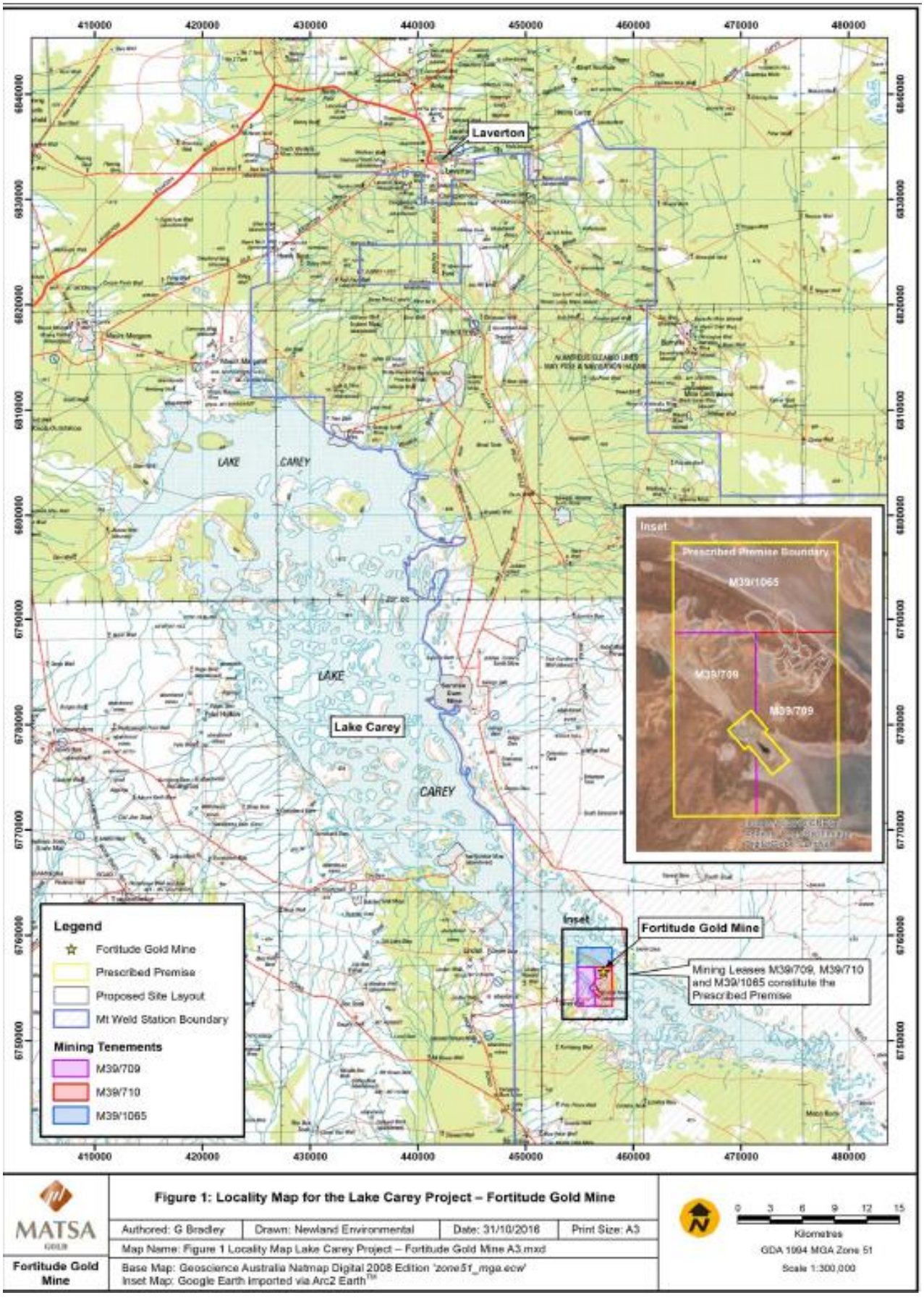


Figure 2: Locality map for the Lake Carey Project

6.2 Residential and sensitive premises

No residential and sensitive receptors are located within a 20 km radius of the Premises. Adjacent land uses include mines located on the eastern and western edges of Lake Carey Saracen's Red October mine is the nearest operating mine, located approximately 20 km to the north-west.

6.3 Specified ecosystems

The distances to specified ecosystems are shown in Table 4. As per the DER *Guidance Statement: Environmental Siting*, a specified ecosystem is an environmental receptor which will be considered in risk assessment and may require additional evidence and information (in the form of either baseline surveys, modelling and predictions of impacts and additional monitoring and management of potential impacts) in order to complete the risk assessment. Information may also be sought from the relevant government department or agency in relation to the potential impacts to the Specified Ecosystem.

Accordingly, advice was sought from the Department of Parks and Wildlife in relation to impacts on priority flora at Lake Carey, as noted in section 5 of this Decision Report.

Table 4: Specified ecosystems

Specified ecosystems	Distance from the Premises
Parks and Wildlife tenure	There is no Parks and Wildlife tenure within a 30km radius of the Premises.
Threatened/ Priority flora	Lake Carey classed as specified according to DER's *Guidance Statement: Environmental Siting* due to the presence of Priority 1 flora (*Tecticornia mellarium).* Part of Lake Carey is included within the Prescribed Premises boundary at M39/1065. The total size of Lake Carey is approximately 50 000 km^2, with a length of 570 km (AQ2 2016b).
Threatened/ Priority fauna	Priority 1 fauna (invertebrate species *Branchinella simplex)* has been found within Lake Carey and at the edges of the lake to the north, near the Wallaby Mine (MWH 2015). It is not known if they are present within the Premises due to lack of specific baseline information.
Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs).	A vegetation survey was conducted at the Premises during September 2016. No TECs or PECs are present at the Premises (Plantecology 2016). The nearest PEC is the Priority 3 'Mount Linden Range vegetation complex (Banded Ironstone Formation);, located 12 km to the west of the Premises.
Public Drinking Water Source Area (PDWSA)	There are no PDSWA within the Premises. The Priority 1 Laverton Water Reserve is approximately 60 km north.
Ramsar wetland	No listed Ramsar wetlands are within a 30 km radius of the Premises.
Important wetlands – Western Australia	Lake Ballard is the nearest wetland that is listed in the Australian Directory of Important Wetlands, located over 100km to the south-west).

Other relevant ecosystem values	Distance from the Premises
Lake Carey water and sediment quality	Located on the eastern boundary of the prescribed premises
Migratory birds	30 species of waterbirds, including the red-necked stint *(Calidris ruficollis)* which is a listed migratory bird, have been recorded on Lake Carey (MWH 2015)

6.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 5.

