Government of Western Australia
Department of Water and Environmental Regulation

Amendment Notice 2

Licence Number	L4496/1988/11
Licensee	Big Bell Gold Operations Pty Ltd
ACN	090 642 809
File Number:	2010/003418
Premises	Bluebird Gold Mine Mining Tenements M20/12, M20/45, M20/68, M20/70 - M20/73, M20/77, M20/107, M20/214, M20/249, M20/421, M51/35, M51/132, M51/190, M51/199, M51/209, M51/211, M51/236-M51/237 M51/254, M51/393, M51/438 - M51/440, M51/455, M51/459, M51/462, M51/463, M51/483, M51/491 - M51/495, M51/523, M51/572, M51/666, M51/757, M51/762, M51/781, M51/784, M51/788, M51/824, M51/834 and E51/1484. MEEKATHARRA WA 6642
Date of Amendment	28 March 2018

Amendment

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

Date signed: 28 March 2018

Alana Kidd

Manager Licensing – Resource Industries

Regulatory Services (Environment)

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

Definitions and interpretation

Definitions

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

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
AER	Annual Environment Report
Amendment Notice	refers to this document
ANZECC	Australian and New Zealand Environment and Conservation Council
Asbestos	means the asbestiform variety of mineral silicates belonging to the serpentine or amphibole groups of rock-forming minerals and includes actinolite, amosite, anthophyllite, chrysolite, crocidolite, tremolite and any mixture containing 2 or more of those
Asbestos fibres	has the meaning defined in the Guidelines for Assessment, Remediation and Management of Asbestos Contaminated Sites, Western Australia, (DOH, 2009)
Category/ Categories/ Cat.	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
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@dwer.wa.gov.au
Clean Fill	has the meaning defined in Landfill Definitions
Delegated Officer	an officer under section 20 of the EP Act
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority

EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of and during this Review
Landfill definitions	means the document titled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer of the Department of Water and Environmental Regulation as amended from time to time
Licensee	Big Bell Gold Operations Pty Ltd
m	metres
m^3	cubic metres
mbgl	Metres below ground level
Minister	the Minister responsible for the EP Act and associated regulations
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.
Putrescible waste	has the meaning defined in Landfill Definitions
Risk Event	as described in *Guidance Statement: Risk Assessment*
Special Waste Type 1	has the meaning defined in Landfill Definitions
TDS	Total Dissolved Solids
tpa	tonnes per annum

Amendment Notice

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

This notice is limited only to an amendment to include the Surprise in-pit TSF as an in-pit tailings storage facility, construct a new Class I landfill to replace the existing landfill and dewatering of the Five Mile Well pit.

The following guidance statements have informed the decisions made in this amendment*:*

- *Guidance Statement: Decision Making (February 2017)*
- *Guidance Statement: Risk Assessment (February 2017)*
- *Guidance Statement: Environmental Siting (November 2016)*

Amendment background

The Licensee operates the Bluebird Mine (Premises) through Licence L4496/1988/11 (Licence). The Premises is located in a 60 km stretch south along the Great Northern Highway from the Meekatharra town site. The processing facilities and tailings storage facilities are located 12 km south of Meekatharra.

The processing facility at the Premises is a traditional crush-grind carbon-in-leach (CIL) circuit. Chemicals associated with the processing operations include cyanide, hydrochloric acid, sodium hydroxide (caustic) and lime. Tailings produced at the Premises are currently deposited into the Bassett's West In-pit TSF (BWTSF) and the Bluebird East in-pit TSF (Bluebird TSF).

The prescribed activities authorised through the Licence are described below:

Table 2: Prescribed activities at the Premises

Category Number	Category description	Category production or design capacity	Approved Premises production or design capacity
5	Processing or beneficiation of metallic or non-metallic ore	50,000 tonnes or more per year	2,500,000 tonnes per annual period
6	Mine dewatering: premises on which water is extracted and discharged into the environment to allow mining of ore	50,000 tonnes or more per year	3,056,000 tonnes per annual period
63	Class I inert landfill site	500 tonnes or more per year	500 tonnes per year
85	Sewage facility	More than 20 but less than 100 cubic metres per day	99 cubic metres per day

Amendment description

Surprise in-pit TSF

The Licensee will use the Surprise Pit for the disposal of tailings material generated at the Premises. The Surprise Pit is located directly north of the processing facility at the Premises and is adjacent to the Great Northern Highway 15 km south of the Meekatharra town (see

image 1 below).

The Surprise in-pit TSF will be managed in line with the existing in-pit facilities at the Premises. A new pipeline to Surprise in-pit TSF will be connected to the existing tailings pipeline network and additional infrastructure will be installed to manage slurry and return water systems.

The Surprise in-pit TSF is 83 m deep and will have capacity for approximately 2.8 years of tailings storage at the anticipated mill throughput of 1.6 million tonnes per annum (mtpa). Based on the pit wall and anticipated tailings beach geometry, stormwater storage capacity within the pit is sufficient to maintain an operational freeboard of 1.8 m below the pit rim at completion of tailings deposition.

Two main rock types are observed at the Surprise pit, locally porphyritic microgranite (generally referred to as porphyry) that is hosted within basalts and high-Mg basalts that are typically sheared to talc-chlorite-carbonate schist (Timms, 2006). The porphyry rock mass is of low to moderate hydraulic conductivity and the talc-chlorite schist is of very low hydraulic conductivity. Both rock types are weathered to depths between 45m (schist) and 80m (porphyry).

The design of the Surprise in-pit TSF includes provision for decant water recovery, containment of pipeline spillage, surface storm water diversion by maintenance of an existing abandonment bund, installation of four groundwater monitoring bores, restriction to faunal access and conceptual closure of the facility.

Image 1: Surprise in-pit TSF

New Class I inert landfill facility

As a result of an expansion to the Run of Mine (ROM) area at the Premises, the existing Class I inert landfill will be closed and a new Class I inert landfill (Landfill) will be built. The new landfill will be located on the Surprise Waste Rock Dump which is only 200 m from the existing landfill which is also located on the Surprise Waste Rock Dump (see Image 2 below).

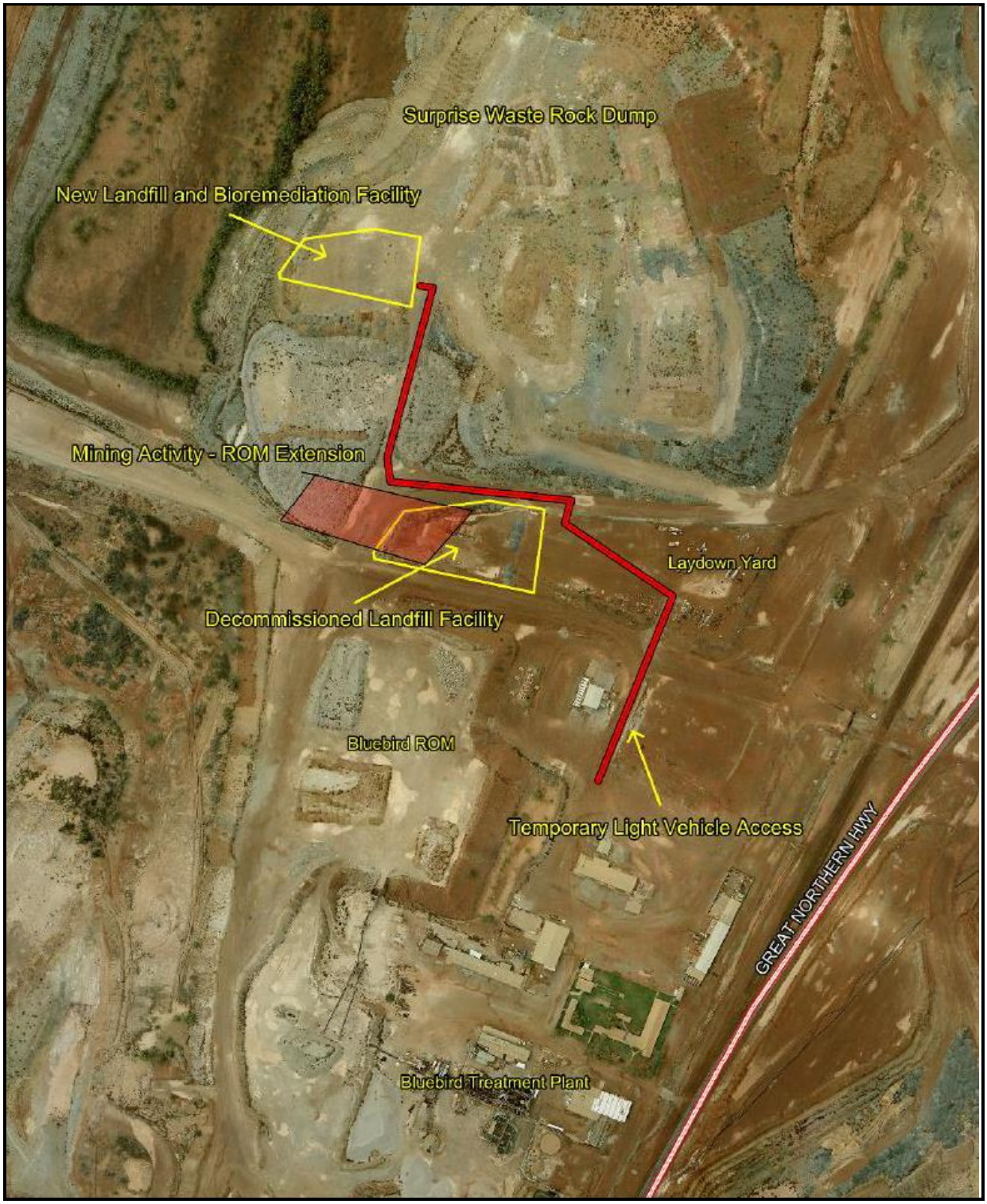
The current landfill is authorised in the Licence to receive for burial of inert wastes type 1 and 2. The new landfill will also receive these types of waste for burial plus special waste type 1 which is waste that contains asbestos and asbestos cement products. The waste containing the asbestos materials consists of personal protective equipment (PPE) including P2 masks and disposable clothing, which would become contaminated with asbestos if site personal were to encounter asbestos containing rock in the underground mining area.

