Government of Western Australia
Department of Water and Environmental Regulation

Amendment Report

Licence Number	L8593/2012/2
Licence Holder	EMR Golden Grove
ACN	114 868 325
File Number:	DER2011/007842-1
Premises	Golden Grove Mine M59/89, M59/363, M59/90, M59/3, M59/227, M59/362, M59/195, M59/361 and M59/91
Date of Report	21/02/2020
Decision	**Grant of licence amendment**

1. Definitions and interpretation

Definitions

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

Table 1: Definitions

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
Amendment Report	refers to this document
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 10 JOONDALUP DC WA 6919 info@dwer.wa.gov.au
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
DMIRS	Department of Mines, Industry Regulation and Safety
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of and during this Review
Licence Holder	EMR Golden Grove
m^3	cubic metres
Minister	the Minister responsible for the EP Act and associated regulations
mtpa	million tonnes per annum

Term	Definition
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 Amendment Report applies, as specified at the front of this Amendment Report.
Revised Licence	the amended Licence issued under Part V, Division 3 of the EP Act, with changes that correspond to the assessment outlined in this Amendment Report.
Risk Event	as described in *Guidance Statement: Risk Assessment*
RL	Reduced Level- survey datum point
TSF	Tailings storage facility

2. Amendment Description

The following guidance statements have informed the assessment and decision outlined in this Amendment Report.

- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Environmental Siting (November 2016)*
- *Guidance Statement: Risk Assessment (February 2017)*
- *Guidance Statement: Decision Making (June 2019)*
- *Guideline: Industry Regulation Guide to Licensing (June 2019)*

2.1. Purpose and scope of assessment

On 22 October 2019 EMR Golden Grove (the Licence Holder) submitted an application to amend Licence L8593/2011/2 for the Scuddles and Gossan Hill underground mine operations. Appendix 1 contains a list of documents that form the application. The mine is supported by two volcanic hosted massive sulphide deposits. Zinc ore, copper ore and copper oxide ore are mined to produce copper, zinc, lead, gold and silver. Tailings are produced as a waste product of the ore processing and then pumped in slurry form to TSF3.

This Amendment Report is limited to a proposed amendment relevant to Category 5: processing and beneficiation of metallic and non-metallic ore. DWER has additionally undertaken consolidation of the Licence conditions as part of this amendment.

The Licence Holder has applied to make the following changes:

1. Construction of a fourth embankment raise (Raise 4) on TSF3 to increase storage capacity by an additional 1,800,000 tonnes or 1,000,000 m^3.

   Note – while the total storage capacity of TSF3 will increase, the Licence Holder is not proposing a change to the approved production/design capacity for Category 5 (2,100,000 tonnes per annual period).

2. Removal of groundwater monitoring bores MB63 and MB73A – to facilitate the TSF3 Raise 4 works.

The location of TSF3 is shown in Figure 1. TSF3 is a single cell paddock style storage facility which covers an area of approximately 51 hectares and is located approximately 1km south-west of the processing plant.

2.2 TSF3 Raise 4 works and operations

TSF3 RAISE 4 WORKS

Summary

The TSF3 Raise 4 design drawings are provided in Appendix 2. The TSF3 Raise 4 works consist of the following:

- Downstream raise of the perimeter embankment
- Modified centreline raise of the decant accessway and decant structure
- Raising of access ramps
- Installation of an emergency spillway
- Installation of a drainage geonet layer

Downstream raise of the perimeter embankment

The perimeter embankment extends from CH 00 to CH 2450 around the existing TSF. The existing embankment will be raised by 3m as shown in Appendix 2. The TSF3 Raise 4 is designed as a downstream raise with the following details.

- Crest width 6m
- Raise crest elevation 381m AHD
- Upstream embankment slope 1(V): 2(H)
- Downstream embankment slope 1(V): 2(H)

- Total length 2450m
- 400mm windrow with side slopes of 1V:2H constructed from Zone 2* material along the downstream edge of the crest.

*see construction materials/ zones section below

Installation of seepage interception drainage geonet

The Raise 4 design includes a seepage interception drainage geonet. The geonet will be placed between the existing embankment downstream face and the proposed downstream raise. The layer will extend from approximately the starter embankment crest to 1m above the raise 1 crest. This area covers the join between the starter embankment and raise 1 lift as well as the join of raise 1 to raise 2. These two locations were identified as the most likely locations for seepage to occur and covers the area where historical seepage events were identified. The intention of this seepage interception layer is to identify if the original starter and raise 1 embankments are being saturated by the high phreatic levels within the facility. The geonet will be placed around the facility from CH 00 (decant access ramp) to CH 1175 (spillway).

The seepage interception system will report through outlet pipes down the downstream embankment face to a seepage collection trench on the downstream toe of the embankment. The seepage collection trench will report to collection sumps located around the facility.

The Licence Holder notes that as the seepage interception system is intended to be a detection system and not expected to flow the collection sumps have been nominally sized.

Modified decant accessway

The existing decant accessway is approximately 300m long and extends out from the north-east embankment towards the centre. The raise 4 decant accessway will be constructed on the southern side. The decant accessway specifications are as follows:

- Crest width 5m
- Raise height 3m
- Batter slopes 1(V): 1.5 (H)
- Total length 300m

Modified decant tower

The existing central decant tower consists of a slotted 1800mm diameter reinforced concrete pipe.and is surrounded by Zone 4 filter rock materials deemed to be potential acid forming (PAF) material. The decant system previously incorporated a sump mounted submersible pump located within the decant tower. However due to problems with scaling and water delivery to the pump the tower was abandoned and this was addressed by installing two skid mounted pumps on the access ramp near the decant tower.

The raise 4 works will incorporate raising of the decant tower and accessway including installing an additional standard 2.44m length of slotted RCP pipe of DN1800 fixed to the existing tower. However, based on operational experience, skid mounted decant return pumps will be installed external to the decant tower.

Raising of access ramps

The TSF3 Raise 4 design includes 3 construction (temporary) access ramps and 1 permanent access ramp. The permanent decant access ramp will be located at approximately the centre of the north-east embankment. The access ramp specifications are as follows:

- Crest width 8m
- Maximum grade 12.5%
- Batter slopes 1(v):2(H)

Emergency spillway

A 10m wide and 150mm deep emergency spillway will be constructed at the same location as the existing spillway (south-west side of TSF3). The existing revetment mattress will be removed to allow for the construction of the TSF embankment raise, however reinstated as part of the Raise 4 works. The revetment mattress will be installed from the 380 RL downstream.

Construction of tailings discharge bund

A tailings discharge bund will be constructed on the tailings immediately upstream of the raise 3 crest. The bund will be used to temporarily relocate the tailings discharge pipeline. The upstream slope will be protected with a 300mm thick 5m wide layer of mine waste below the spigots. The bund will be constructed from Zone 7 material (tailings) and Zone 3 material (mine waste rock).

Installation of new electric piezometers

Three additional titanium pressure transducer piezometers will be installed with the TSF3 tailings as part of the Raise 4 works.

CONSTRUCTION MATERIALS

The perimeter embankment for TSF3 Raise 4 is designed to be a downstream construction raise using low permeability material (Zone 1 material) sourced from a borrow pit which provided materials for the TSF3 starter embankments and three previous raises. Table 2 below provides details on the potential material sources, uses and estimated volumes for the TSF3 Raise 4 works.

Table 2: Potential material sources, uses and estimate volumes for TSF3 Raise 4 works

Material zone/ type	Source/s	Use	Estimated volume
Zone 1 Clayey embankment fill	a) Borrow pit *(~2.2km north-west of TSF3)*	Perimeter embankment fill	11,000 m^3
Zone 2 Gravel wearing course	a) Suitable material from existing embankment; b) Gravel pit *(~1.1km south-east of TSF1)*	Wearing course and windrows	7,000 m^3
Zone 3 Mine waste rock *(Potentially Acid Forming material)*	a) Gossan Hill ROM pad *(4.4km south of Gossan Hill mine)*	Decant accessway and erosion protection at spigot locations	19,000 m^3
Zone 7 Coarse tailings	a) Existing tailings beach within TSF3	Construction bunds	11,000 m^3
Zone 8 Drainage material	a) Stockpile adjacent to evaporation ponds *(~1.1km south-east of TSF3);* b) Open pit waste dump - non-acid forming material *(~6.6km south-east of TSF3);*	Drainage material	80,000 m^3

Zone 9 Selected general fill	a) Overburden dump adjacent to borrow pit *(~2.2km north-west of TSF3);* b) Open pit waste dump area *(east of Gossan Hill copper pit)*	Perimeter embankment downstream fill and access ramps	350,000 m^3

CONSTRUCTION TIMEFRAME

Construction of TSF3 Raise 4 is planned to be undertaken over approximately 3 months.