Table 5: Groundwater and water sources

Groundwater and water sources	Distance from Premises	Environmental Value
Groundwater is hypersaline (~250 000 mg/L TDS)	Open pits will intersect the groundwater resource and hence the application to discharge the water to Lake Carey	Water is used only for mining (not suitable for livestock).

6.5 Meteorology

6.5.1 Rainfall and temperature

The nearest Bureau of Meteorology weather monitoring station is located at Laverton. Average rainfall at Laverton is 235 mm/year. Rainfall is highly variable and usually occurs in later summer from ex-tropical lows.

The annual pan evaporation is estimated at 2776 mm (Matsa Gold 2016).

The area records rainfall on an average of 30 days per year, with mean maximum temperatures ranging from 17.8 ^{o}C in July to 35.8 ^{o}C in January and mean minimum temperatures between 5.2 ^{o}C in July to 20.5 ^{o}C in January (Plantecology 2016).

7. Risk Assessment

7.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DER 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 6 and Table 7.

The identification of the sources, pathways, receptors to determine Risk Events are set out in Table 6 and Table 7 below.

Table 6: 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	Construction of dewatering infrastructure (pipelines, pumps, sedimentation ponds)	Noise	No residences or other sensitive human receptors in proximity. Priority 1 flora species (*Tecticornia mellarium)*	Air / wind dispersion	None	No	No receptor present
		Dust			None	No	Dust impacts to be regulated by Clearing Permit issued under Division2, Part V of the EP Act; issued by DMP under delegation.
		Clearing of vegetation		Unauthorised clearing	Death of native vegetation	No	Administered by DMP under the Mining Act 1978 and delegation of Division 2, Part V of the EP Act

Table 7: 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		
Dewatering	Discharge to Lake Carey	Dewater to surface water (Lake Carey)	Riparian ecosystems (including Priority 1 flora species (*Tecticornia mellarium))*	Direct discharge, change to surface water hydrology	Decline/death of vegetation from salt spray / salt inundation	Yes – refer to section 7.4	Potential impact to receptors; including sensitive ecosystem
					Decline/death of vegetation from change to surface water hydrology	Yes- refer to section 7.4	Potential impact to receptors; including sensitive ecosystem
			Aquatic biota (algae and invertebrate fauna species (including potentially Priority 1 species *Branchinella simplex,* and *Parartemia bicornia,* species with restricted distribution in Lake Carey)).	Direct discharge; change to lake hydroperiod (period of inundation); increase in metals in sediment; increase in salt loading/salt crust formation	Reduction in species abundance and diversity	Yes – refer to section 7.5	Potential impact to receptors; including sensitive ecosystem
			Birds and bats(including migratory birds)	Ingestion of saline water with elevated metals (in particular cadmium, mercury selenium)	Poor health in birds/ bats	No	Research conducted on avifauna 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).

Risk Events						Continue to detailed Risk Assessment	Reasoning
Sources/Activities		Potential Emissions	Potential Receptors	Potential Pathway	Potential Adverse Impacts		
				Reduction in algae and invertebrate species	Reduction in food availability for avifauna leading to poor health	Yes - Covered above in section 7.5	Potential impact to receptors; including sensitive ecosystem
	Abstraction of groundwater (mine dewater)	Groundwater drawdown	Riparian vegetation	Reduction in groundwater resource	Decline/death of vegetation	No	Regulated by the Department of Water under section 5C of the *Rights in Water and Irrigation Act 1914*. Root systems of riparian vegetation found at salt lakes generally dependent on surface water flows rather than underlying groundwater.
	Pipeline failure	Saline dewater discharge	Riparian ecosystems (including Priority 1 flora species (*Tecticornia mellarium*))	Spill to land	Decline/death of vegetation	Yes – refer to section 7.6	Potential impact to receptors; including sensitive ecosystem
	Settling ponds overtopping	Saline dewater discharge	Adjacent native vegetation (including riparian vegetation)	Release to land/vegetation	Decline/death of vegetation	Yes – refer to section 7.7	Potential impact to receptors; including sensitive ecosystem
Stormwater management	Overflow of sediment basins	Suspended solids discharge	Native vegetation including priority 1 flora *Tecticornia mellarium* (located between the low grade stockpile and topsoil stockpile)	Release to land/vegetation	Decline/death of vegetation via inundation	No	Management of stormwater surrounding mining infrastructure is not included in category 6 authorisation. It should be noted by the applicant that the works approval and licence issued consequently does not provide a defence under the EP Act.

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 8 below.

Table 8: 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

DER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 9 below.

Table 9: 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	• **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
Likely	The risk event will probably occur in most circumstances	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
Possible	The risk event could occur at some time	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
Unlikely	The risk event will probably not occur in most circumstances	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
Rare	The risk event may only occur in exceptional circumstances	Slight	• **on-site impact**: minimal • Specific Consequence Criteria (for environment) met	• **Local scale**: minimal to amenity • 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, DER may have regard to the Department of Health's, *Health Risk Assessment (Scoping) Guidelines*

"on-site" means within the prescribed premises boundary.

7.3 Acceptability and Treatment of Risk Event

DER will determine the acceptability and treatment of Risk Events in accordance with the Risk Treatment Table below:

Table 10: Risk Treatment Table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DER 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 – Impact to riparian vegetation from dewater discharge

7.4.1 Description of risk event

Discharge of hypersaline mine dewater to Lake Carey.

7.4.2 Identification and general characterisation of emission

A maximum of 950 000 tpa of hypersaline water with elevated metal/ metalloids concentrations is planned to be discharged continuously over a 26 month period to Lake Carey.

In order to provide an estimate of the water quality to be discharged, groundwater was sampled at four of the proposed production bores in September and October 2016, and a sample was also taken from the pit water in the Bindah open pit. A summary of the pH, TDS and salts concentrations is detailed in Table 11 below.

Metals and metalloids were reanalysed at the request of DER so that the level of detection (also known as limit of reporting) was sufficient to allow assessment of the water quality criteria in Table 13, detailed in section 7.4.4 following. This water quality data is detailed in Table 12.