The Landfill will consist of a system of trenches, excavated one at time, for the deposition of waste. Each trench will be approximately 2 m deep, 3 m wide and 30 metres in length.

Earthen bunds will be constructed around the facility to control windblown waste and divert stormwater away from the waste.

The Licensee has committed to covering the waste at least weekly and undertakes monthly inspections of the Landfill.

Image 2: New Class I inert landfill



Dewatering Five Mile Well pit

The Licensee will recommence mining of the Five Mile Well pit which is located on mining tenement M51/199 (see Image 3 below). Initial dewatering of the existing pit lake containing 85,876 tonnes of water and ongoing pit dewatering from groundwater inflows is required. Groundwater inflow into the Five Mile Well pit is estimated to be up to 560 tonnes per day however could be as high as 850 tonnes per day if the rocks in the pit wall are more permeable than indicated by the water balance for the existing pit.

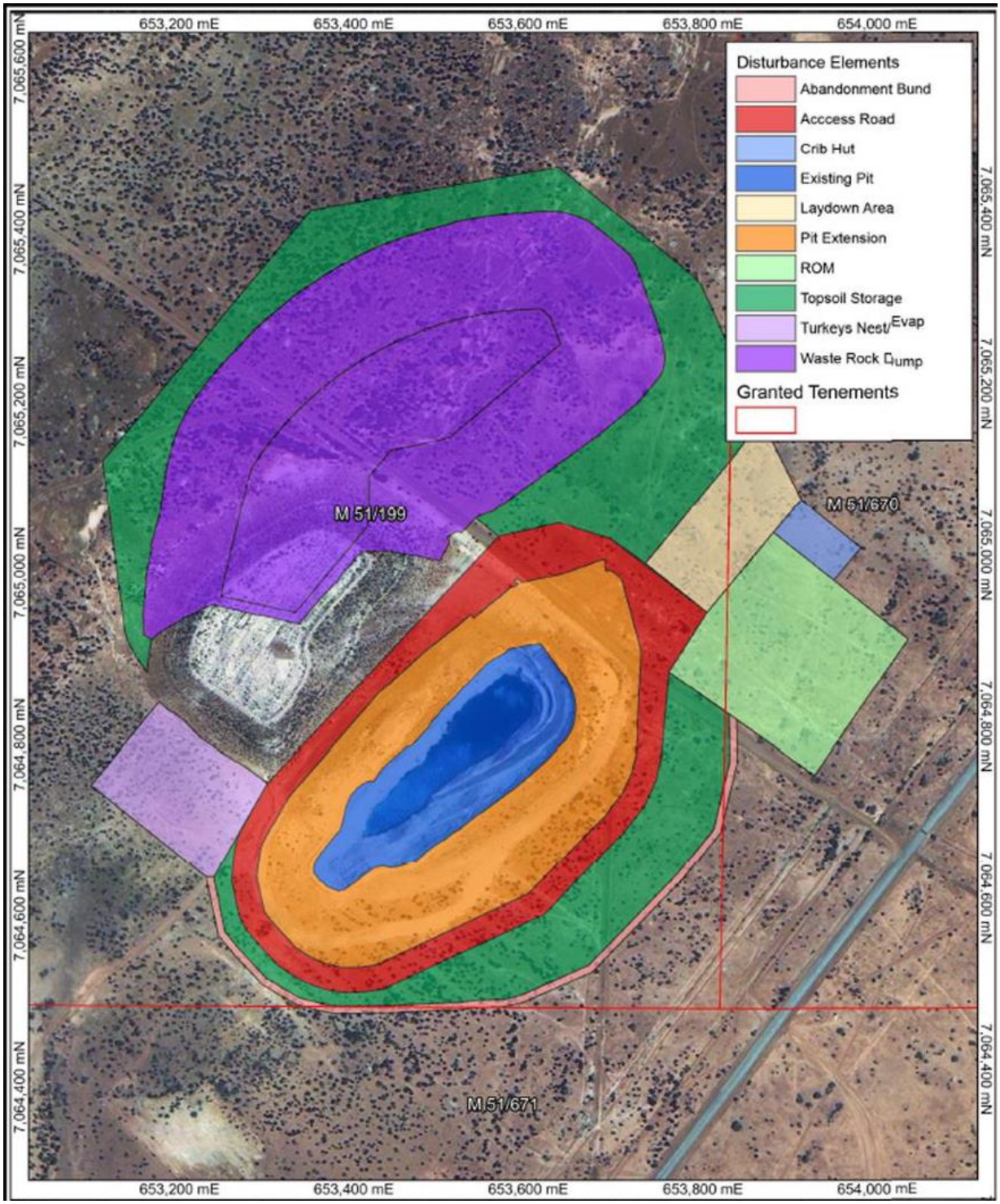
The majority of the pit water will be used for dust suppression at the Premises with the excess water being discharged to an evaporation pond (identified as a turkeys nest in image 3 below). Up to 800 tonnes per day will be required for dust suppression, therefore it is not anticipated that large amounts of water will be stored in the evaporation pond for long periods of time.

The evaporation pond is clay lined with an approximate size of 2.09 hectares and is located adjacent to the Five Mile Well pit. The capacity of the evaporation pond is approximately 55,000 m^3 with a 0.5 metre freeboard being maintained. A one metre high earthen bund will be constructed around the perimeter of the evaporation pond.

Dewatering of the pit lake is expected to take up to nine weeks to complete. Pit dewatering will then continue during mining of the pit. A total of 296,676 tonnes, which consists of pit lake water and inflows into the pit, is expected to be dewatered during the mining life of the Five Mile Well pit (approximately 9 months).

The pit water has been sampled on four separate occasions since 2001 to determine quality with the most recent sampling occurring in July 2017. The results from the most recent sampling are shown in Table 7 below. The results indicate the water is alkaline, with relatively high magnesium, sulphate and bicarbonate concentrations, and TDS of 5,600 mg/L. Sample results in 2001 show the concentrations of magnesium, sulphate and bicarbonate were considerably lower and TDS was 2,200 mg/L. These increasing concentrations are likely a result of evapo-concentration. Metals in the most recent sampling results are generally below limits of detection, except for low levels of arsenic. Groundwater in the area of the Five Mile Well pit is considered fresh to brackish with a TDS range of 700 to 1,100 mg/L.

Image 3: Five Mile Well pit



Amendment history

Table 3 provides the amendment history for L4496/1988/11.

Table 3: Licence amendments

Instrument	Issued	Amendment
L4496/1988/11	21/01/2016	Dewatering of the Reedy mining area with discharge to Lake Annean (Category 6) and a new Class I landfill (Category 63)
L4496/1988/11	12/05/2016	Include Bluebird East as an Inpit tailings storage area
L4496/1988/11	23/05/2017	Amendment Notice 1 to include dewatering of the pit lake and groundwater at the Aladdin Pit with the dewatering effluent being discharged to Lake Annean, and the inclusion of additional mining tenements to the Premises description to identify the additional prescribed activities.
L4496/1988/11	28/03/2018	Amendment Notice 2 to include the Surprise Pit as an in-pit tailings storage facility, construction of a new Class II landfill to replace the existing landfill and dewater the Five Mile Well pit.