TAILINGS CHARACTERISTICS

A number of different ore types are mined and processed at the Golden Grove Operations, from both open cut and underground mining. Ore types include Zinc Ore, Copper Sulphide Ore and Copper Oxide Ore. The different ore types are processed separately in campaigns to produce Zinc, Copper, Lead and Copper Oxide concentrate. Tailings are produced as a waste product of the ore processing.

Tailings from ore processing is a mixture of sulphide slurry, water and flotation reagent chemicals. The oxidation of processed ores results in a high potential for acidified slurry and leachate. Metals and metalloids expected in the tailings include Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Selenium and Zinc.

Tailings samples were subjected to laboratory testing programs in 2016 and 2019, which identified tailings characteristics outlined below:

- Tailings classified as sandy and non-plastic silty materials with coarser materials in proximity to the embankment.
- Standard maximum dry density (SMDD) of 2.2 t/m^3 and 2.3t/m^3 at optimum moisture content (OMC) of 10.3% and 11.6 % - *2016 investigation*.
- SMDD of 1.81 t/m^3 (average) and OMC of 15.8 % (average) - *2019 investigation.*
- In-situ dry and wet density of 1.89t/m^3 (average) and 2.34 t/m^3 (average) respectively.
- Specific gravity of 3.5 t/m^3 (average).
- Interpretation of the CPTu data and dissipation tests indicated that the in-situ permeability of the tailings was in the order of 10^{-6} to 10^{-7} m/s.

ANNUAL RATE OF TAILINGS DISCHARGE

Since commissioning in September 2010 until the end of March 2019, approximately 9.42 Mt of tailings solids were deposited in TSF3.

Over the period of 2016-2018 the tailings average annual production rate was 0.75 Mtpa - the Raise 4 design is based on this current average production rate. The Licence Holder has advised that annual production rates are planned to increase to 1.3 – 1.5 Mtpa, noting however that this is likely to occur after the life of TSF3.

TSF3 OPERATION

A summary of the TSF3 Raise 4 operational aspects is provided below.

Tailings deposition and water management

The existing tailings delivery and discharge arrangement will be maintained for Raise 4, with new slotted spigot droppers provided at the discharge points.

Tailings is pumped from the Golden Grove plant (located at the Scuddles Mine) to TSF3 via two

parallel DN 315 HDPE pipelines. Two 8/6 Warman slurry pumps are available for transfer of tailings from the concentrator at the plant to TSF3. A second flow meter on each pipeline at the TSF provides indication to the mill control room of a break in the pipeline. The pipelines are located in a bunded corridor between the plant and the storage facility.

The tailings deposition ring main consists of two DN 315 polypropylene pipelines (arms) each running approximately one half of the tailings dam perimeter. Each arm of the deposition ring main contains 102 spigots. Each spigot is connected to a mining hose which is inserted into a slotted PVC pipe dropper pipe. The dropper pipes extend to the base of the embankment and allow controlled discharge of tailings.

Deposition of tailings slurry generally occurs simultaneously from both arms of the ring main, which enables a consistent beach profile and decant pond location to be maintained. Cycling thorough the spigots in a sequential manner provides an even distribution of tailings over the beach area. The maximum layer thickness of the continuously deposited tailings is limited to approximately 200mm to allow for effective draining and sun drying.

Decant generated at TSF3 will continue to be pumped and conveyed to the processing plant water pond, via return water pipelines fitted with flow meters. Tailings deposition and water management aims to centralise the decant pond around the decant area, and minimise the pond size as much as possible.

TSF3 performance monitoring will include monitoring of decant pond level and TSF piezometer pressures on a weekly basis. An updated trigger, action and response plan will be developed for the TSF piezometer monitoring.

TSF3 RAISE 4 STORAGE CAPACITY

The original TSF3 design concept was based on a tailings production rate of 0.95 Mtpa, a tailings slurry constitution of 25% solids, and a well-managed central decant pond, to achieve a stored tailings density of 1.8t/m^3.

The design of Raise 4 is based on the current average production rate of 0.75 Mtpa. The following assumptions were made for the TSF 3 Raise 4 capacity estimate:

- Total estimate tailings volume 1.00Mm^3
- Total tonnage 1.9Mt
- Average settled dry density of tailings in-situ 1.9t/m^3
- Production rate 0.75 Mtpa
- Raise 4 capacity 2.5 years
- Estimated rate of rise 1.2m/year

TSF3 REMAINING DESIGN LIFE

The estimated remaining design life of TSF3 is 2.5 years. The Licence Holder's consultant has recommended that Raise 4 is the final raise of the facility and that production beyond the 2.5 year capacity will require a new facility.

PROPOSED REMOVAL OF MONITORING BORES 63 AND 73A

The Licence Holder proposed to remove groundwater monitoring bores MB63 and MB73A from the groundwater monitoring network at the premises. MB63 is located north-west of the decommissioned TSF**2** within the clay borrow pit. MB73A is located at the south-east corner of TSF**3**.

The Licence Holder indicates the monitoring outcomes from bores MB63 and MB73A indicate no impact on groundwater and, in regard to MB63, that there are other bores in the vicinity to continue groundwater monitoring.

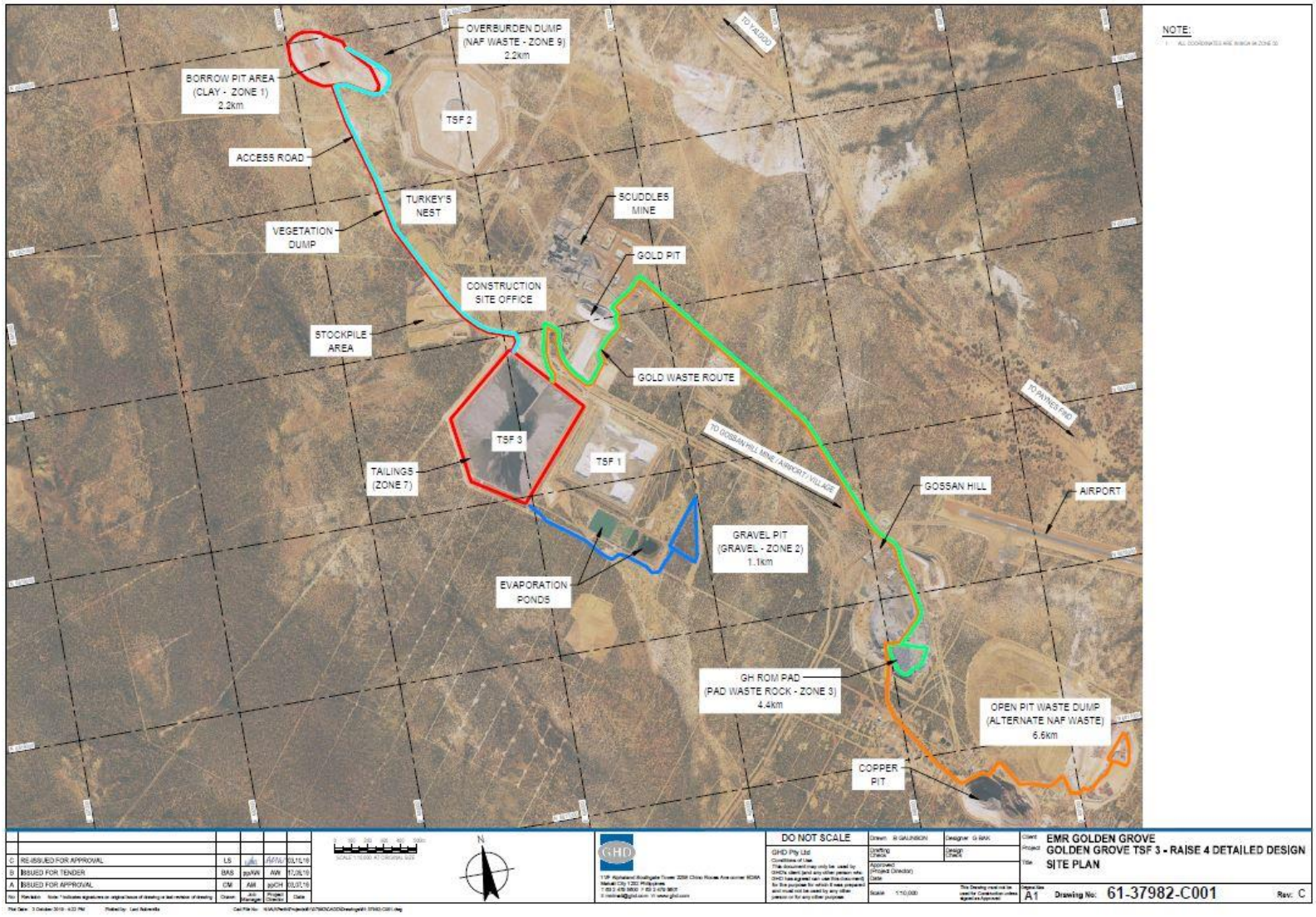


Figure 1: TSF3 raise 4 site plan.