Table 11: Water quality parameters (excepting metal/metalloids) for groundwater sampled at Premises (indicative of the discharge dewater quality)

Parameter	Units	Bore FCWB02	Bore FCWB04	Bore FCWB05	Bore FCWB07	Bindah Old Pit
Date sampled		*27/10/16*	*28/10/16*	*21/10/16*	*28/10/16*	*28/10/16*
pH	-	6.8	6.6	6.8	6.8	7.1
Total dissolved solids	mg/L	250 000	240 000	250 000	240 000	320 000
Bicarbonate	mg/L	51	62	57	57	53
Carbonate	mg/L	1	1	1	1	1
Chloride	mg/L	140 000	140 000	120 000	150 000	180 000
Sulfate	mg/L	15 000	13 000	16 000	15 000	26 000
Calcium	mg/L	670	650	620	650	150
Magnesium	mg/L	5 400	5 100	5 500	5 000	10 000
Potassium	mg/L	1 700	1 600	1 700	1 600	1 800
Sodium	mg/L	95 000	92 000	93 000	91 000	1 100 000

Table 12: Metal/metalloid concentrations in groundwater at the Premises

Parameter	Units	X10 Dilution LOR[1]	Bore FCWB02	Bore FCWB04	Bore FCWB06	Bore FCWB07
Date sampled	-	-	*10/10/16*	*03/10/16*	*13/10/16*	*16/10/16*
Arsenic	mg/L	0.0052	0.031	0.0137	<0.0052	2.35
Barium	mg/L	0.01	0.033	0.051	0.02	0.022
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	1.05	<1.05	<1.05	<1.05	<1.05
Cadmium	mg/L	0.002	0.005	0.0011	0.0014	0.003
Chromium	mg/L	0.005	0.0145	0.0241	0.0551	0.342
Cobalt	mg/L	0.0005	0.0329	0.0372	0.0286	0.162
Copper	mg/L	0.0021	0.0189	0.0089	0.075	<0.0021

Parameter	Units	X10 Dilution LOR[1]	Bore FCWB02	Bore FCWB04	Bore FCWB06	Bore FCWB07
Iron	mg/L	0.05	7.02	6.9	27.5	6.39
Lead	mg/L	0.002	0.027	0.0051	0.0018	0.0027
Manganese	mg/L	0.005	8.81	9.77	4.78	9.21
Nickel	mg/L	0.005	0.0451	0.0393	0.0753	1.69
Selenium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01
Zinc	mg/L	0.01	0.085	0.126	0.107	0.064
Thallium	mg/L	0.001	0.003	0.0023	0.0027	0.0025

Note 1: LOR refers to the 'limit of reporting' otherwise known as level of detection. In order to achieve analysis at concentrations that enable comparison with the criteria in Table 13 the samples were diluted by a factor of 10.

Aspects of the dewater emissions that are of relevance to this assessment are:

- A change to the hydroperiod (persistence of water) with ponding of water at the discharge site;
- The potential for hypersaline water to be in contact with riparian vegetation;
- Increased salt loading / salt crust at the discharge site in Lake Carey as compared to background (non-impacted sites);
- Increased metal loading in lake sediments in vicinity of discharge site; and
- Increased concentration of metals in Lake Carey surface water at the discharge site.

7.4.3 Description of potential adverse impact from the emission

Discharge of mine dewater may result in adverse plant health due to:

- exposure from salt spray/drift ; and
- changes to the hydroperiod and changes to local hydrology.

A baseline vegetation survey of the Premises has been conducted (Plantecology 2016). Some populations of Priority 1 flora (listed species under the *Wildlife Conservation Act 1950)*, *Tecticornia mellarium* were recorded. These plants (147 in total) were located on the edge of a saline claypan to the south west of the Premises, and not on Lake Carey itself (refer to Figure 3). A previous survey, conducted in 1999, had recorded *Tecticornia mellarium* on the edge of Lake Carey, adjacent to the Premises (at transect #4, located at the old Bindah Minesite) but the 2016 survey did not record any individuals at the shore of Lake Carey (Plantecology 2016).

Of the 165 ha surveyed for the 2016 baseline assessment, 127 ha of vegetation (representing 77.3% of the survey area) was found to be of 'excellent' condition (rating according to Keighery 1994) (Plantecology 2016). Areas subject to previous and current drilling programs were classified as 'Very good' condition and, despite disturbances, there is very little weed infestation (Plantecology 2016). Refer to Figure 4 for further detail of the vegetation condition.

Advice received from the Department of Parks and Wildlife (DPaW) notes that *Tecticornia* species can occur in large numbers and regenerate after disturbance, however they are highly

dependent on micro relief and surface hydrological expression and appear to be quite site–specific (DPaW 2017). Consequently DPaW noted that the impacts to these species may extend outside the proposed disturbance area if there is dewatering discharge within the lake (i.e. adjacent populations of *Tecticornia* outside the Premises may also be affected by the change in surface hydrology). As the presence of species adjacent to the Premises is currently unknown it is possible that further populations exist, and that these may be impacted by the discharge, dependent on the size of the pond that forms.

The 10 year report of the Lake Carey Catchment Management Group also notes that hypersaline water in contact with the riparian zone can cause plant degradation and death (Outback Ecology *et al* 2013). Impacts may eventuate dependent on the size of the lake that forms from the discharge, noting that the lake shore immediately to the south east of the pipeline causeway will be disturbed by clearing and development of the largest open pit and the associated flood bund, out beyond the shore as shown in Figure 1.