Other Approvals

Department of Mines, Industry Regulation and Safety (DMIRS)

Approval by DMIRS has been given in a mining proposal to discharge tailings into Surprise Pit.

Location and receptors

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

Table 4: Receptors and distance from activity boundary

Residential and sensitive premises	Distance from Prescribed Premises
Meekatharra Town	15 km from the Premises
Great Northern Highway (Highway) Major inland highway frequently used by tourists, local mining companies and for transportation of goods and services.	Runs through the centre of the Premises. Surprise Pit is approximately 200 m away from the Highway. The Landfill is approximately 700 m away from the Highway.

Table 5 below lists the relevant environmental receptors in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 5: Environmental receptors and distance from activity boundary

Environmental receptors	Distance from Prescribed Premises and description
Surface water	There are no nearby permanent surface water bodies however a major tributary passes through the Premises which has been diverted around pits, waste rock dumps and infrastructure. The tributary eventually discharges into Lake Annean located over 20 km away. Flow is ephemeral following heavy rainfall events.

Groundwater	**Surprise in-pit TSF** Groundwater at the Surprise in-pit TSF is approximately 86 metres below ground level (mbgl). Prior to tailings deposition commencing, the groundwater table will have been lowered to approximately 100m by pit dewatering. The depth of the Surprise in-pit TSF is 88 metres mbgl. There is a small, shallow pit lake in the base of the pit (water level at 86 mbgl). The Meekatharra Water Reserve (P1 Area) is located approximately 18 km away in the opposite direction of groundwater flow. The three nearest stock watering bores are identified below: • Yaloginda Bore – 4.5 km away to the North. No owner • 12 Mile Well – 3.3 km away to the South. No owner • Johnses Well – 4.0 km away to the South West **Five Mile Well pit** Groundwater at Five Mile Well pit is greater than 20 mbgl. Meekatharra Water Reserve (Priority Drinking Water Source Area) is located approximately 7 km away.
Fauna	There are three broad fauna habitat types identified in the Premises area. However these broad fauna habitats were not considered regionally significant to vertebrate fauna as they are all widespread, well-connected and typical of this region.
Flora	No flora species or vegetation of conservation significance recorded during survey (Outback Ecology, 2012). One broad vegetation type was identified as occurring across the entire site (Mulga Shrublands on washplains of hardpan clay with rills, gutters and channels which form part of a wider drainage system and catchment for Lake Annean).

Table 6: Surprise pit water and groundwater quality

Sample Id	Surprise Pit lake	WB2	SB01	SB02	SB03
Date	3/02/2017	1/06/2009	29/05/2017	29/05/2017	29/05/2017
Calcium	77	160	45	74	170
Magnesium	130	220	70	110	260
Sodium	370	410	320	400	540
Potassium	28	36	13	29	37
Bicarbonate	230	210	220	310	210
Sulfate	300	410	200	300	490
Chloride	650	1,100	390	550	1,200
TDS	1,900	3,300	1,200	1,700	2,900
pH	8.3	8.2	8.1	8.1	7.9
Alkalinity	190	170	180	250	170
Hardness	710	1,300	400	650	1,500
Iron	0.012	<0.01	0.008	0.005	0.006
Silica	26	29	NR	NR	NR
Nitrate	34	532	54	33	30
Carbonate	<1	<1	<1	<1	<1
Aluminum	<0.005	0.04	0.01	0.01	<0.005
Manganese	0.047	<0.01	0.033	0.02	0.001
Cadmium	<0.0001	NR	<0.0001	<0.0001	<0.0001
Chromium	<0.005		<0.001	0.014	0.011
Copper	<0.005		<0.001	<0.001	<0.001
Nickel	0.017		0.001	0.007	<0.001
Zinc	0.02		<0.005	0.006	<0.005
Arsenic	1.3		0.004	0.004	<0.001
Lead	<0.005		<0.001	<0.001	<0.001
Selenium	0.082		0.007	0.004	0.008

Mercury	<0.0005		<0.0005	<0.0005	0.00055
Colbalt	0.005		<0.001	<0.001	<0.001
Cyanide	NR		<0.004	<0.004	<0.004
Fluoride	0.005		0.2	0.3	0.2

Table 7: Five Mile Well pit water quality

Five Mile Well	10/04/2001	10/04/2002	30/05/2013	20/07/2017
pH	8.6	8.6	8.8	8.9
Calcium	46	36	31	31
Magnesium	110	110	230	320
Sodium	530	560	1,300	1,500
Potassium	15	17	33	33
Bicarbonate	290	280	370	380
Sulphate	420	420	880	960
Chloride	690	770	1,900	1,900
TDS	2,200	2,600	4,700	5,600
Iron	<0.05	<0.05	<0.02	<0.025
Carbonate	14	22	60	79
Nitrate	120	120	44	4.1
Cyanide	<0.01	<0.01	<0.004	-
Arsenic	0.1	0.11	0.12	0.13
Cadmium	0.005	<0.005	<0.001	<500E-6
Cobalt	<0.05	<0.05	-	<0.005
Chromium	<0.05	<0.05	<0.005	<0.005
Copper	<0.05	<0.05	<0.005	<0.005
Lead	<0.05	<0.05	<0.02	<0.005
Nickel	<0.05	<0.05		<0.005
Zinc	<0.05	<0.05		<0.025
Selenium	<0.01	<0.01		0.006
Mercury	<500E-6	<500E-6	<50E-6	<50E-6
Nitrite	-	-	0.31	<0.05
Manganese	-	-	<0.005	<0.005
Fluoride	-	-	-	0.7
Silicon	-	14	18	14
Aluminum	-	-	-	<0.025

Risk assessment

Tables 8 and 9 describe the Risk Events associated with the amendment consistent with the *Guidance Statement: Risk Assessments*. The table identifies whether the emissions present a material risk to public health or the environment, requiring regulatory controls.

Table 8: Risk assessment for proposed amendments during construction

Risk Event						Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**				
Cat 5 In-pit Tailings Storage Facility	Earthworks and construction of infrastructure	Dust Noise	Residences (Meekatharra town)	Air / wind dispersion	Amenity	Slight	Rare	Low	No residences within 15 km. Great Northern Highway located approximately 700 metres away however limited time of exposure to any potential emissions. No additional regulatory controls are required to mitigate this risk. The distance is considered too great to impact offsite receptors.
Category 6 Dewatering evaporation storage pond	Earthworks and construction of infrastructure	Dust Noise	Residences (Meekatharra town)	Air / wind dispersion	Amenity	Slight	Rare	Low	Nearest residence is 8 km away from the Five Mile Well pit. Water carts are used where required. No additional regulatory controls are required to mitigate this risk. The distance is considered too great to impact offsite receptors.
Category 63 Class I inert landfill	Earthworks and construction of infrastructure	Dust Noise	Residences (Meekatharra town)	Air / wind dispersion	Amenity	Slight	Rare	Low	No residences within 15 km. Great Northern Highway located approximately 700 metres away however limited time of exposure to any potential emissions. Water carts are used where required. No additional regulatory controls are required to mitigate this risk. The distance is considered too great to impact offsite receptors.

Table 9: Risk assessment for proposed amendments during operation

Risk Event						Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**				
Cat 5 In-pit tailings storage facility	Discharge of tailings into a disused mine pit	Seepage from tailings material	Groundwater used for livestock watering	Migration through soils and direct interaction with groundwater	Contamination of groundwater potentially used for stockwatering purposes	Moderate	Unlikely	**Medium**	Refer to detailed risk assessment (risk event 1) below.
		Tailings and return water from rupture or leaks of pipelines.	Surrounding soils and vegetation Groundwater used for livestock watering	Direct discharge to land and infiltration to groundwater	Impacts on vegetation Contamination of surrounding soils with metals and metalloids, dissolved solids and cyanide affecting soil and groundwater quality.	Moderate	Possible	**Medium**	Tailings discharge and return pipelines are located within earthen bunded areas and are inspected daily to monitor pipeline integrity, bunds and identify leaks. The vegetation in this area is highly disturbed due to mining activities and does not contain any threatened or priority flora. The Licensee has committed to undertake daily inspections of the tailings discharge and return pipelines. Existing Licence condition 1.3.2 requires the Licensee to ensure all pipelines containing tailings materials are equipped with automatic cut-outs, provided with secondary containment, or provided with telemetry systems and pressure sensors. Existing Licence condition 1.3.3 requires the Licensee conducts daily inspections of the tailings pipelines and return water pipelines to ensure an appropriate level of environmental protection is provided and to take corrective