2.2. Consolidation of Licence

As part of this amendment package DWER has consolidated the licence by incorporating changes made under the following Amendment Notices:

- Amendment Notice 1, granted on 21 April 2017

The obligations of the Licence Holder have not changed in consolidating the licence. DWER has not undertaken any additional risk assessment of the Premises related to the previous Amendment Notice.

In consolidating the licence, the CEO has:

- Updated the format and appearance of the Licence.

The previously issued Amendment Notice will remain on the DWER website for future reference and will act as record of DWER's decision making.

3. Other approvals

Other approvals relevant to the application are outlined in Table 3 below.

Table 3: Relevant approvals

Legislation	Number	Approval
Mining Act 1978	Registration ID 83255	Mining Proposal for TSF3 Raise 4 dated 18 October 2019 – approved on 5 December 2019

4. Amendment history

Table 4 provides the licence amendment history for L8593/2012/2.

Table 4: Licence amendments

Instrument	Issued	Amendment
L8593/2011/1	16/9/2011	Licence re-issue
L8593/2011/2	11/9/2014	Licence re-issue to REFIRE format
L8593/2011/2	26/11/2015	Licence amendment to add Category 61: Liquid Waste Facility as wash water generated at the port is reused back at the mine site in the processing plant. TSF1 and TSF2 were removed from the containment infrastructure table as they have been decommissioned
L8593/2011/2	22/9/2016	Licence amendment to increase Total Dissolved Solids limit in ambient groundwater due to exceedances and implement Improvement Conditions to address management of the seepage issue from Evaporation Pond A Addition of construction conditions for the TSF3 lift
L8593/2011/2	21/4/2017	Amendment Notice: Licence amendment to increase the capacity of Category 61: Liquid Waste Facility from 1,000 tonnes per annual period to 5.000 tonnes per annual period Licensee name change to EMR Golden Grove Pty Ltd Amendments to Conditions 1.1.2; 1.2.1; 4.1.1; and 5.1.2.
L8593/2011/2	21/02/2020	This licence amendment

5. Location and receptors

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

Table 5: Receptors and distance from activity boundary

Residential and sensitive premises	Approximate distance from TSF3
The Licence Holder notes the nearest residence or sensitive land use is Thundelarra homestead.	20kms

Table 6 below lists the relevant environmental receptors in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 6: Environmental receptors and distance from activity boundary

Environmental receptors	Approximate distance from TSF3
Parks and Wildlife Managed Lands and Waters *Unnamed unallocated crown land*	6.5km south-east
Priority Ecological Communities (buffer areas) *Minjar and Chulaar Hills vegetation complexes (banded ironstone formation)*	Buffer area is adjacent to and incurs into the existing TSF3 area.
Priority Ecological Communities (buffer areas) *Badja calcrete groundwater assemblage type on Moore palaeodrainage on Badja Station*	10.8km north-west
Declared rare flora (DRF) *Stylidium scintillans*	The Licence Holder has advised DRF *Stylidium scintillans* is located within the Golden Grove mining tenements, with the nearest population being more than 4kms from the project area.
Priority 3 fauna (bird) *Masked owl*	Sighting 1.25km north-east
Soils	Soils beneath TSF3. Soils in the vicinity of TSF3 and associated infrastructure.
Groundwater	Groundwater is expected to occur at significant depth beneath the TSF – approximately 50-60 mBGL.
Unnamed ephemeral creek lines	Numerous creek lines in the region. The nearest creekline to TSF3 is approximately 2.1km north-east of TSF3.
Native vegetation	Remnant native vegetation is located in the region of TSF3.
Cattle	Stock water supply bores may be located in the broader region outside of the EMR Golden Grove tenements.

6. Risk assessment

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

Table 7: Risk assessment for proposed amendments during *construction*

Risk Event				Consequence rating[1]	Likelihood rating[1]	Risk[1]	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/Activities	**Potential emissions**	**Potential receptors, pathway and impact**	**Applicant controls**					
TSF3 Raise 4 **construction works**	Noise Dust	Nil	Not applicable	N/A	N/A	N/A	Potential noise and dust emissions generated during construction works are not expected to impact residential premises due to the separation distances. The nearest residence to the TSF3 area is Thundelarra Homestead located approximately 20kms away from TSF3.	Nil

Table 8: Risk assessment for proposed amendments during *operation*

Risk Event				Consequence rating[1]	Likelihood rating[1]	Risk[1]	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/Activities*	**Potential emissions**	**Potential receptors, pathway and impact**	**Applicant controls**					
Pipeline failures associated with the transport of tailings slurry and decant water	**Slurry and/or decant water:** Total dissolved solids; Acidified and metal enriched water - metals/metalloids including As, Cd, Cr, Cu, Pb, Hg, Se, Zn Elevated Nitrate and Sulphate	**Pathway:** Overland flow following spill event **Receptors:** Soils and remnant native vegetation in the vicinity of the pipelines **Impact:** Soil contamination Deceased vegetation	▪ Tailings slurry and decant return water pipelines will be HDPE. ▪ Pipelines located within a bunded corridor between the processing plant and TSF3. ▪ Flow meters installed on pipelines including a second flow meter on each pipeline to facilitate identification of leak events. ▪ Daily inspection of pipeline integrity.	Moderate	Possible	Medium	A spill or leak from the slurry and/or return water pipelines may result in contaminated soil and deceased vegetation in the vicinity. A pipeline spill is possible, however not expected to be a regular occurrence. The Licence Holder will have measures in place to contain and identify a spill in a timely manner, reducing the potential scale of impact.	The risk event is acceptable subject to regulatory controls summarised below: <u>Infrastructure requirements</u> ▪ Tailings slurry and decant water pipelines to be HDPE and incorporate flow meters. ▪ Provision of secondary containment as per existing condition 1.2.8 <u>Operational requirements</u> ▪ Monitoring for pipeline failures and inspection records as per existing condition 1.2.7. ▪ Requirement to take corrective action measures as per existing condition 1.2.7.
Seepage of slurry water and contaminants through the base of TSF3 [2]	**Slurry water:** Total dissolved solids; Acidified and metal enriched water - metals/metalloids including As, Cd, Cr, Cu, Pb, Hg, Se, Zn Elevated Nitrate and Sulphate	**Pathway:** Infiltration through to soil and groundwater beneath the TSF Potential impact on groundwater off-site. **Receptors:** Soils beneath TSF; Groundwater; Cattle in region (via potential stock bores) **Impact:** Soil and groundwater contamination; Adverse impact on cattle	▪ TSF underdrainage system and liners including: - Existing underdrainage and pumping system - Existing 1.5mm thick HDPE liner extended up the starter embankments to RL363.5m - Existing 0.5 metre thick layer of compacted saprolitic clay - Existing Paleo-channel interception drain that extends down to the caprock along the south-eastern embankment to intercept potential seepage below the liner. ▪ Decant water recovery system ▪ Existing groundwater monitoring bore system	Moderate	Possible	Medium	The Raise 4 works and subsequent operation of the TSF is not considered to increase the risks to soils and groundwater beneath the TSF. Controls implemented in the construction of the TSF starter embankment were designed to manage seepage and risks to groundwater for the life of the multistage TSF. The existing TSF3 underdrainage and liner system is considered to reduce the likelihood of soil and groundwater contamination. The likelihood of groundwater contamination is also reduced as groundwater is understood to occur at significant depth beneath the TSF. Impacts on soil and groundwater quality are expected to be localised, and minimal or nil on a wider scale. TSF3 is not considered to present a risk to the *Badja calcrete groundwater assemblage* PEC due to the separation distance of approximately 10.8km.	The risk event is acceptable subject to regulatory controls summarised below: <u>Infrastructure requirements</u> ▪ Raise 4 works to incorporate a decant water recovery system as specified <u>Operational requirements (additional conditions)</u> ▪ Completion of a monthly water balance. <u>Groundwater monitoring</u> ▪ Completion of groundwater monitoring in accordance with existing conditions. <u>Reporting (additional condition)</u> ▪ A review of the conceptual hydrogeological model for the site and an assessment of impacts of TSF3 on groundwater within and outside of the premises boundary.