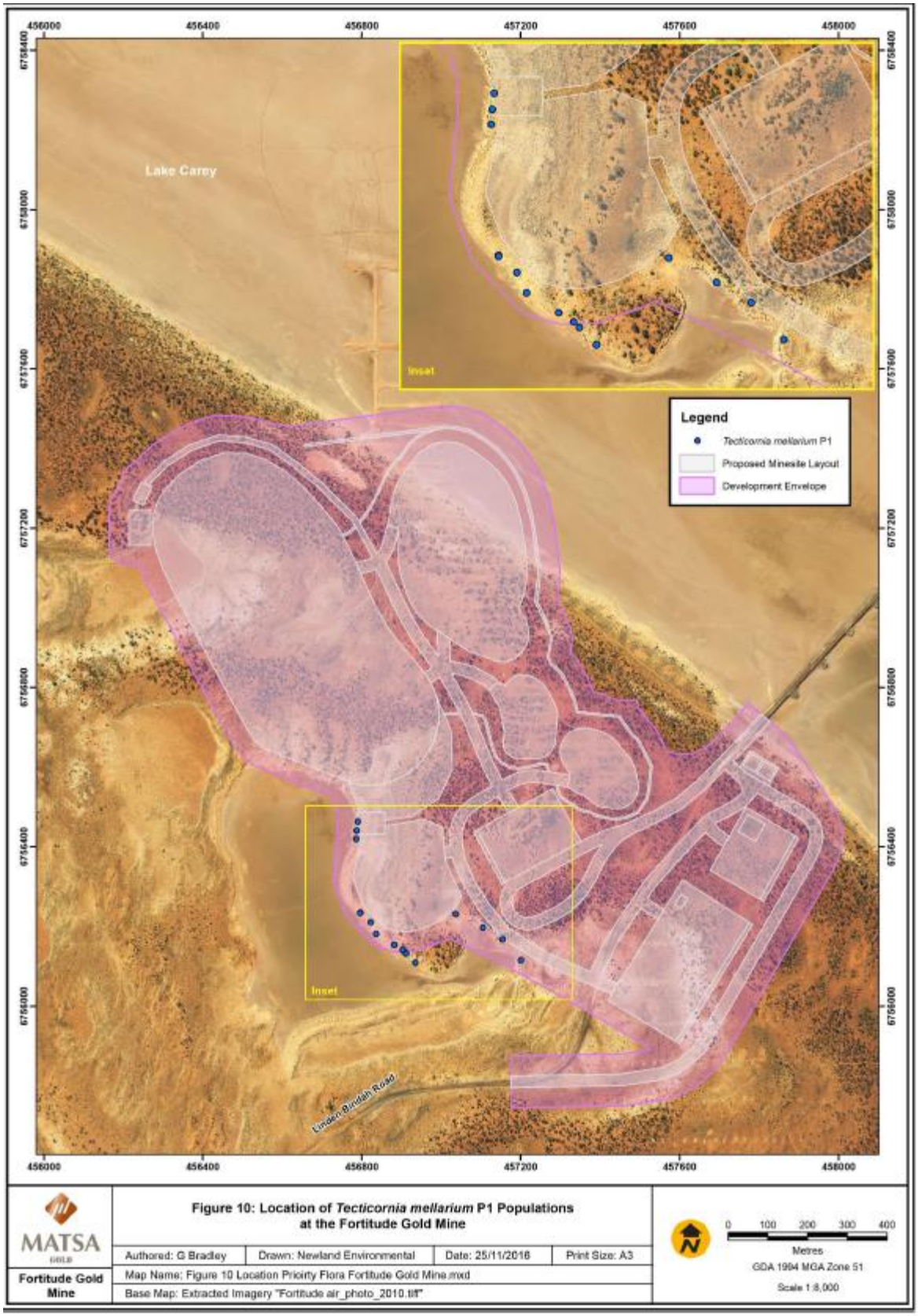


Figure 3: Location of *Tecticornia mellarium* populations within the Premises.

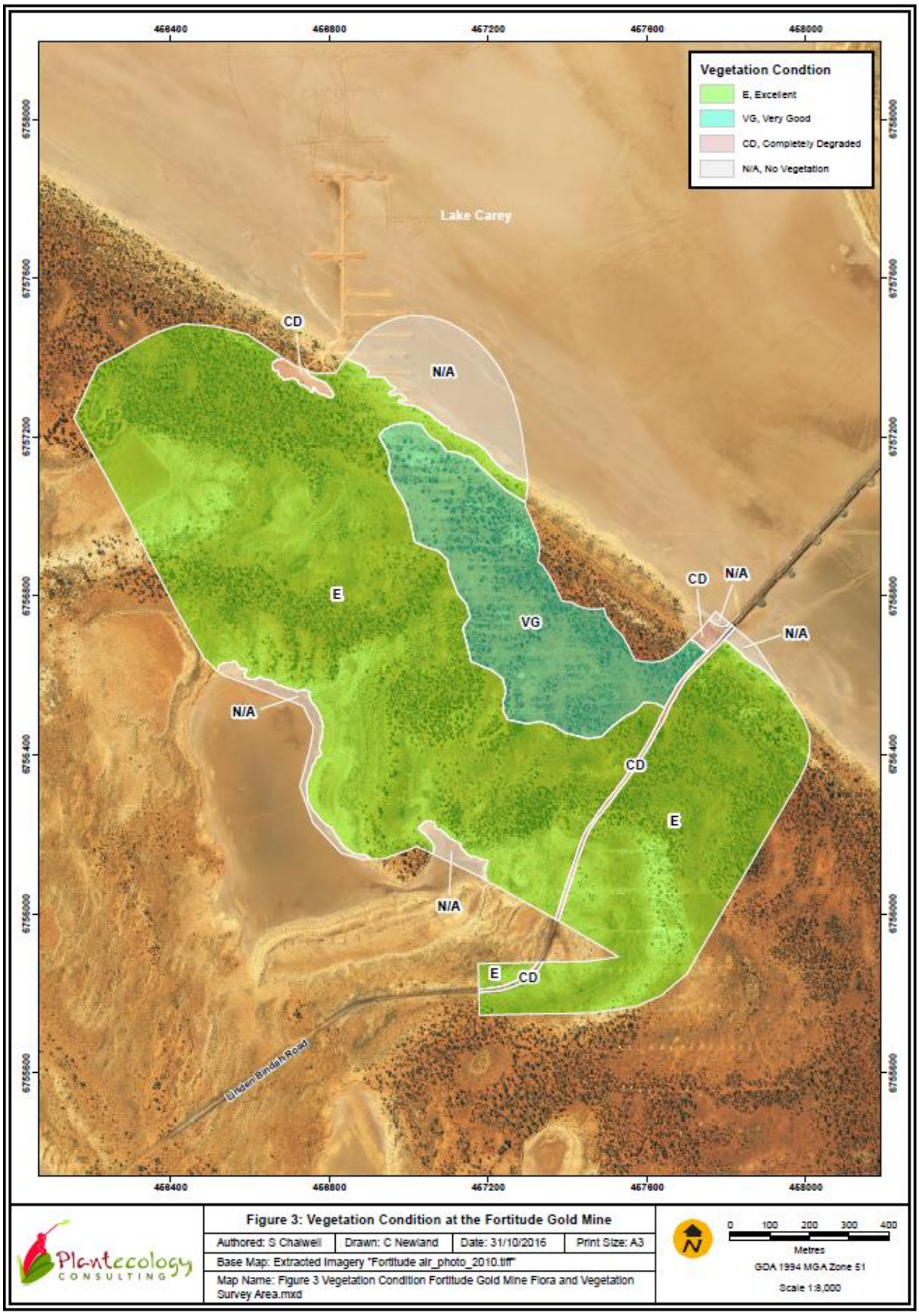


Figure 4: Vegetation condition map for the Premises (Plantecology 2016).