									action where required. The Licensee management measures and licence controls are satisfactory and the likelihood of pipeline failure is possible, and the risk to the environment is therefore **medium**. No additional regulatory controls are required to mitigate this risk.
		Discharge of tailings due to overtopping of the pit embankment	Surrounding soils and vegetation Groundwater used for livestock watering	Migration through soils Sheet flow across land	Contamination of groundwater Impacts on vegetation Changes to the surrounding soil composition	Rare	Moderate	**Medium**	The Licensee has committed to providing a maximum normal operating pond level within the pit TSF of at least 3m below the surrounding ground surface. The Licensee has stated that any lateral seepage at shallower depth which could occur as a result of significant rainfall will be represented as fresh water percolation or significantly diluted decant water. An existing abandonment bund surrounding the Surprise in-pit TSF prevents the ingress of stormwater. The Licensee management measures are satisfactory and the likelihood of overtopping is determined to be rare, and the risk to the environment is therefore **medium**. The Surprise in-pit TSF will be included into the existing regulatory controls for maintaining freeboard and routine inspections.
Category 6 Dewatering of the Five Mile Well pit	Discharge of dewatering water into an evaporation pond	Seepage from the evaporation pond	Groundwater used for livestock watering	Migration through soils	Contamination of groundwater	Minor	Rare	Low	Seepage to groundwater is expected to be negligible due to the following: - the underlying mafic basalts are completely oxidised to clay to a depth of 25 metres; - the in-situ clays are conditioned to

									achieve a permeability of 10^{-9} m/s or better; - it is not anticipated that large volumes of water will be stored for long periods of time due to its use for dust suppression at the Premises; and - the evaporation pond will only be used for approximately 9 months while the Five Mile Well pit is mined. Depth to groundwater is greater than 20 mbgl. Evaporation rates are high and rainfall volumes are low. The Licensee has committed to monthly discharge and surface water quality sampling for field pH and electrical conductivity, and quarterly sampling for laboratory analysis of major components. Noting the points outlined above, the impacts from seepage is considered **low**. No additional regulatory controls are required to mitigate this risk.
		Discharge of dewatering water due to overtopping of the evaporation pond embankment	Surrounding soils and vegetation	Sheet flow across land	Impacts on vegetation Changes to the surrounding soil composition	Slight	Rare	Low	As a result of stored water being used for dust suppression, large volumes of water are not expected to be stored at any one time which would reduce the capacity of the evaporation pond. The pond has been designed with a minimum freeboard of 0.5 m to allow for a 1 in 100 year 72 hour rainfall event for that region. The Licensee will conduct daily inspections of the evaporation pond

									to determine the integrity of the pond walls and the available freeboard. The Licensee management measures are satisfactory and the likelihood of overtopping is determined to be rare, and the risk to the environment is therefore considered as **low**. The Five Mile Well pit will be included into the existing regulatory controls for maintaining freeboard and routine inspections.
		Discharge of dewatering effluent due to pipeline failure	Surrounding soils and vegetation	Sheet flow across land	Impacts on vegetation Changes to the surrounding soil composition	Slight	Possible	Low	The pipeline will be located within an earthen bund to contain any spilt material due to pipeline leaks and failures. The pipeline will be inspection at least once for every 12 hour work shift. Existing Licence condition 1.3.3 requires the Licensee to conduct daily inspections of the dewatering discharge pipelines to ensure an appropriate level of environmental protection is provided and to take corrective action where required. The evaporation pond is located near the Five Mile Well pit and therefore the dewatering discharge pipeline length is only up to 500 metres long. The water quality is low in metals. The TDS of the water is considered saline (5,600) however only slightly higher than 5,000 mg/L which would still be considered suitable for stockwatering.

									Following the dewatering of the pit water over the first 9 weeks, the only dewatering required is the removal of groundwater inflows into the pit. This water is considered good quality with TDS shown to be fresh to slightly brackish with no elevated metals. Noting the above points, the Licensee management measures and the likelihood of pipeline failure is possible; the risk to the environment is therefore **low**. No additional regulatory controls are required to mitigate this risk.
Category 63 Class I inert landfill	Acceptance of inert waste for burial	Noise from vehicle movement	Residences (Meekatharra town)	Air / wind dispersion	Amenity	Slight	Rare	Low	No residences within 15 km. Great Northern Highway located approximately 700 metres away however limited time of exposure to any potential emissions. The distance is considered too great to impact offsite receptors.
		Dust from vehicle movement and burial of waste	Residences (Meekatharra town)						No residences within 15 km. Great Northern Highway located approximately 700 metres away however limited time of exposure to any potential emissions. Limited vehicle movement at the landfill area. Water carts used to supress dust as required. The distance is considered too great to impact offsite receptors.

		Leachates	Groundwater used for livestock watering	Migration through soils	Contamination of groundwater	Slight	Rare	Low	The depth to the water table is 60 - 65 m below ground level. No putrescibles waste is buried at the landfill. All putrescible waste is collected and transported to Meekatharra town for burial. Waste is covered on a weekly basis. Stormwater is diverted away from the tipping area through the use of earthen bunding around the perimeter of the trench. Noting the points outlined above the risk of impact of leachate seepage is considered to be **low**. No additional regulatory controls are required to mitigate this risk.
		Discharge of contaminated stormwater	Surrounding soils Surface water	Direct discharge to surrounding soils Discharge to surface waters through sheet flow	Contamination of soils Contamination of surface waters	Slight	Rare	Low	The nearest surface water body is 100 m away. Contaminated stormwater will remain within the tipping area due to the use of trenches for the burial of wastes. Uncontaminated stormwater is diverted away from the tipping area through the use of earthen bunds surrounding the trenches. Noting the points outlined above the risk of impacts from contaminated stormwater is considered to be **low**. No additional regulatory controls are required to mitigate this risk.

		Windblown waste	Surrounding land and vegetation	Air transport then deposition	Loss of amenity and nuisance impacts	Slight	Possible	Low	The Licensee has committed to covering all waste weekly. Waste is disposed below ground level through the use of trenches which reduces effects from winds. Earthen bunding surrounding the trenches assists in diverting winds over the trenches. Existing licence conditions requiring the Licensee collects windblown waste on a weekly bases and makes all reasonable and practical measures to ensure no windblown waste escapes from the landfill area. Noting the points outlined above the risk of impacts from windblown waste is considered to be **low**. No additional regulatory controls are required to mitigate this risk.
		Discharge of airborne asbestos fibers	Residences (Meekatharra town)	Air emission	Effects on human health by asbestos related diseases	Major	Rare	**Medium**	Only small quantities of asbestos contaminated PPE is expected to be buried. All asbestos contaminated PPE will be wrapped in heavy duty plastic prior to burial. Asbestos contaminated PPE will be Immediately covered following disposal. The area used for disposal will be segregated from all other wastes and will be signed posted. No residences within 15 km. Great Northern Highway located approximately 700 metres away however limited time of exposure to

									any potential emissions. Landfill restricted to trained personnel from the Premises. The consequences of the risk are considered major as a result of asbestos materials; however the likelihood is rare, therefore the risk is considered **Medium.** New conditions for the appropriate management and the covering of waste containing asbestos materials have been included in the Licence.

Detailed Risk Assessment

1. Risk Event: Discharge of tailings into a disused mine pit.

Description of Risk Event

The discharge of 1,600,000 tonnes per year of tailings material, containing cyanide and some elevated metals, into a disused mine pit which was mined to below the water table and therefore there is possibility of tailings interacting with groundwater.

Identification and general characterisation of the emission

A total of 16 tailings samples taken from the existing TSF's at the Premises have undergone acid base accounting test work. The sampling consisted of five samples from Bluebird TSF in 1997, two samples from BWTSF in 2008, one sample from BWTSF in 2012, two tailings samples from BWTSF in 2013 and six tailing samples from BWTSF in 2015. A summary of the test work results is provided below:

- The tailing samples were neutral to alkaline;
- The tailing samples had a low to medium content of soluble salts;
- The tails total Sulphur values ranged from 0.01 to 0.77 with a median value of 0.16. Forty percent of tails had a total Sulphur of less than 0.005 percent;
- 11 of the tailings samples had high acid consuming properties;
- A majority of samples had sufficient buffering capacity;
- The results indicate that under the strongly-oxidising conditions of the Net Acid Generating (NAG)-test work, the tailings samples did not acidify. 100 percent of the Bluebird tailings samples were acid consuming and 64 percent of the BWTSF samples were acid consuming and the other 24 percent of BWTSF tails samples were Non Acid Forming (NAF);
- The tailings material is classified as NAF. The tailings contain only trace amounts of sulphide minerals and have a high capacity to consume acid;
- The leached tailings exceed Chromium limits for ANZECC Stock drinking water guidelines and the Department of Health (DoH) Non-Potable groundwater use limits, Nickel and Iron exceed DoH (2014) limits, Lead and Aluminum stock water (ANZECC, 2000) and DoH (2014) limits; and
- The process tailings stream produced is considered geochemically benign.