Risk Event				Consequence rating[1]	Likelihood rating[1]	Risk[1]	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/Activities*	**Potential emissions**	**Potential receptors, pathway and impact**	**Applicant controls**					
Seepage of contaminants through TSF3 embankments and through to embankment toe [2]	**Slurry water:** Total dissolved solids; Acidified and metal enriched water - metals/metalloids including As, Cd, Cr, Cu, Pb, Hg, Se, Zn Elevated Nitrate and Sulphate	**Pathway:** Migration of tailings leachate through TSF embankments and through to the embankment toe and surrounds. **Receptors:** Soils and vegetation in the vicinity of TSF3 PEC buffer area for Minjar and Chulaar Hills vegetation complexes **Impact:** Soil contamination Deceased vegetation	▪ The perimeter embankment for TSF3 Raise 4 will be constructed with clayey low permeability material. ▪ Decant water recovery system. ▪ A total of 29 electric piezometers (including 3 additional electric piezometers) and 18 standpipe piezometers installed within the TSF to monitor the phreatic surface within the facility. ▪ Seepage interception drainage system installed between the existing embankment downstream face and the downstream raise (Raise 4) – seepage intercepted will flow to outlet pipes on the downstream embankment face to a seepage collection trench on the downstream toe of the embankment. The seepage collection trench will report to collection sumps located around the facility.	Minor	Unlikely	Medium	The multiple controls proposed by the Licence Holder are considered to reduce the likelihood of seepage impacting soils and vegetation in vicinity of the TSF. Potential impacts on soils and vegetation are expected to be localised. There is potential for leachate to migrate from the TSF embankments into the *Minjar and Chulaar Hills vegetation complexes PEC buffer zone.* However, seepage from the embankments is expected to be low and is to be contained by seepage collection trench and sump system. In addition, it is considered that seepage from the TSF embankments would not migrate upgradient into hill areas were the PEC is understood to be located.	The risk event is acceptable subject to regulatory controls summarised below: <u>Infrastructure requirements</u> ▪ Compliance with TSF3 Raise 4 construction specifications. <u>Operational requirements</u> ▪ Inspection of seepage collection trench/sumps. ▪ Completion of monthly water balance (additional condition).
Overtopping due to excess loading or heavy rainfall or both [2]	**Slurry and/or decant water** Total dissolved solids; Acidified and metal enriched water - metals/metalloids including As, Cd, Cr, Cu, Pb, Hg, Se, Zn Elevated Nitrate and Sulphate	**Pathway:** Overflow from TSF **Receptors:** Soils and vegetation in the vicinity of TSF3 Ephemeral creeks (nearest creek line is ~2.1km NE of TSF3) **Impact:** Soil contamination Deceased vegetation	▪ Tailings delivery and discharge arrangement ▪ Decant water recovery system ▪ Freeboard design to contain the 1 in 100 year 72 hour rainfall event without the maximum water level reaching the crest level of the emergency spillway. ▪ Minimum operational freeboard of 300mm ▪ Maximum normal operating pond level to accommodate the 1 in 100 year 72 hour duration rainfall event, plus 500mm total freeboard. ▪ Emergency spillway 150m deep and 10m wide to accommodate a 1 in 1,000 year 72 hour rainfall event without the TSF3 Raise 4 embankments being overtopped. ▪ Inspection of embankment freeboard and decant pond.	Moderate	Rare	Medium	The multiple controls proposed by the Licence Holder are considered to reduce the likelihood of an overtopping event to a rare rating. The TSF3 Raise 4 is designed to contain the 1 in 100 year 72 hour rainfall event. The emergency spillway is to accommodate the 1 in 1,000 year 72 hour rainfall event. In the rare event of overtopping via the emergency spillway impacts on soils and vegetation are expected to be local in scale.	The risk event is acceptable subject to regulatory controls summarised below: <u>Infrastructure requirements</u> ▪ Compliance with TSF3 Raise 4 construction specifications. Operational requirements ▪ Inspection of embankment freeboard and decant pond.

Risk Event				Consequence rating[1]	Likelihood rating[1]	Risk[1]	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/Activities*	**Potential emissions**	**Potential receptors, pathway and impact**	**Applicant controls**					
Overtopping due to excess loading or heavy rainfall or both [2]	**Slurry and/or decant water** Total dissolved solids; Acidified and metal enriched water - metals/metalloids including As, Cd, Cr, Cu, Pb, Hg, Se, Zn Elevated Nitrate and Sulphate	**Pathway:** Overflow from TSF **Receptor:** PEC buffer area for Minjar and Chulaar Hills vegetation complexes located upgradient **Impact:** Soil contamination Deceased vegetation	▪ Tailings delivery and discharge arrangement ▪ Decant water recovery system ▪ Freeboard design to contain the 1 in 100 year 72 hour rainfall event without the maximum water level reaching the crest level of the emergency spillway. ▪ Minimum operational freeboard of 300mm ▪ Maximum normal operating pond level to accommodate the 1 in 100 year 72 hour duration rainfall event, plus 500mm total freeboard. ▪ Emergency spillway 150m deep and 10m wide to accommodate a 1 in 1,000 year 72 hour rainfall event without the TSF3 Raise 4 embankments being overtopped. ▪ Inspection of embankment freeboard and decant pond. ▪ Existing TSF3 perimeter drain	Major	Rare	Medium	A major consequence rating has been determined due to the potential for long term impact on the PEC vegetation. However, it is considered the risk event may only occur in exceptional circumstances, therefore a rare likelihood rating has been determined. In summary, the rare rating has been determined based on the following factors: ▪ The remaining life of TSF3 of approximately 2.5 years ▪ TSF3 will be constructed to accommodate the 1 in 100 year 72 hour rain event. ▪ The TSF3 emergency spillway will be constructed to accommodate a 1 in 1,000 year 72 hour rainfall event without the TSF3 embankments being overtopped. ▪ Regular inspection of the embankment freeboard and decant pond and execution of corrective actions to mitigate the risk of overtopping. ▪ Retention of existing TSF3 perimeter drain to capture flow from the emergency spillway in a rare spill event. ▪ Operations to date have been well managed with no overflow event. ▪ The PEC vegetation is understood to be located upgradient of TSF3 which reduces the likelihood of impact on the PEC vegetation.	The risk event is acceptable subject to regulatory controls summarised below: <u>Infrastructure requirements</u> ▪ Compliance with TSF3 Raise 4 construction specifications. ▪ Retention of existing TSF3 perimeter drain Operational requirements ▪ Inspection of embankment freeboard and decant pond.
Stormwater contact with TSF embankment seepage collection trench	**Dilute contaminated water:** Total dissolved solids; Acidified and metal enriched water - metals/metalloids including As, Cd, Cr, Cu, Pb, Hg, Se, Zn Elevated Nitrate and Sulphate	**Pathway:** Overland flow **Receptors:** Soils and vegetation in the vicinity of TSF3 Ephemeral creeks (nearest creek line is ~2.1km NE of TSF3) PEC buffer area for Minjar and Chulaar Hills vegetation complexes **Impact:** Soil contamination Deceased vegetation	▪ Existing surface water diversion channels – around the north-east and to the south-west of the facility	Minor	Rare	Low	The existing controls are considered to reduce the likelihood of the risk event to a rare rating. Potential impacts on soils and vegetation are expected to be localised. The PEC *Minjar and Chulaar Hills vegetation complexes* are not considered to be at risk in this case as stormwater is expected to flow downgradient and away from the PEC.	The risk event is acceptable and not subject to regulatory controls.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the Department's Guidance Statement: Risk Assessments (February 2017)

Note 2: Source of emissions includes potential oxidation of PAF material used to construct the TSF accessway and erosion protection at spigot locations.

7. Consultation

Department of Mines, Industry Regulation and Safety

The application was referred to DMIRS for comment on 5 December 2019. Submissions were received from DMIRS on 16 December 2019 and 21 January 2020 which are summarised below.