7.4.4 Criteria for assessment

DER has specified criteria for assessment of dewater quality using site-specific derived control site ranges for expected metals/metalloids in surface water quality at Lake Carey, derived from long term research at Lake Carey (MWH 2014), with the ANZECC guidelines for 80% protection of marine species also provided as an accompanying conservative measure.

Table 13: Reference water quality criteria for surface water at Lake Carey (metal and metalloid concentrations)

Parameter	Lake Carey CSRs 80th percentile[1] (mg/L)	ANZECC (2000) Guidelines 80% protection of species in marine environments (mg/L)
Barium	0.164	-
Cadmium	0.003	0.036
Chromium	-	0.085
Cobalt	0.007	0.15
Copper	0.047	0.008
Iron	0.600	-
Lead	-	0.012
Manganese	0.046	-
Mercury	-	0.0014
Nickel	0.029	0.56
Selenium[2]	-	0.002
Zinc	-	0.043

Note 1: Site-specific trigger values (or control site ranges 'CSRs') have been developed for Lake Carey through over 10 years of sampling (MWH 2014)

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 Lake Carey.

A comparison of the metal/metalloid concentrations in groundwater with the assessment criteria follows in Table 14.

Table 14: Comparison of groundwater quality concentrations with assessment criteria

(Note appropriate criteria is not available for arsenic, beryllium, boron, thallium)

Parameter	Units	X10 Dilution LOR[1]	Bore FCWB02	Bore FCWB04	Bore FCWB06[1]	Bore FCWB07	Lake Carey CSRs 80th percentile	ANZECC (2000) Guidelines 80% protection of species in marine environments
Date sampled	-	-	*10/10/16*	*03/10/16*	*13/10/16*	*16/10/16*		
Arsenic	mg/L	0.0052	0.031	0.0137	<0.0052	2.35		
Barium	mg/L	0.01	0.033	0.051	0.02	0.022	0.164	
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001		
Boron	mg/L	1.05	<1.05	<1.05	<1.05	<1.05		
Cadmium	mg/L	0.002	**0.005**[2]	0.0011	0.0014	0.003	0.003	0.036
Chromium	mg/L	0.005	0.0145	0.0241	0.0551	0.342		0.085
Cobalt	mg/L	0.0005	**0.0329**	**0.0372**	**0.0286**	**0.162**[3]	0.007	0.15
Copper	mg/L	0.0021	**0.0189**	**0.0089**	**0.075**	<0.0021	0.047	0.008
Iron	mg/L	0.05	7.02	6.9	27.5	6.39	0.600	
Lead	mg/L	0.002	0.027	0.0051	0.0018	0.0027		0.012
Manganese	mg/L	0.005	**8.81**	**9.77**	**4.78**	**9.21**	0.046	
Mercury[4]	mg/L	0.00005	0.00033	<0.00005	<0.00005	<0.00005		0.0014

Parameter	Units	X10 Dilution LOR[1]	Bore FCWB02	Bore FCWB04	Bore FCWB06[1]	Bore FCWB07	Lake Carey CSRs 80th percentile	ANZECC (2000) Guidelines 80% protection of species in marine environments
Nickel	mg/L	0.005	**0.0451**	**0.0393**	**0.0753**	**1.69**	0.029	0.56
Selenium[5]	mg/L	0.01	<0.01	<0.01	<0.01	<0.01		0.002[5]
Zinc	mg/L	0.01	**0.085**	**0.126**	**0.107**	**0.064**		0.043
Thallium[6]	mg/L	0.001	**0.003**	**0.0023**	**0.0027**	**0.0025**		

Note 1: Although included here for comparison, FCWB06 is not forecast to be a production bore; i.e not a contributor to discharge water quality.

Note 2: Entries in green are above one of the criteria.

Note 3: Entries in red are above both criteria

Note 4: Mercury analysis data is from the initial round of analysis as it met the requirements for limit of reporting.

Note 5: None of the selenium samples were analysed at a sufficient level of detection to allow comparison with the criteria (note criterion is sourced from Lemly (2002) not from ANZECC (2000)).

Note 6: The Department of Health (WA) has advised that the USEPA maximum contaminant level goal of 0.0005 mg/L Thallium for drinking water quality can be adopted as a screening tool level for Thallium. It is noted that this is a conservative value and a threshold for the protection for human health, therefore this value has not been included in Table 14 above. The USEPA have set an enforceable maximum contaminant level for drinking water quality at 0.002mg/L, and the values in the table have been compared against this concentration, in the absence of Australian guidance (USEPA 2009).

7.4.5 Applicant controls

This assessment has reviewed the controls set out in Table 15 below.

Table 15: Applicant's proposed controls for riparian vegetation protection

Site Infrastructure	Requirement	Reference to Issued Works Approval Plan (Attachment 1)
Pipeline discharge outlet	Located 300m away from shore at the end of the historic exploration causeway; following consultation with DER, the outlet was relocated from an enclosed embayment south of the Bindah/Linden Rd causeway to north of this causeway, allowing contact with the larger part of Lake Carey (improving the capacity of the dewatering pond to disperse to the north and also improving the likelihood that the lake salinity reduces in a rainfall event (Outback Ecology *et al* 2013)).	As shown in the Site Layout Map in Schedule 1.
Settling Ponds	500mm freeboard to be maintained in each pond	As shown in the Site Layout Map in Schedule 1.
	Regular cleaning out of sediment within the pond , including prior to forecast rain events, to ensure capacity is available within the pond	

7.4.6 Key findings

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

1. A Priority 1 flora species, *Tecticornia mellarium,* is present within the proposed disturbance area of the Premises, although not at the lake edge.
2. DPaW advises that the change to the hydrology of the lake may impact on *Tecticornia mellarium* and other *Tecticornia* populations if present outside the immediate disturbance area.
3. The vegetation survey assessed 165 ha within the Mining tenements M39/1065, M39/701 and M39/702. However, not all the riparian vegetation areas within the Premises but outside the disturbance area were surveyed.

7.4.7 Consequence

If destruction of priority flora populations from exposure to hypersaline dewater occurs, then the Delegated Officer has determined that the impact of destruction priority flora will constitute short term impact to an area of high conservation value or special significance. Therefore, the Delegated Officer considers the consequence of this event to be **major**.