Description of impacts from the emission

Contamination of local groundwater with tailings material containing some elevated metals, dissolved solids and cyanide.

Criteria for assessment

DWER 'Water Quality Protection Guidelines No.2, Mining and Mineral Processing, Tailings facilities', 2000.

The Department of Mines, Industry Regulation and Safety Code of Practice 'Tailings Storage Facilities in Western Australia', 2013.

Relevant freshwater quality criteria for comparison include ANZECC guidelines for livestock drinking water quality.

Controls

Tailings have been intermittently deposited into the nearby BWTSF and Bluebird TSF's (both in-pit tailings facilities) for the past 20 years. Groundwater monitoring results presented in recent AER's indicate tailings disposal into both in-pit TSF's at the Premises has had no detrimental impacts to the groundwater. It was noted that groundwater quality around the BWTSF has generally remained stable or improved since tailings disposal ceased in 2014. Results also show there has not been any exceedance of licence limits or ANZEEC livestock drinking water guidelines. TDS levels at the currently active Bluebird TSF did reach the upper limits for stock watering (4,000 mg/L) when tailings disposal first commenced in 2016, however the levels dropped to around 1,000 mg/L in the following month and have since remained at that level.

Rockwater (2013) constructed a simple numerical groundwater flow model to estimate the hydraulic conductivity of the wall rocks at the Surprise pit. The results indicated average hydraulic conductivities could be about 0.5m/d (6E-6 m/s) for the porphyry and 0.004 m/d (5E-8 m/s) for the talc chlorite schist. Although these values depend on a number of assumptions, Rockwater considered they are of the correct order.

The weathered porphyry comprises mainly clayey materials with high consistency and relatively low hydraulic conductivity. The dominant talc chlorite schist is of very low hydraulic conductivity. The Licensee expects preferential seepage into the porphyry unit which forms a potential conduit for tailings water that extends 400m south of the Surprise in-pit TSF towards the other existing TSF's. The talc chlorite schist forms a barrier to groundwater flow which will greatly restrict the movement of tailings water away from the pit.

Groundwater levels in the Surprise in-pit TSF have been relatively stable, with little seasonal variation since dewatering ceased. This indicates that interconnectivity between the groundwater and percolating surface water is limited.

As a result of long term evaporation and ongoing dewatering, the pit will effectively act as a groundwater sink until the water level in the deposited tailings reaches equilibrium with the regional water table. At this point, the porphyry exposed in the northern pit wall will be buried by low permeability tailings.

Prior to tailings deposition commencing, the groundwater table will be lowered by approximately 100m by pit dewatering. During the first few months of deposition, when there is limited thickness of deposited tailings in the base of the pit, the high negative hydraulic gradient will result in water flowing into the pit and outward seepage of tailings decant water is not anticipated. When the pit is approximately 50 percent full (8 months) and the hydraulic gradient begins to reverse, total seepage flow into the Porphyry unit is expected to be approximately $2m^3$/day. This however will decrease rapidly as tailings fill the pit and begin to consolidate. Under maximum hydraulic head conditions (towards end of deposition) estimated seepage rates into the porphyry unit are expected to be less than $1m^3$/day which is considered very low.

Experience in the nearby BWTSF suggests that groundwater levels in the vicinity of the pit are unlikely to rise above 15 mbgl. As the surrounding topography is relatively flat, surface expression of seepage is not anticipated.

Licensee controls

The decant pond will be positioned at the truncated end of the porphyry unit, minimising the effect of seepage external to the pit.

Quarterly monitoring of the installed groundwater monitoring bores surrounding the Surprise in-pit TSF with results presented in the AER.

Previous and ongoing test work of the tailings material by the Licensee indicates it is non-acid forming and does not contain mobile enriched metals.

The effect of seepage on the downstream groundwater quality will be measured using baseline values. The Licensee has committed to installing additional monitoring bores if WAD cyanide or other contaminants are detected in the bores at concentrations exceeding licence limits.

Consequence

The consequence of discharging tailings materials into the Surprise in-pit TSF is considered **moderate** due to the potential contamination of the local groundwater due to seepage which would result in a detrimental impact on the future use of the groundwater for stockwatering purposes.

Likelihood of Risk Event

The likelihood of an occurrence is **unlikely** given the results from groundwater monitoring conducted at the nearby BWTSF and Bluebird in-pit TSF's for the past 20 years shows there has been no detrimental impacts on the groundwater quality from the deposition of tailings, the deposition of low permeability tailings and ongoing consolidation will progressively seal the base of the pit which reduces seepage potential, and test done on the tailings material indicates the tailings are geochemically benign.

Overall rating of Risk Event

The risk rating for the discharge of tailings material into a disused mined pit is therefore considered **Medium.**

Decision

Surprise in-pit TSF

Based on the application supporting documentation, the Delegated Officer has determined that the discharge of tailings materials into the Surprise in-pit TSF presents a medium risk to the environment. However these risks may be acceptable subject to the additional regulatory controls outlined below.

Conditions 1.3.1, 1.3.3 and 3.4.1 of the Licence for the containment infrastructure, freeboard and ambient groundwater monitoring requirements respectively, have been amended to include the Surprise in-pit TSF.

Condition 1.3.7 is amended to include the construction requirements for the Surprise in-pit TSF.

Condition 4.3.1 is amended to include the construction notification requirements for the Surprise in-pit TSF.

Dewater of Five Mile Well

Based on the application supporting documentation, the Delegated Officer has determined that the discharge of dewatering water from the Five Mile Well pit into an evaporation pond presents a low risk to the environment.

The approved premises production or design capacity for Category 6 has not been increased to include the 85,876 tpa that will be dewatered from the Five Mile Well. Dewatering water discharged into the clay lined evaporation pond with a minimum permeability of 10^{-9} m/s is not considered a discharge to the environment.

Condition 1.3.1 of the Licence has been amended to include the Five Mile Well evaporation

pond as containment infrastructure. The Licensee has committed to constructing the evaporation pond so the in-situ clays will be conditioned to achieve a permeability of 10^{-9} m/s or better and the pond walls will provide a freeboard of 0.5 m. These commitments have been formalised into existing Licence conditions 1.3.1 and 1.3.3 respectively.

The Licensee has also committed to daily inspections of dewatering and discharge pipelines which are already an existing requirement of Licence condition 1.3.3.

Condition 1.3.7 is amended to include the construction requirements for the Five Mile Well evaporation pond.

Condition 4.3.1 is amended to include the construction notification requirements for the Five Mile Well evaporation pond.

New Class I landfill

Based on the application supporting documentation, the Delegated Officer has determined that the new Class I inert landfill presents a low risk to the environment for the disposal of Inert Waste Type 1 and Inert Waste Type 2, and a medium risk for the disposal of Special Waste Type 1.

Conditions currently on the Licence capture operational emissions relating to the receipt, handling and disposal of Inert Type 1 and Inert Waste Type 2 wastes. The Delegated Officer considers no new conditions or an amendment to these conditions is required for these types of wastes.

The Delegated Officer has included new conditions for the receipt, handling and disposal of Special Waste Type 1 at the Premises.

Condition 1.3.7 is amended to include the construction requirements for the Class I landfill.

Condition 4.3.1 is amended to include the construction notification requirements for the Class I landfill.

Other amendments

Mining tenement M51/199 has been included in the Premises address for the dewatering of the Five Mile Well pit.

Condition 1.3.11 has been amended to remove the construction requirements of the Bluebird in-pit TSF which has been completed.

The condition numbers have been updated as a result of duplicate conditions 1.3.3.

The Premises map has been updated to include mining tenement M51/199.