The Mining Proposal for TSF 3 Raise 4 was assessed and approved by DMIRS on 5 December 2019. DMIRS' assessment of the Mining Proposal included geotechnical review of the TSF 3 Raise 4 Detailed Design Report. Conditions under the Mining Act 1978 (WA) include non-standard conditions as follows:

- *Where the TSF Raise 4 design production rates (0.75 Mtpa) and rate of rise (1.2m/year) exceed TSF design assumptions, provide DMIRS with assessments demonstrating TSF3 will remain stable under the new production conditions.*

- *The lessee is to complete construction, performance monitoring strategies and reporting as specified in the TSF 3 Raise 4 design document Reg.ID 83255 – "EMR Golden Grove Pty Ltd - Golden Grove TSF 3 Raise 4 Detailed Design Report", dated October 2019.*

EMR Golden Grove are to provide an update on future tailings disposal plans to DMIRS after 2.5 years, given that Raise 4 is recommended to be the final raise of the facility.

Shire of Yalgoo

The application was referred to the Shire of Yalgoo for comment on 5 December 2019. No submissions were received from the Shire of Yalgoo.

8. Conclusion

CONSTRUCTION OF EMBANKMENT RAISE 4 ON TSF3

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a licence amendment will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

PROPOSED REMOVAL OF GROUNDWATER MONITORING BORES MB63 AND MB73A

Bore MB73A

Due to the continued potential for impacts on groundwater (related to the TSF3 operation) the Delegated Officer has determined that monitoring bore MB73A is to be replaced by the Licence Holder. Conditions pertaining to this requirement have been added to the licence.

Bore MB63

Monitoring bore MB63 is located approximately 240m north-west of TSF2. TSF2 has been decommissioned since 2011. An additional 4 bores are located in the vicinity of TSF2 including bore GGW050 located approximately 260m to the south of MB63. The Delegated Officer has determined that the removal of bore MB63 (to facilitate the extraction of borrow material for TSF3) is acceptable, subject to continued monitoring of remaining bores in the vicinity of TSF2, in accordance with existing licence conditions.

8.1. Summary of amendments

Table 10 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Revised Licence as part of the amendment process.

Table 10: Licence amendments

Condition No.	Summary of amendments
1.1.2	Insertion of definitions for the following terms: ▪ ASTM D5092/D5092M-16” ▪ “AS1726”
1.2.5	Amended to specify operational freeboard for TSF3 and top of embankment freeboard for CW1 and Evaporation Pond C
1.2.7	Table 1.2.5 amended to include inspection of decant pond and seepage collection trenches/sumps
1.2.10	New condition to specify design and construction requirements for TSF3 embankment **raise 4**. Omission of text relating to previous TSF3 embankment raise
1.2.11	Amended wording
1.2.12	New condition to specify design and construction requirements for a replacement groundwater monitoring well (replacement for MB73A)
1.2.13	New condition requesting the completion of a monthly water balance for TSF3
2.1.1	Amended wording
3.5.1	Omission of groundwater monitoring bore MB63
4.1	Omission of outdated condition 4.1 improvement program – improvement reference IR1
5.1 to 5.3	Updated to Condition numbers 4.1 to 4.3
5.2.2 (a)	Corrected reference to conditions
5.2.2 (c)	New condition requiring submission of water balance data specified under condition 1.2.13
5.2.2 (d)	New condition requiring a review of the conceptual hydrogeological model for the site and an assessment of the potential impacts of TSF3 on groundwater within and outside of the premises boundary.
5.3.1	Amended wording
5.3.1 - Table 5.3.1	New conditions relating to the submission of construction compliance reports for TSF3 Raise 4 and a replacement groundwater monitoring bore (replacement for monitoring bore MB73A) Omission of text relating to previous TSF3 embankment raise

Condition No.	Summary of amendments
Schedule 1	Insertion of site plan figure
Schedule 2	Corrections to licence holder name
Schedule 3	Insertion of schedule with TSF3 raise 4 design drawings

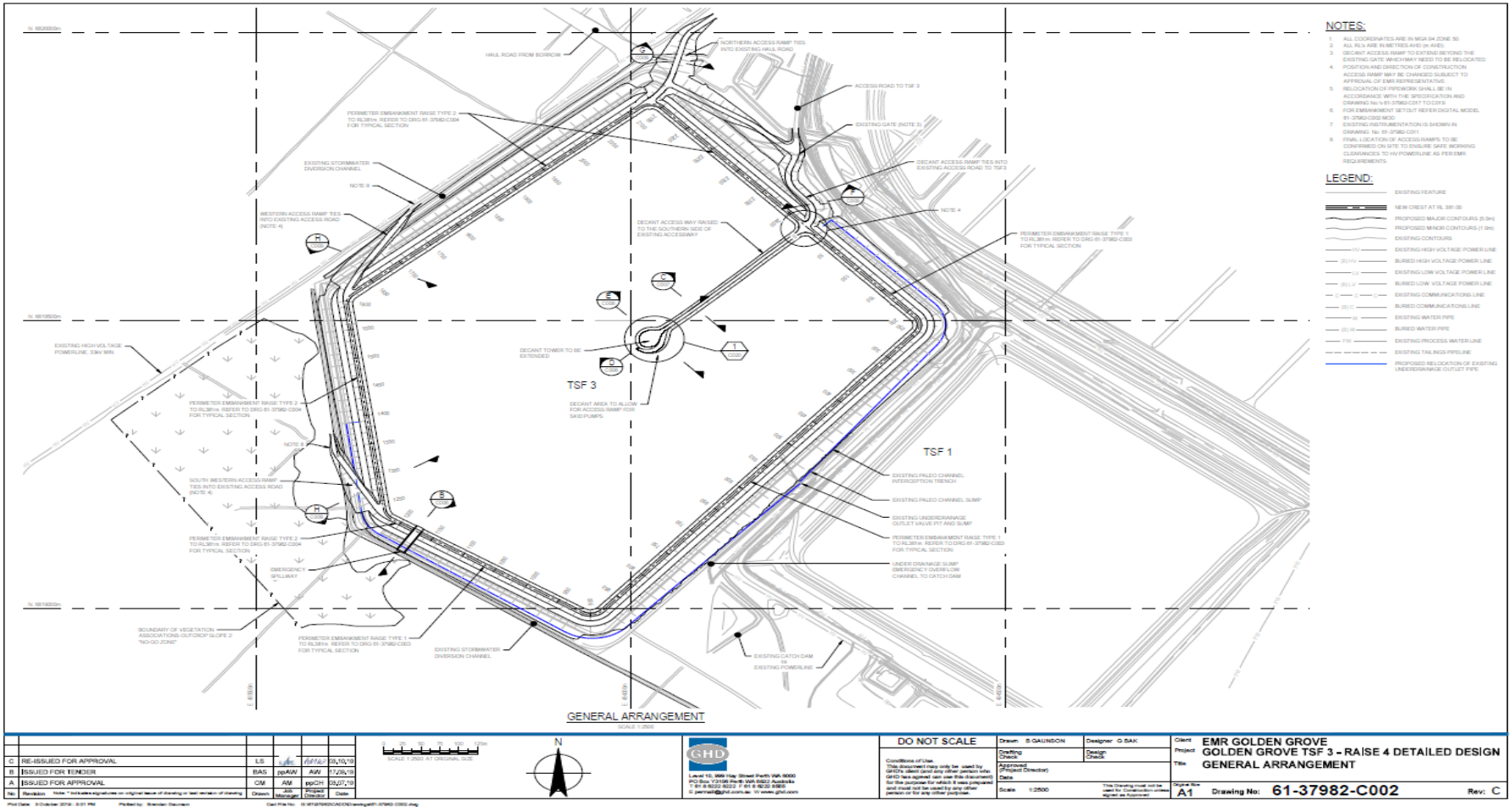
Alana Kidd
MANAGER RESOURCE INDUSTRIES
INDUSTRY REGULATION