7.4.8 Likelihood of consequence

The Delegated Officer has determined that the likelihood of hypersaline water impacting on priority flora occurring during the mine life of 26 months to be unlikely. Therefore, the Delegated Officer considers the likelihood of this event to be **unlikely**.

7.4.9 Overall rating of riparian vegetation impact from dewater discharge

The Delegated Officer has compared the consequence and likelihood ratings described above with the Risk Rating Matrix (Table 10) and determined that the overall rating for the risk of is **Medium**.

7.5 Risk Assessment – Impact to aquatic biota from dewater discharge

7.5.1 Description of risk event

Discharge of hypersaline mine dewater to Lake Carey.

7.5.2 Identification and general characterisation of emission

- Increased salt loading / salt crust as compared to background;
- Increased metal/metalloid loading in lake sediments in vicinity of discharge site;
- Increased concentration of metals/metalloids in Lake Carey surface water at the discharge site;

7.5.3 Description of potential adverse impact from the emission

Discharge of mine dewater may result in a reduction in the abundance and diversity of aquatic biota (diatoms and invertebrate fauna species) due to:

- Increased metal/metalloid loading in lake sediments;
- Increased concentration of metals/metalloids in Lake Carey surface water;
- Increased salt loading and salt crust.

This aquatic biota provides a food source for flying fauna (birds and bats).

Other operating adjacent mine sites with mine dewater discharge to Lake Carey have recorded reductions in aquatic biota diversity and abundance at discharge impacted sites.

It also noted if flooding events of 2011 have restored the biological function of these impacted sites to a degree. A 10 year review of ecological monitoring at Lake Carey, including aquatic biota species diversity and abundance has found that a flooding event may restore the function of the lake, even for discharge impacted sites(Outback Ecology *et al* 2013), It is also acknowledged that the absence of baseline information prior to the discharge occurring, has made it difficult to estimate the degree of impact to aquatic biota from the discharge, as the ecological monitoring programs have all commenced after discharge was occurring.

7.5.4 Criteria for assessment

DER has specified criteria for discharge dewater quality assessment using site- specific derived control site ranges for expected metals/metalloids in surface water quality at Lake Carey, derived from long term research at Lake Carey (MWH 2014), with the ANZECC guidelines for 80% protection of marine species also provided as an accompanying conservative measure. Refer to Table 13 in section 7.4.4 for further detail.

7.5.5 Applicant controls

This assessment has reviewed the controls set out in Table 16 below.

Table 16: Applicant's proposed controls for aquatic biota protection

Site Infrastructure	Requirement	Reference to Issued Works Approval Plan (Attachment 1)
Location of outfall	Following discussion with DER, the outlet was relocated from an enclosed embayment south of the Bindah/Linden Rd causeway to north of this causeway, allowing contact with the larger part of Lake Carey (improving the capacity of the dewatering pond to disperse to the north and also improving the likelihood that the lake salinity reduces in a rainfall event (Outback Ecology *et al* 2013)) (Sibbel 2017).	As shown in the Site Layout Map in Schedule 1.

7.5.6 Key findings

The Delegated Officer has reviewed the information regarding the impact of dewater discharge on aquatic biota and has found:

1. A Priority 1 invertebrate fauna species, *Branchinella simplex,* has been recorded within Lake Carey and may be present at the discharge site.
2. No baseline aquatic biota survey has been completed at the proposed discharge site; there is data from sites upstream and downstream of the discharge point (Outback Ecology *et al* 2013).
3. Comparable dewatering discharges at Lake Carey have recorded impacts to biota in the vicinity of the discharge location; however these impacts can be mitigated if the lake is flushed by a flooding event.

7.5.7 Consequence

Given the volume of 950 000 tpa there may be impact at the discharge site to aquatic biota from exposure to hypersaline dewater, as previous studies into impacts to aquatic biota at dewatering sites have indicated (MWH 2014; Outback Ecology *et al* 2013).

It should be noted that the discharge amount is comparably lower than two other existing authorised mine site dewatering discharges (10 000 000 kL/a for Granny Smith, 5 000 000 tpa for Sunrise Dam (noting that Sunrise Dam's actual discharge amount is ~2 000 000 tpa). Red October Mine currently is authorised to discharge 900 000 tpa, a similar amount to that requested by the ***Applicant***. The short duration of the discharge should limit the persistence of impact to biota, but this can only be confirmed through monitoring.

The relocation of the discharge site from south of the Linden Rd/ Bindah causeway to north of the causeway (refer to Figure 1) by the Applicant should improve the capacity of the impacted site to recover in the event of a flooding event, as built up salt and metals will be better able to disperse through the wider lake following significant rainfall, in contrast to being isolated in a small embayment.

The Lake Carey Catchment Management Group 10 year report into Lake Carey suggests that despite recorded impacts in the vicinity of dewatering outfall sites, there is capacity within the Lake Carey system to recover during a flushing flooding event (Outback Ecology *et al* 2013).

The Delegated Officer has determined the consequence of the dewater discharge on aquatic biota will constitute an on-site (i.e. within the Premises) mid -level impact. Therefore, the Delegated Officer considers the consequence of this risk to be **moderate**.

7.5.8 Likelihood of consequence

The Delegated Officer has determined that the likelihood of hypersaline water impacting on aquatic biota (including potentially priority fauna) to cause the consequence listed above, during the mine life of 26 months to be **unlikely**.

7.5.9 Overall rating of impact to aquatic biota from dewater discharge

Overall rating for this risk event is **Medium**.

7.6 Risk Assessment – Dewatering Pipeline Failure

7.6.1 Description of risk event

Discharge of hypersaline mine dewater to native vegetation from pipeline failure.

7.6.2 Identification and general characterisation of emission

A failure of the pipeline would result in a release of dewater. The dewater is hypersaline, with elevated metal/metalloid concentrations. Estimated discharge dewater quality is provided in Table 11 and Table 12 in section 7.4.2.

7.6.3 Description of potential adverse impact from the emission

Discharge of mine dewater may result in a death/ damage to native vegetation due to dewater's hypersalinity.

7.6.4 Criteria for assessment

DER has specified criteria for discharge dewater quality assessment using site-specific derived control site ranges for expected metals/metalloids in surface water quality at Lake Carey, derived from long term research at Lake Carey (MWH 2014), with the ANZECC guidelines for 80% protection of marine species also provided as an accompanying conservative measure. Refer to Table 13 in section 7.4.4 for further detail. An assessment of the metals/metalloid concentrations in groundwater against the criteria is shown in Table 14 of the same section.