Amendment

1. The Premises address on page 1 of the licence is amended by the insertion of the following additional mining tenements shown in bold text and underlined below:

M51/199

2. The Licence is amended by the insertion of the bold text shown in underline below:

Category number	***Category description***	***Category production or design capacity***	***Approved premises production or design capacity***
5	*Processing or beneficiation of metallic or non-metallic ore*	*50,000 tonnes or more per year*	*2,500,000 tonnes per annual period*
6	*Mine dewatering*	*50,000 tonnes or more per year*	*3,056,000 tonnes per annual period*
63	*Class I inert landfill site*	*500 tonnes **or more** per year*	*500 tonnes per year*
85	*Sewage facility*	*More than 20 but less than 100 cubic metres per day*	*99 cubic metres per day*

3. Condition 1.3.1 and Table 1.3.1 of the Licence is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

*1.3.1 The Licensee shall ensure that ~~tailings and decant water~~ **materials described in Table 1.3.1** are only discharged into the containment structures with the relevant infrastructure requirements and at the locations specified in Table 1.3.1 and located in the map of storages in Schedule 1.*

Table 1.3.1: Containment infrastructure			
Containment point reference	***Storage vessel or compound***	***Material***	***Infrastructure requirements***
TSF	*Bassetts West Pit TSF Tailings Storage Facility (TSF)*	*Tailings*	*Decant pump*
Bluebird East Pit TSF	*Bluebird East Pit TSF*	*Tailings*	*Decant pump*
Surprise in-pit TSF	***Surprise in-pit TSF***	***Tailings***	***Decant pump***
Five Mile Well evaporation pond	***Five Mile Well evaporation pond***	***Dewatering water from the Five Mile Well pit***	***Managed to ensure containment of a 1 in 100 year rainfall event over 72 hours*** ***Lined to achieve a minimum permeability of 10^{-9}m/s***
PWD	*Process water dam*	*Decant water from the TSF*	*Lined with a membrane spray. Storage of return water from the TSF.*
-	*Waste water treatment ponds*	*Sewage waste water undergoing treatment*	*Managed to ensure:* *(a) containment of a 1 in 100 year rainfall event over 72 hours; and* *(b) vegetation and floating debris (emergent or otherwise) is prevented from encroaching onto pond surfaces and pond embankments.*

4. Table 1.3.2 of Condition 1.3.3 of the Licence is amended by the insertion of the bold text shown in underline below:

Table 1.3.2: Freeboard requirements	
Storage vessel or compound	***Freeboard requirements***
TSF and Bluebird East Pit TSF	*Minimum freeboard of 500mm or equivalent to contain a 1 in 100 year rainfall event over 72 hours (whichever is greater).*
Surprise in-pit TSF	***Minimum freeboard of 3.0m measured as the distance between the maximum normal operating pond level and the surrounding natural ground level outside of the pit***
PWD	*Minimum freeboard of 300mm.*
Five Mile Well pit evaporation pond	***Minimum freeboard of 500mm***

5. Duplicate Condition 1.3.3 of the Licence relating to inspections of infrastructure has been renumbered as Condition 1.3.12.

6. Table 1.3.4 of Condition 1.3.5 is amended by the insertion of the bold text shown in underline below:

Table 1.3.4: Management of waste[1, 2]		
Waste type	***Management strategy***	***Requirements***
Inert Waste Type 1 and Type 2 (other than tyres)	*Receipt, handling and disposal of waste by landfilling*	*Disposal of waste by landfilling shall only take place within the landfill areas shown on the landfill location map in Schedule 1.* *Waste shall be placed in a defined trench or within an area enclosed by earthen or rock bunds.* *Only one trench shall be open for deposition at any one time.* *The separation distance between the base of the landfill and the highest groundwater level shall not be less than 3 m.* *Maintain a minimum distance of at least 100 m between the previously filled areas of the landfill and the active tipping area and any surface water body.*
Inert Waste Type 2 (Tyres)		*Disposal of tyres shall only take place within the tyre burial areas shown on the tyre burial location map in Schedule 1.* *Ensure that fire-fighting equipment is stored at the premises, that is capable of controlling and/or abating a used tyre fire at the premises.*
Special Waste Type 1	***Receipt, handling and disposal of waste by landfilling***	***Must be wrapped in heavy duty plastic prior to acceptance***

7. Table 1.3.5 of Condition 1.3.8 is amended by the insertion of the bold text shown in underline below:

Table 1.3.5: Cover requirements [1]			
Waste Type	***Material***	***Depth***	***Timescales***
Inert Waste Type 1 and Type 2 (Plastics)	*Inert and incombustible material*	*150 mm*	*Monthly*

Inert Waste Type 2 (Tyres)	*Soil or other dense inert and incombustible material*	*1,000 mm*	*At regular intervals so that no more than 1,000 tyres are left exposed at any one time.* *As soon as practical following the achievement of final waste levels in the area(s) where tyres are disposed of.*
Special Waste Type 1	***Clean fill***		***Immediately after disposal***

8. Condition 1.3.11 is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below, and the insertion of new Conditions 1.3.12, 1.3.13 and 1.3.14 as shown in the bold text in underline below:

1.3.11 ~~The Licensee shall construct the Bluebird East Pit TSF in accordance with the documentation detailed in Table 1.3.7:~~

~~Table 1.3.7: Construction Requirements[1]~~		
~~Document~~	***~~Parts~~***	***~~Date of Document~~***
~~Licence amendment application form~~	*~~All, including Drawings~~*	*~~17 February 2016~~*
~~Central Murchison Gold Project , Bluebird-East In-Pit Tailings Storage Facility, Big Bell Gold Operations Pty Ltd, February 2016~~	*~~Sections 1.1.3 to 1.1.4, 1.1.7, 2.3, 6.1 to 6.6, 8.1 to 8.5, and 8.9~~*	*~~19 February 2016~~*

1.3.11 The Licensee must install and undertake the Works for the infrastructure and equipment:
(a) specified in Column 1; and
(b) to the requirements specified in Column 2 of Table 1.3.7 below:

Table 1.3.7: Construction Requirements	
Column 1	***Column 2***
Infrastructure/ Equipment	***Requirements (design and construction)***
Surprise in-pit TSF	***Tailings discharge and return pipelines are located within earthen bunded areas; and*** ***The decant infrastructure is positioned at the truncated end of the porphyry unit within the pit.***
Five Mile Well Pit evaporation pond	***Pond is constructed to provide a minimum freeboard of 0.5 m to allow for a 1 in 100 year 72 hour rainfall event;*** ***The in-situ clays used for the pond wall construction are conditioned to achieve a permeability of 10^{-9} m/s or better; and*** ***Discharge pipeline is located within an earthen bunded area.***
Class I inert landfill	***To be constructed at the Surprise Waste Rock Dump;*** ***Each trench (cell) is constructed so the separation distance between the base of the landfill and the highest groundwater level shall not be less than 3 m; and*** ***Earthen bunds are constructed around the facility to divert stormwater away from the waste.***

1.3.12 If any departures from the specifications in Table 1.3.7 occur, then the Licensee

must provide the CEO with a list of departures which are certified as complying with Condition 1.3.11 at the same time as the certifications under Condition 1.3.13.

1.3.13 The Licensee must submit a construction compliance document to the CEO, within one month, following the construction of the Works and prior to operating the new works at the premises.

1.3.14 The Licensee must ensure the construction compliance document:
(a) is certified by a suitably qualified professional engineer or builder that each item of infrastructure specified in Condition 1.3.11, Table 1.3.7 has been constructed in accordance with the Conditions of the Licence with no material defects; and
(b) be signed by a person authorised to represent the Licensee and contain the printed name and position of that person within the company.