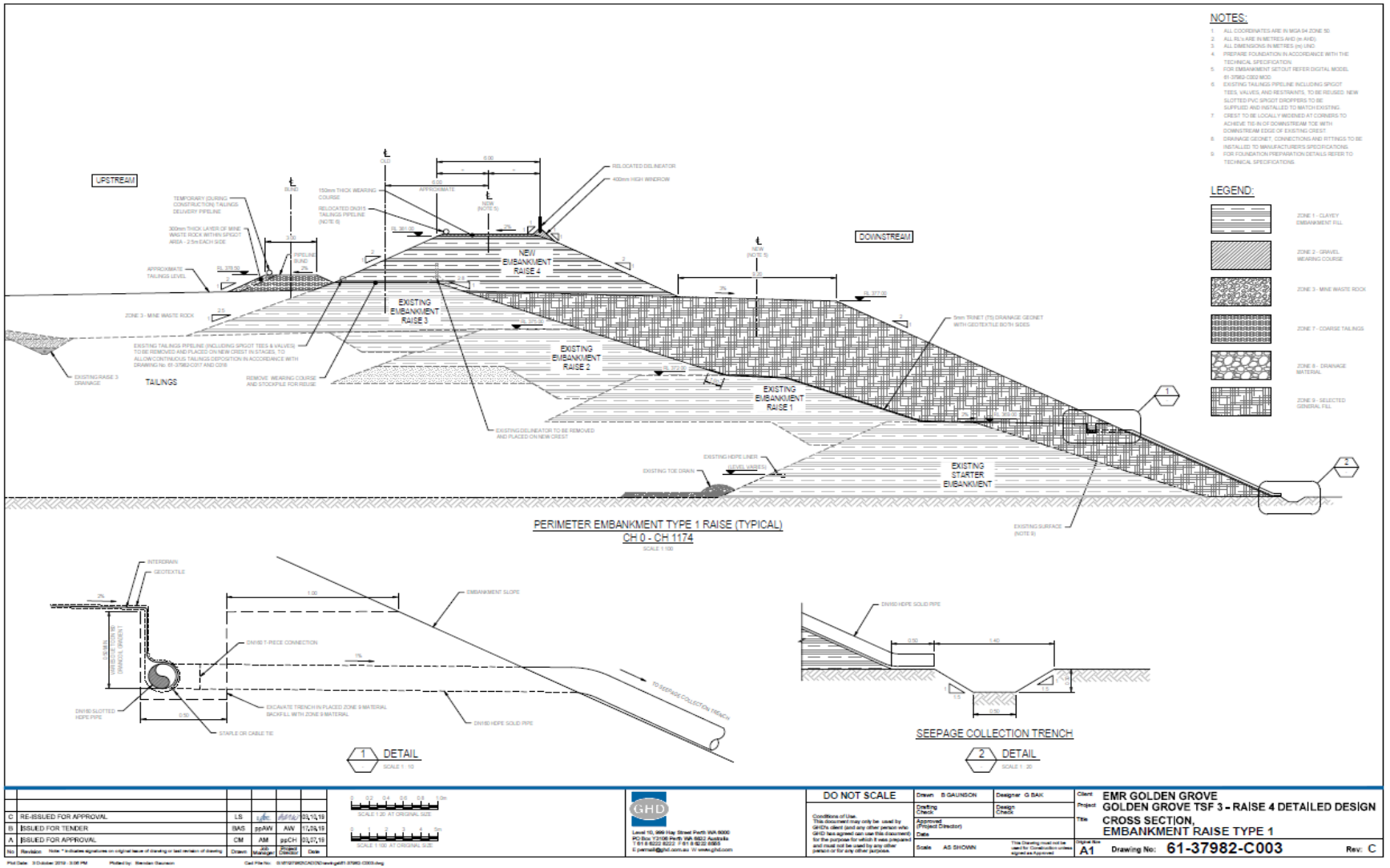
An officer delegated by the CEO under section 20 of the EP Act

Appendix 1: Key documents

Document title	In text ref	Availability
Licence L8593/2011/2 Scuddles and Gossan Hill Mine	Licence L8593/2011/2	https://www.der.wa.gov.au/
Licence L8593/2011/2 Scuddles and Gossan Hill Mine - Amendment Notice 1	Amendment Notice	https://www.der.wa.gov.au/
Licence amendment application including: - Signed application form, dated 21 October 2019 - Supporting documentation, dated October 2019 - Appendix 1 TSF3 Raise 4 Design Report, dated 3 October 2019. - Appendix 2 TSF3 Raise 4 Technical Specification, Rev 1, dated October 2019 - Appendix 3 raw data for bores MB63 and 73A - Appendix 4 Fauna assessment for a proposed third tailings storage facility, dated December 2008 - Appendix 5 TSF3 flora survey and vegetation mapping, dated February 2009	Application	DWER records (A1834179) DWER records (A1834178) DWER records (A1834184) DWER records (A1855318) DWER records A1834182 DWER records (A1834181) DWER records (A1834180)
Submissions from DMIRS received on 16 December 2019 and 21 January 2020	N/A	DWER records A1851885, A1861094
Submission from applicant (response to draft amended licence and draft amendment report) – received 19/2/2020	Application	DWERDT255620