7.6.5 Applicant controls

The ***Applicant*** has committed to providing bunding for the pipeline as per the Mining Proposal.

7.6.6 Key findings

The Delegated Officer has reviewed the information regarding the impact of pipeline failure on vegetation and has found:

1. There is potential for vegetation to be damaged due to release of dewater from a pipeline failure.
2. The pipeline routes appear to be located away from priority flora populations as identified by Plantecology (2016).

7.6.7 Consequence

The Delegated Officer has determined the consequence of the dewater discharge on vegetation will constitute an on-site (i.e. within the Premises) mid level impact. Therefore, the Delegated Officer considers the consequence of this risk to be **moderate**.

7.6.8 Likelihood of consequence

The Delegated Officer has determined that the likelihood of hypersaline water impacting on vegetation to cause the consequence listed above, during the mine life of 26 months to be **possible**.

7.6.9 Overall rating of vegetation impact from pipeline failure

Overall rating for this risk event is **Medium**.

7.7 Risk Assessment – Overtopping of Settling Ponds

7.7.1 Description of risk event

Discharge of hypersaline mine dewater to native vegetation from overtopping settling ponds.

7.7.2 Identification and general characterisation of emission

Overtopping/overflowing ponds would result in a release of dewater. The dewater is hypersaline, with elevated metal/metalloid concentrations. Estimated discharge dewater quality is provided in Table 11 and Table 12 in section 7.4.2.

7.7.3 Description of potential adverse impact from the emission

Discharge of mine dewater may result in a death/ damage to native vegetation due to its hypersalinity.

7.7.4 Criteria for assessment

DER has specified criteria for discharge dewater quality assessment using site- specific derived control site ranges for expected metals/metalloids in surface water quality at Lake Carey, derived from long term research at Lake Carey (MWH 2014), with the ANZECC guidelines for 80% protection of marine species also provided as an accompanying conservative measure. Refer to Table 13 in section 7.4.4 for further detail. An assessment of the metals/metalloid concentrations in groundwater against the criteria is shown in Table 14 of the same section.

7.7.5 Applicant controls

This assessment has reviewed the controls set out in Table 17 below.

Table 17: Applicant's proposed controls for overtopping settling ponds

Site Infrastructure	Requirement	Reference to Issued Works Approval Plan (Attachment 1)
Settling Ponds	500mm freeboard to be maintained in each pond	As shown in the Site Layout Map in Schedule 1.
	Regular cleaning out of sediment within the pond , including prior to forecast rain events, to ensure capacity is available within the pond	

7.7.6 Key findings

The Delegated Officer has reviewed the information regarding the impact of overtopping ponds on vegetation and has found:

1. There is potential for vegetation to be damaged due to release of dewater from

overtopping ponds.

2. The risk is mitigated by the proposed proponent controls.

7.7.7 Consequence

The Delegated Officer has determined the consequence of the dewater discharge on vegetation will constitute an on-site (i.e. within the Premises) mid level impact. Therefore, the Delegated Officer considers the consequence of this risk to be **moderate**.

7.7.8 Likelihood of consequence

The Delegated Officer has determined that the likelihood of hypersaline water being released to vegetation form overtopping settling ponds to cause the consequence listed above, during the mine life of 26 months to be **unlikely**.

7.7.9 Overall rating of vegetation impact from overtopping sediment ponds

Overall rating for this risk event is **Medium**.

8. 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 18 below. Controls are described further in section 9.

Table 18: 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.	Hypersaline mine dewater	Mine dewatering	Change to local hydrology/ direct contact with riparian vegetation including priority flora.	Discharge outfall site located 300m away from the lake shore	Major consequence Unlikely likelihood **Medium risk**	Acceptable subject to conditioned proponent control and regulatory controls	Works approval to specify: • location of outlet. Licence to specify: • monitoring of vegetation health on an annual basis (comparison between un-impacted and impacted sites); • outcome based condition requiring discharges to be managed to avoid inundating the shoreline.
2.	Hypersaline mine dewater	Mine dewatering	Reduction in aquatic biota species diversity and abundance due to increased salt loading, metals in sediments and lake surface water.	Infrastructure and management controls.	Moderate consequence Unlikely likelihood **Medium risk**	Acceptable subject to proponent controls conditioned	Works approval to specify: • baseline monitoring of aquatic biota at the discharge site; and • Location of the discharge outfall to be north of the Linden Rd/Bindah causeway. Licence to specify: • Monitoring of water quality discharged and volumes; • Monitoring of receiving surface water quality and metal/metalloids in sediments on an annual basis; and

	Description of Risk Event			Applicant controls	Risk Rating	Acceptability with controls (conditions on instrument)	Resulting Regulatory Controls
	Emission	**Source**	**Pathway/ Receptor (Impact)**				
							• Monitoring of aquatic biota (algae, invertebrates (including resting stages)) at the discharge site and control site(s) on an annual basis.
3.	Hypersaline mine dewater	Pipeline failure	Death or decline in health of adjacent native vegetation (including riparian vegetation)	NA	Moderate consequence Possible likelihood **Medium risk**	Acceptable subject to conditioned regulatory controls	Works approval to specify: • A permanent anchoring structure to be installed along the pipeline to prevent movement in the event of a storm/flood event; and • Bunding required for land pipeline sections outside of pits. Licence to specify: • Daily inspections of the pipeline integrity whilst in operation.
4.	Hypersaline mine dewater	Settling Ponds overflowing	Death or decline in health of adjacent native vegetation (including riparian vegetation)	Freeboard on settling ponds Regular maintenance to ensure capacity	Moderate consequence Unlikely likelihood **Medium risk**	Acceptable subject to proponent controls conditioned	Works approval to specify: • Dimensions of the settling ponds. Licence to specify • Regular inspections of freeboard; and • Regular maintenance of settling pond to ensure capacity.

9. Regulatory Controls

A summary of regulatory controls determined to be appropriate for the Risk Events follows in this section. Controls are set with 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.

9.1 Works Approval Controls

9.1.1 Dewatering pipelines

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 pipelines shall be located in a bund or equivalent sized to capture spills from that section of the pipe. Where pipelines are located within a pit such that spills would be captured within the pit, a bund is not required.
2. The section of the pipeline located on the causeway is required to be anchored so as to protect from potential damage from a storm/ flood event.

Following completion of works, a construction and compliance document shall be submitted to DER detailing compliance with the requirements of the ***Works Approval***.