9. Table 3.4.1 of Condition 3.4.1 is amended by the insertion of the bold text shown in underline below:

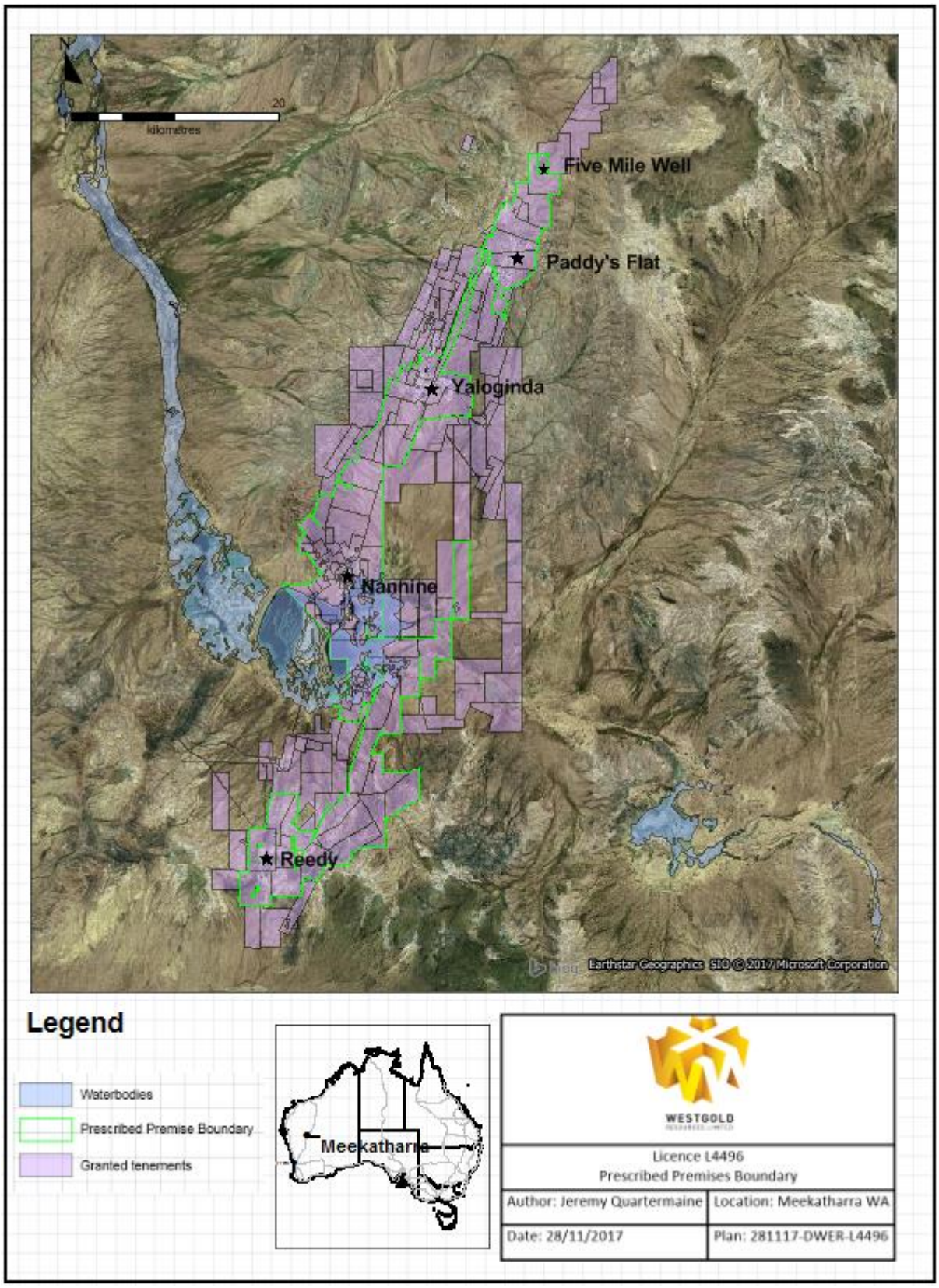
Table 3.4.1: Monitoring of ambient groundwater quality					
Monitoring point reference and location	***Parameter***	***Limit***	***Units***	***Averaging period***	***Frequency***
BWMB1, BWMB2, BWMB3, BWMB4, BWMB5 and BWMB 6 (Bassetts West Pit TSF) *PWD1, PWD2, PWD3 (Process Water Dam)* *BEMB1, BEMB2, BEMB3 and BEMB4 (Bluebird East Pit TSF)[2]* ***SB01, SB02 and SB03 (Surprise in-pit TSF)***	*Standing water level[1]*	*-*	*m(AHD)*	*Spot sample*	*Quarterly*
	pH	*≥6.0 to ≤9.0*	*-*		
	TDS	*-*	*mg/L*		
	As	*0.5*			
	Cd	*-*			
	Cr	*-*			
	Cu	*0.5*			
	Pb	*-*			
	Hg	*-*			
	Ni	*1.0*			
	Se	*-*			
	Zn	*20*			
	WAD CN	*0.5*			

10. Table 4.3.1 of Condition 4.3.1 is amended by the deletion of the text shown in

strikethrough below and the insertion of the bold text shown in underline below:

Table 4.3.1: Notification requirements			
Condition or table (if relevant)	***Parameter***	***Notification requirement[1]***	***Format or form[2]***
-	*Breach of any limit specified in the Licence*	*Part A: As soon as practicable but no later than 5pm of the next usual working day.* *Part B: As soon as practicable*	*N1*
~~*Table 1.3.7*~~	~~*Construction of the Bluebird East Pit TSF and all associated pipelines and groundwater monitoring bores.*~~	~~*Notify the CEO in writing within 14 days following the completion of the works specified in condition 1.3.11.*~~ ~~*The written notification shall:*~~ ~~*(a) confirm that the works were constructed in accordance with condition 1.3.11 and Table 1.3.7; and*~~ ~~*(b) be signed by a person authorised to represent the Licence Holder and contain the printed name and position of that person within the company.*~~ ~~*Following submission of the written notification, the Licensee shall operate the Bluebird East Pit TSF in accordance with the conditions of this Licence.*~~	~~*Not specified*~~

11. The Licence is amended by removing the map in *Schedule 1 Map of Premises* and insertion of the map below:

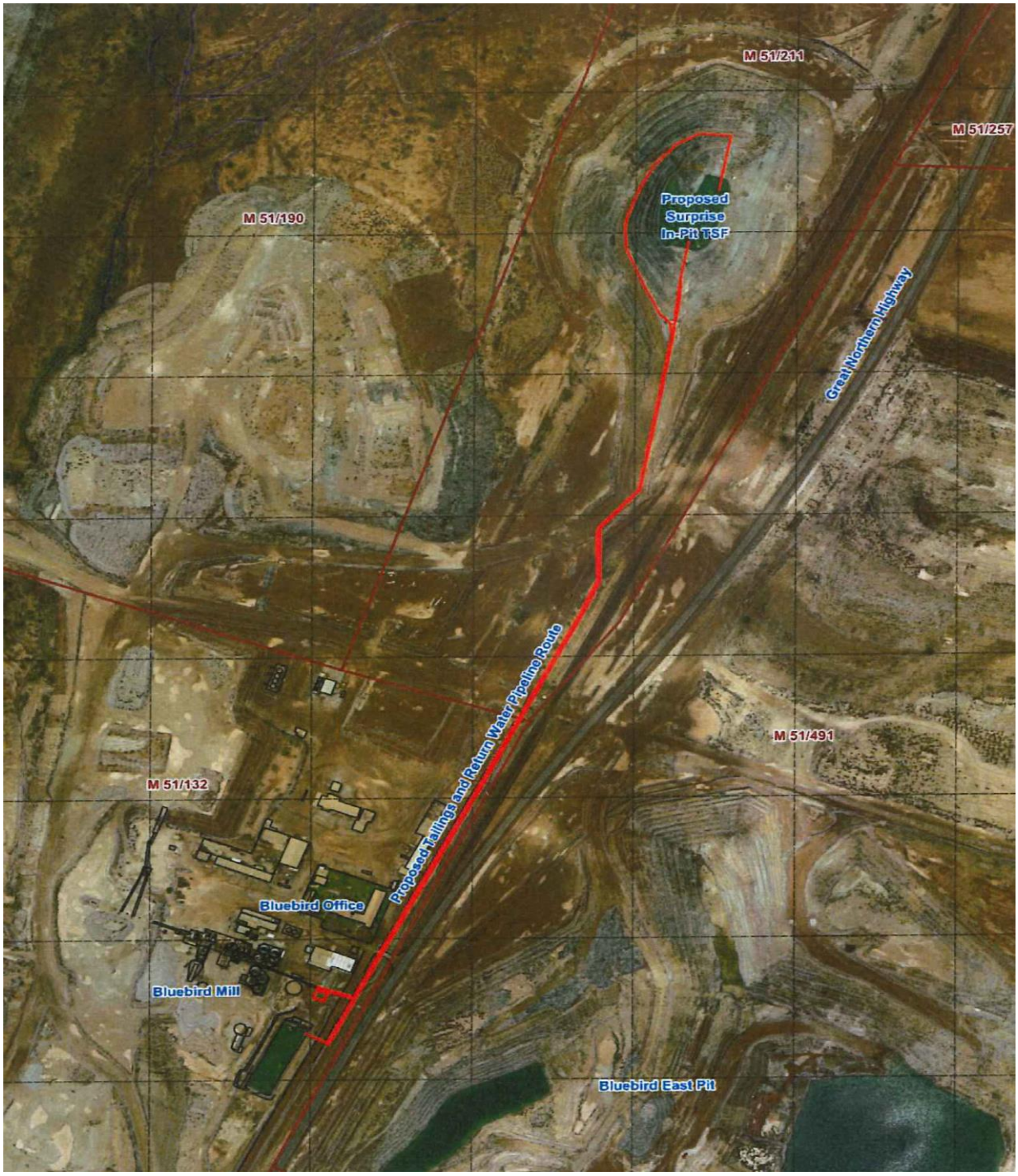


12. The Licence is amended by the insertion of the map below into Schedule 1 Map of groundwater monitoring bore locations:

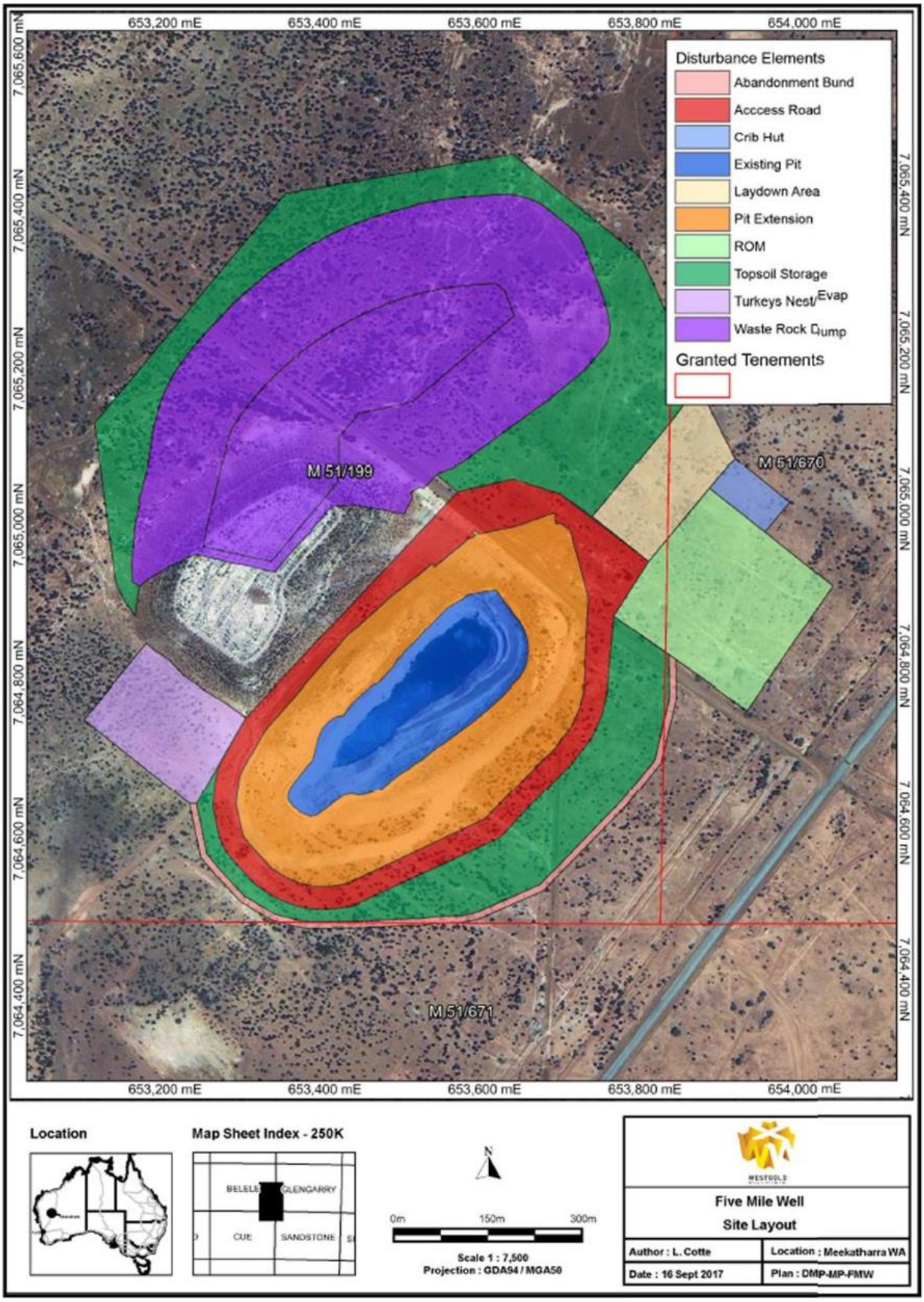
Surprise in-pit TSF groundwater monitoring bores

13. The Licence is amended by the insertion of the maps below into Schedule 1 Map of storage locations:

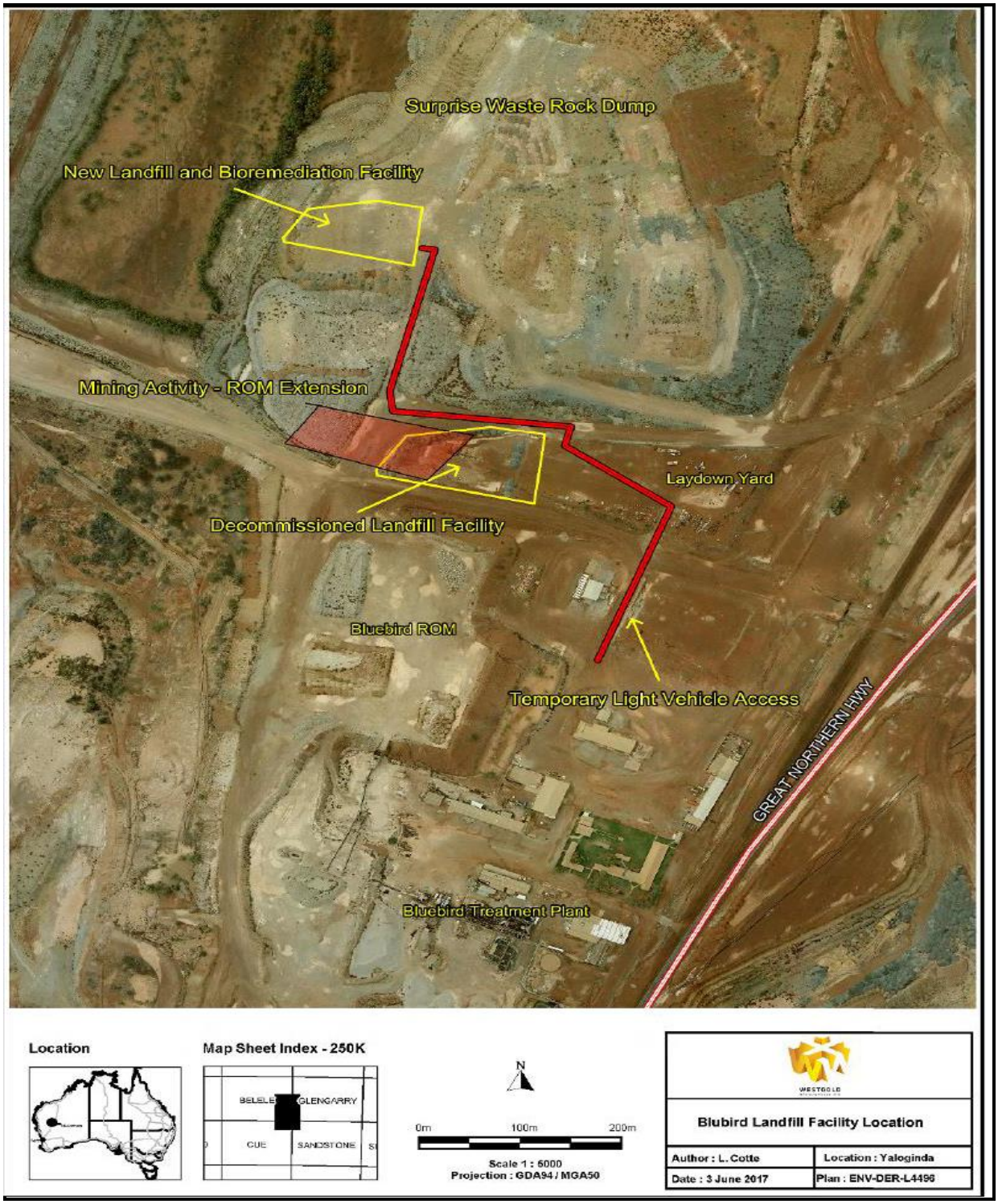
Surprise in-pit TSF



Five Mile Well Pit evaporation pond



14. The Licence is amended by removing the map in Schedule 1 Map of Landfill location and insertion of the map below:



Appendix 1: Key documents

	Document title	In text ref	Availability
1	Licence amendment application form for the Surprise in-pit TSF and Class I inert landfill, 9 July 2017	-	A1485354
2	Westgold Resources Limited, Supporting Documentation for Licence Amendment Surprise In-Pit Tailings Storage Facility, July 2017	-	A1485354
3	Licence amendment application form and supporting documentation, 8 November 2017	-	A1558775
4	Additional information for construction of the Five Mile Well evaporation pond, 7 December 2017	-	A1580004

Appendix 2: Summary of Licensee comments

The Licensee was provided with the draft Amendment Notice on 21 March 2018 for review and comment. The Licensee responded on 21 March 2018 waiving the remaining comment period until 11 April 2018. No comments were submitted on the draft Amendment Notice.