Appendix 2 TSF3 Raise 4 design drawings

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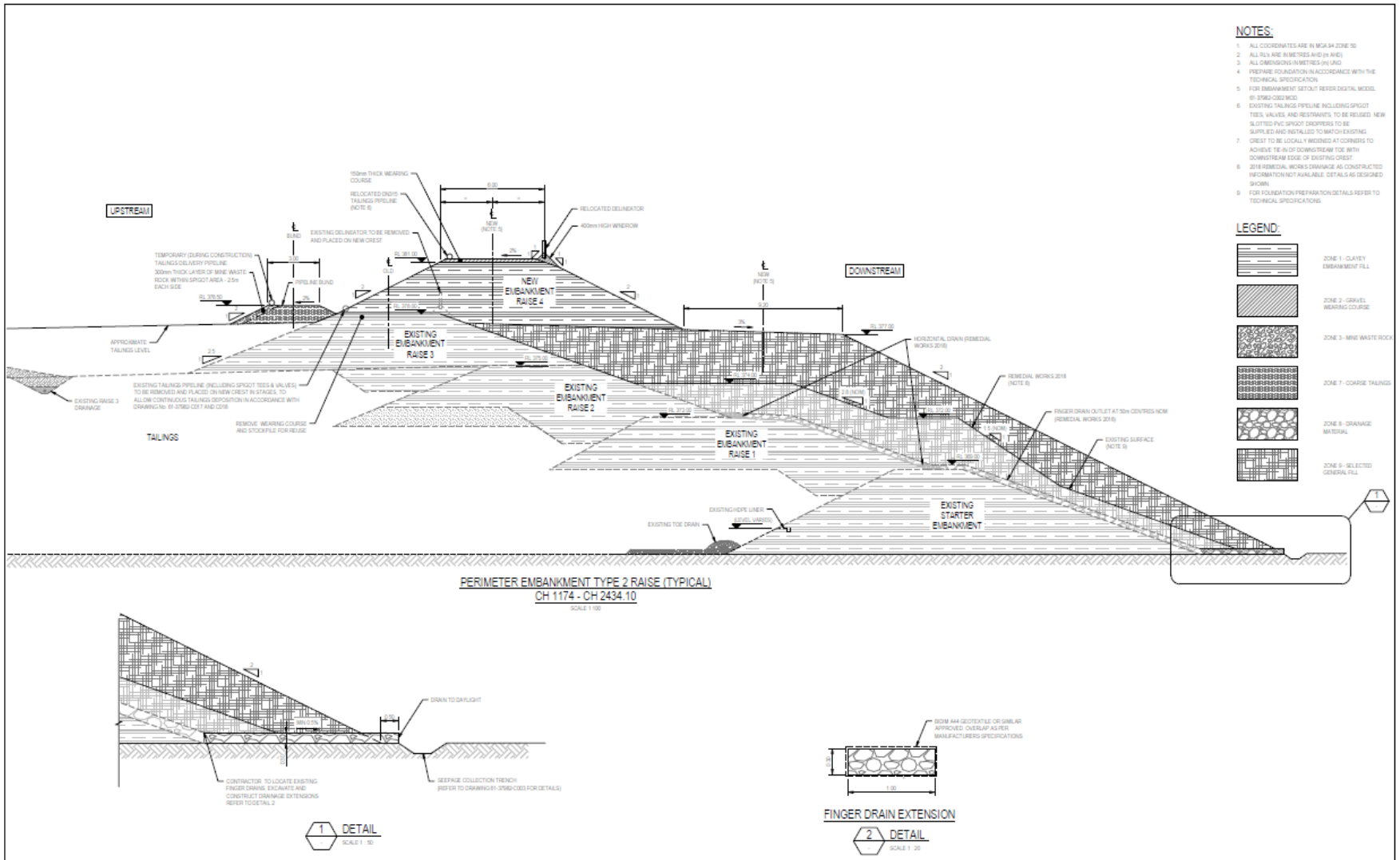
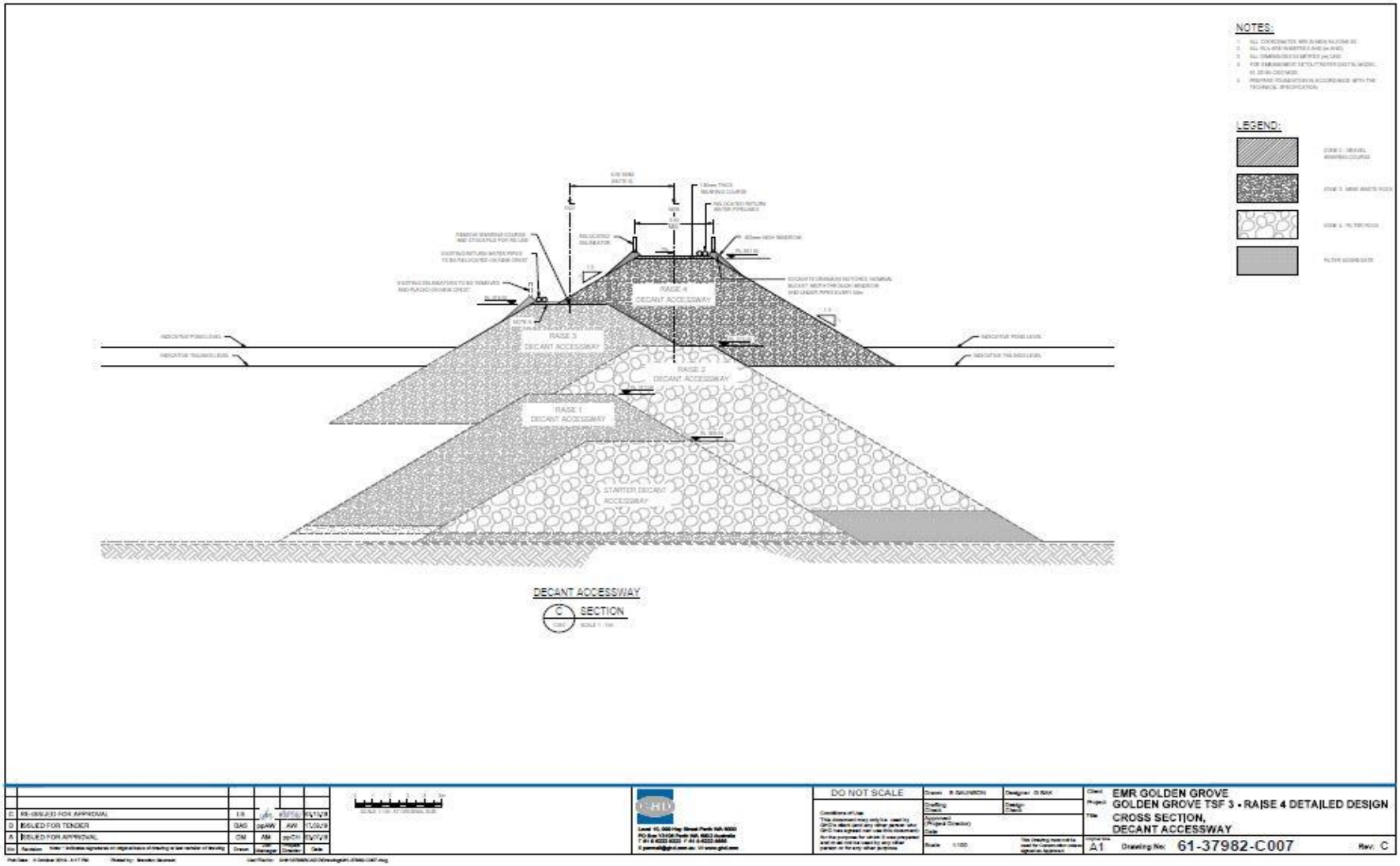
LEGEND:
UPSTREAM
DOWNSTREAM
NEW EMBANKMENT RAISE 4
EXISTING EMBANKMENT RAISE 3
EXISTING EMBANKMENT RAISE 2
EXISTING EMBANKMENT RAISE 1
EXISTING STARTER EMBANKMENT
TAILINGS
PERIMETER EMBANKMENT TYPE 1 RAISE (TYPICAL)
CH 0 - CH 1174
SEEPAGE COLLECTION TRENCH
DETAIL
DETAIL
DO NOT SCALE
EMR GOLDEN GROVE
GOLDEN GROVE TSF 3 - RAISE 4 DETAILED DESIGN
CROSS SECTION,
EMBANKMENT RAISE TYPE 1
A1
61-37982-C003
Rev: C