9.1.2 Monitoring requirements

As part of the Works Approval, the ***Applicant*** will be required to complete a baseline environmental survey of aquatic biota present at the proposed discharge outfall site. The survey shall be completed by a suitably qualified scientist.

The ***Applicant*** shall also nominate control site(s) to allow comparison of potential riparian vegetation and aquatic biota impacts against non-impacted sites. At least four impacted sites (two vegetation, two aquatic biota) and four non-impacted sites shall be selected.

9.1.3 Monitoring reports

The ***Applicant*** shall submit the baseline aquatic biota report and proposed vegetation and aquatic biota monitoring locations to DER as part of the compliance documentation for construction works authorised by the Works Approval.

9.2 Licence Controls

9.2.1 Dewatering pipeline operation

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

1. Regular checks of the integrity of the pipeline.

9.2.2 Settling Pond operation

The following environmental controls, infrastructure and equipment should be maintained and operated onsite for spill management:

1. Daily checks of the freeboard;
2. Regular maintenance of the settling pond 1, with scheduled removal of sediment to ensure capacity; and
3. Check of the capacity of the ponds prior to any significant forecast rainfall event.

9.2.3 Specified actions

The ***Applicant*** shall maintain the 500 mm freeboard in each of the settling ponds during operation.

The ***Applicant*** shall manage the dewatering discharge so as to avoid inundating the shoreline.

The ***Applicant*** shall notify DER within one business day of any releases of hypersaline water that have or may cause environmental impact, consistent with s72 of the ***EP Act***.

9.2.4 Monitoring requirements

The ***Applicant*** shall record and report the total volume of water quality discharged and have the water quality of the discharge water 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.

Monitoring of aquatic biota (algae, invertebrates (including resting stages)) at the discharge site and at control sites shall occur on an annual basis by an appropriately qualified scientist.

Monitoring of vegetation at un-impacted and impacted sites shall occur on an annual basis by an appropriately qualified botanist.

9.2.5 Monitoring reports

The ***Applicant*** shall submit the an annual report comprising discharged water volumes, water quality data and an annual assessment of riparian vegetation health, aquatic biota species diversity and abundance.

10. Applicant's comments

The Applicant was provided with the draft decision report and draft issued works approval on 15 May 2017.

The Applicant noted two errors (in sections 6.1 and 7.7.9) which have been corrected in the final version.

11. 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 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 Licensing (Resource Industries)
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 M398(II); Cyanide Ecotoxicity at Hypersaline Gold Operations' Final Report Volume 2 – Definitive Investigation, 26 August 2008.	Adams M. D., et al 2008	DER Internal
2	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
3	DER (2015) *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth, July 2015.	DER 2015a	accessed at http://www.der.wa.gov.au
4	DER (2015) *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth, October 2015.	DER 2015b	
5	DER (2016) *Guidance Statement: Licence duration.* Department of Environment Regulation, Perth, August 2016.	DER 2016a	
6	DER (2016) *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth, November 2016.	DER 2016b	
7	DER (2016), *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth, November 2016.	DER 2016c	
8	DER (2016) *Guidance Statement: Environmental Siting*, November 2016.	DER 2016d	

9	Email from Ken Atkins, Manager Species and Communities Branch, Department of Parks and Wildlife (2017). *Re: Part V Application referred for comment – Matsa Gold Pty Ltd,* 5:06PM, 20 March 2017	DPaW 2017	DER internal (DER document number: A141891)
10	Plantecology (2016). *Fortitude Project, Lake Carey Flora And Vegetation Survey,* November 2016.	Plantecology 2016	DER Internal (DER document number: A1366227)
11	Lemly, A. D. (2002) *Selenium Assessment in Aquatic Ecosystems: A Guide for Hazard Evaluation and Water Quality Criteria*, Springer-Verlag	Lemly 2002	
12	Matsa Gold Pty Ltd (2016) Works Approval and Licence to Operate Applications and supporting documentation for the discharge f saline water (sourced from pit dewatering) into Lake Carey ; Lake Carey Project – Fortitude Gold Mine, submitted 3 November 2016..	Matsa 2016	DER internal (DER document numbers: A1190809; A1190819)
13	Mindat.org (2017) "*Bindah Gold Mine, Linden Goldfield, Leonora Shire, Western Australia",* accessed on 1 May 2017	Mindat 2017	Accessed at: https://www.mindat.org/loc-268857.html
14	MWH Australia Pty Ltd (2014) *Sunrise Dam Gold Mine 2014 Dewatering Discharge License Report*, unpublished report prepared for AngloGold Ashanti Australia Ltd, February 2014	MWH 2014	DER internal
15	MWH Australia Pty Ltd (2015) *Desktop Investigation into the Effects of Metals on Aquatic Biota in Lake Carey (Wallaby Project Area)*, unpublished report prepared for Gold Fields Australia, February 2015	MWH 2015	DER internal
16	Outback Ecology and *actis* Environmental Services (2013) *Lake Carey: A 10 Year Overview*, unpublished report prepared for the Lake Carey Catchment Management Group (LCCMG), October 2013	Outback Ecology *et al* 2013	DER internal

17	Outback Ecology (2009) *Development of framework for assessing the cumulative impacts of dewatering discharge to salt lake in the Goldfields of Western Australia.* Prepared for the Department of Water, funded by Rangelands NRM, Perth.	-	Accessed at: https://www.water.wa.gov.au/__data/assets/pdf_file/0019/5149/102743.pdf.
18	Letter from Sibbel, F., to DER (2017) "RE Response to Ref# CEO4537/16 Works approval & licence application to discharge water from the Fortitude Gold Mine into Lake Carey ", 27 January 2017	Sibbel 2017	DER internal (DER document number: A1366066)
19	Taukulis, F. (2016*) Dewatering Discharge in Goldfields: Ecology, Monitoring, Management and Mitigation*. Paper presented at 2016 Goldfields Environmental Management Group Workshop, Kalgoorlie May 2016.	-	Accessed at: http://www.gemg.org.au/ckfinder/userfiles/files/Workshop%20Proceedings%202016.zip
20	USEPA (2009) National Primary Drinking Water Regulations	USEPA 2009	Accessed at: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#Inorganic

Appendix 2: Summary of Applicant's Comments on Risk Assessment and Draft Conditions

Comments received	Environmental risk	DER consideration of risk:
Matsa Gold • Accept the draft works approval and decision report issued 15/5/17	• N/A	• N?A

Attachment 1: Works Approval