NOTES:
1. ALL COORDINATES ARE IN MGA 94 ZONE 50.
2. ALL RL's ARE IN METRES AHD (m AHD).
3. ALL DIMENSIONS IN METRES (m) UNO.
4. PREPARE FOUNDATION IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION.
5. FOR EMBANKMENT SETOUT REFER DIGITAL MODEL 61-37982-C002.MOD.
6. EXISTING TAILINGS PIPELINE INCLUDING SPIGOT TEES, VALVES, AND RESTRAINTS, TO BE REUSED. NEW SLOTTED PVC SPIGOT DROPPERS TO BE SUPPLIED AND INSTALLED TO MATCH EXISTING.
7. CREST TO BE LOCALLY WIDENED AT CORNERS TO ACHIEVE TIE-IN OF DOWNSTREAM TOE WITH DOWNSTREAM EDGE OF EXISTING CREST.
8. 2018 REMEDIAL WORKS DRAINAGE AS CONSTRUCTED INFORMATION NOT AVAILABLE. DETAILS AS DESIGNED SHOWN.
9. FOR FOUNDATION PREPARATION DETAILS REFER TO TECHNICAL SPECIFICATIONS.
LEGEND:
ZONE 1 - CLAYEY EMBANKMENT FILL
ZONE 2 - GRAVEL WEARING COURSE
ZONE 3 - MINE WASTE ROCK
ZONE 7 - COARSE TAILINGS
ZONE 8 - DRAINAGE MATERIAL
ZONE 9 - SELECTED GENERAL FILL
UPSTREAM
DOWNSTREAM
150mm THICK WEARING COURSE
RELOCATED ENDS TAILINGS PIPELINE (NOTE 6)
RELOCATED DELINEATOR
400mm HIGH WINDROW
EXISTING DELINEATOR TO BE REMOVED AND PLACED ON NEW CREST
TEMPORARY (DURING CONSTRUCTION) TAILINGS DELIVERY PIPELINE
300mm THICK LAYER OF MINE WASTE ROCK WITHIN SPIGOT AREA - 2.5m EACH SIDE
PIPELINE SUND
APPROXIMATE TAILINGS LEVEL
EXISTING RAISE 3 DRAINAGE
EXISTING TAILINGS PIPELINE (INCLUDING SPIGOT TEES & VALVES) TO BE REMOVED AND PLACED ON NEW CREST IN STAGES, TO ALLOW CONTINUOUS TAILINGS DEPOSITION IN ACCORDANCE WITH DRAWING No. 61-37982-C017 AND C018
REMOVE WEARING COURSE AND STOCKPILE FOR REUSE
TAILINGS
NEW EMBANKMENT RAISE 4
EXISTING EMBANKMENT RAISE 3
EXISTING EMBANKMENT RAISE 2
EXISTING EMBANKMENT RAISE 1
EXISTING STARTER EMBANKMENT
HORIZONTAL DRAIN (REMEDIAL WORKS 2018)
REMEDIAL WORKS 2018 (NOTE 8)
FINGER DRAIN OUTLET AT 50m CENTRES NOM (REMEDIAL WORKS 2018)
EXISTING SURFACE (NOTE 9)
EXISTING HDPE LINER
EXISTING TOE DRAIN
PERIMETER EMBANKMENT TYPE 2 RAISE (TYPICAL)
CH 1174 - CH 2434.10
SCALE 1:100
DRAIN TO DAYLIGHT
CONTRACTOR TO LOCATE EXISTING FINGER DRAINS, EXCAVATE AND CONSTRUCT DRAINAGE EXTENSIONS REFER TO DETAIL 2
SEEPAGE COLLECTION TRENCH (REFER TO DRAWING 61-37982-C003 FOR DETAILS)
1 DETAIL
SCALE 1 : 50
800M A4 GEOTEXTILE OR SIMILAR APPROVED, OVERLAP AS PER MANUFACTURERS SPECIFICATIONS
FINGER DRAIN EXTENSION
2 DETAIL
SCALE 1 : 20
C RE-ISSUED FOR APPROVAL LS 25.10.19
B ISSUED FOR TENDER BAS ppAW AW 17.09.19
A ISSUED FOR APPROVAL CM AM ppCH 05.07.19
SCALE 1:100 AT ORIGINAL SIZE
GHD
Level 10, 999 Hay Street Perth WA 6000
PO Box Y3106 Perth WA 6832 Australia
T 61 8 6222 8222 F 61 8 6222 8555
E permail@ghd.com.au W www.ghd.com
DO NOT SCALE
Conditions of Use.
This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.
Drawn: B.GAUNSON
Designer: G.BAK
Drafting Check
Design Check
Approved (Project Director)
Date
Scale: 1:100
This Drawing must not be used for Construction unless signed as Approved
Client: EMR GOLDEN GROVE
Project: GOLDEN GROVE TSF 3 - RAISE 4 DETAILED DESIGN
Title: CROSS SECTION, EMBANKMENT RAISE TYPE 2 (OVER REMEDIAL WORKS)
Original Size: A1
Drawing No: 61-37982-C004
Rev: C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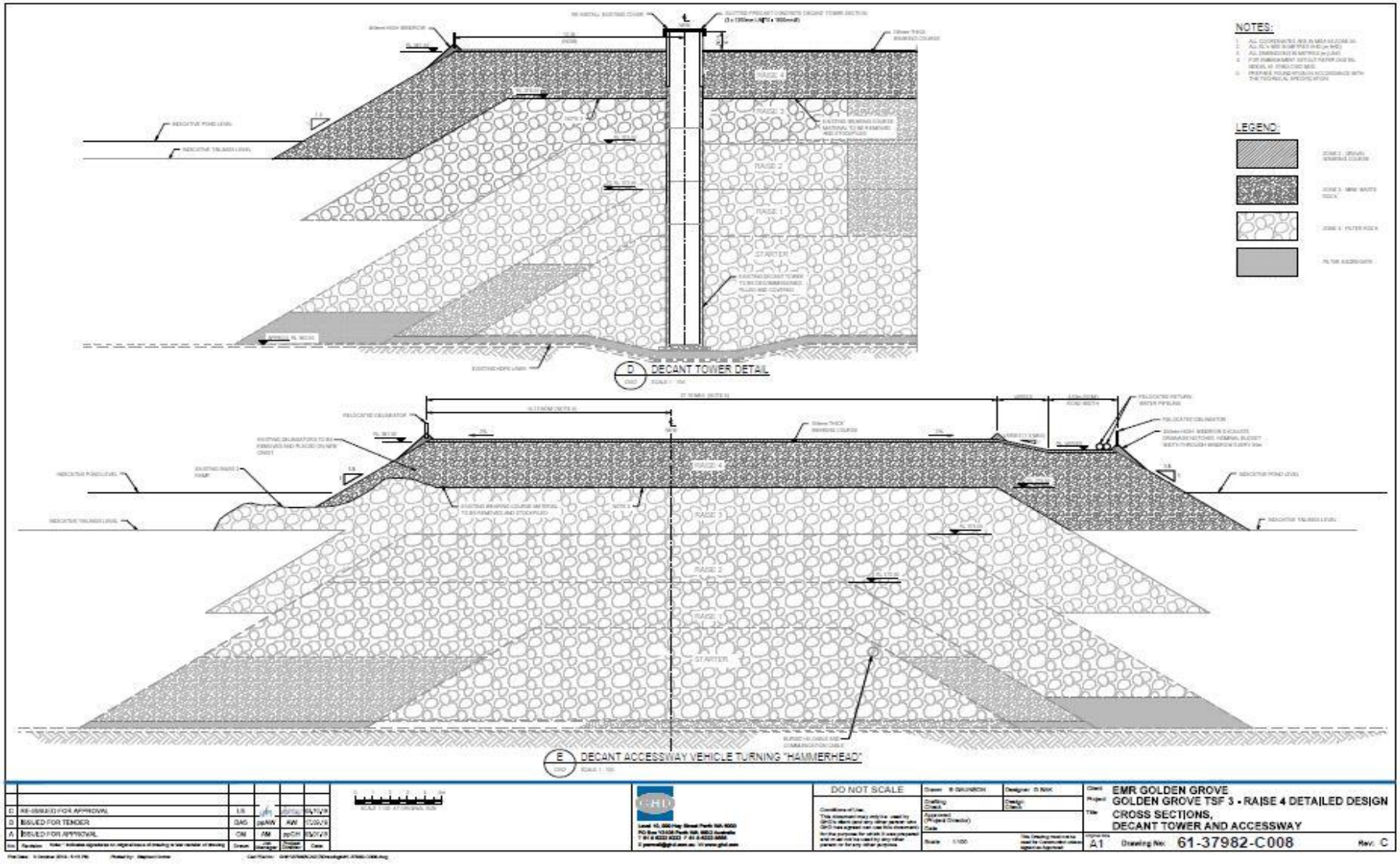
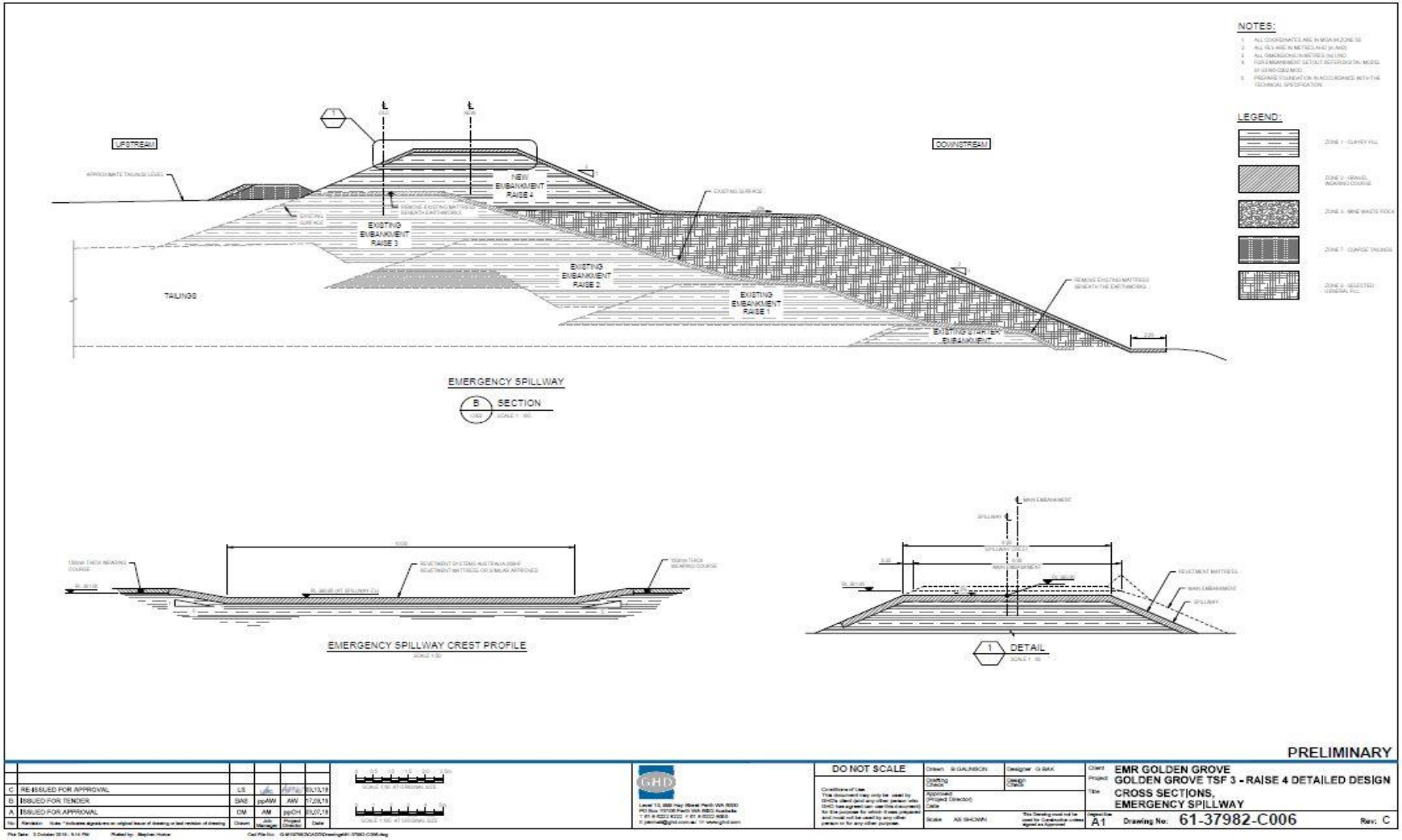
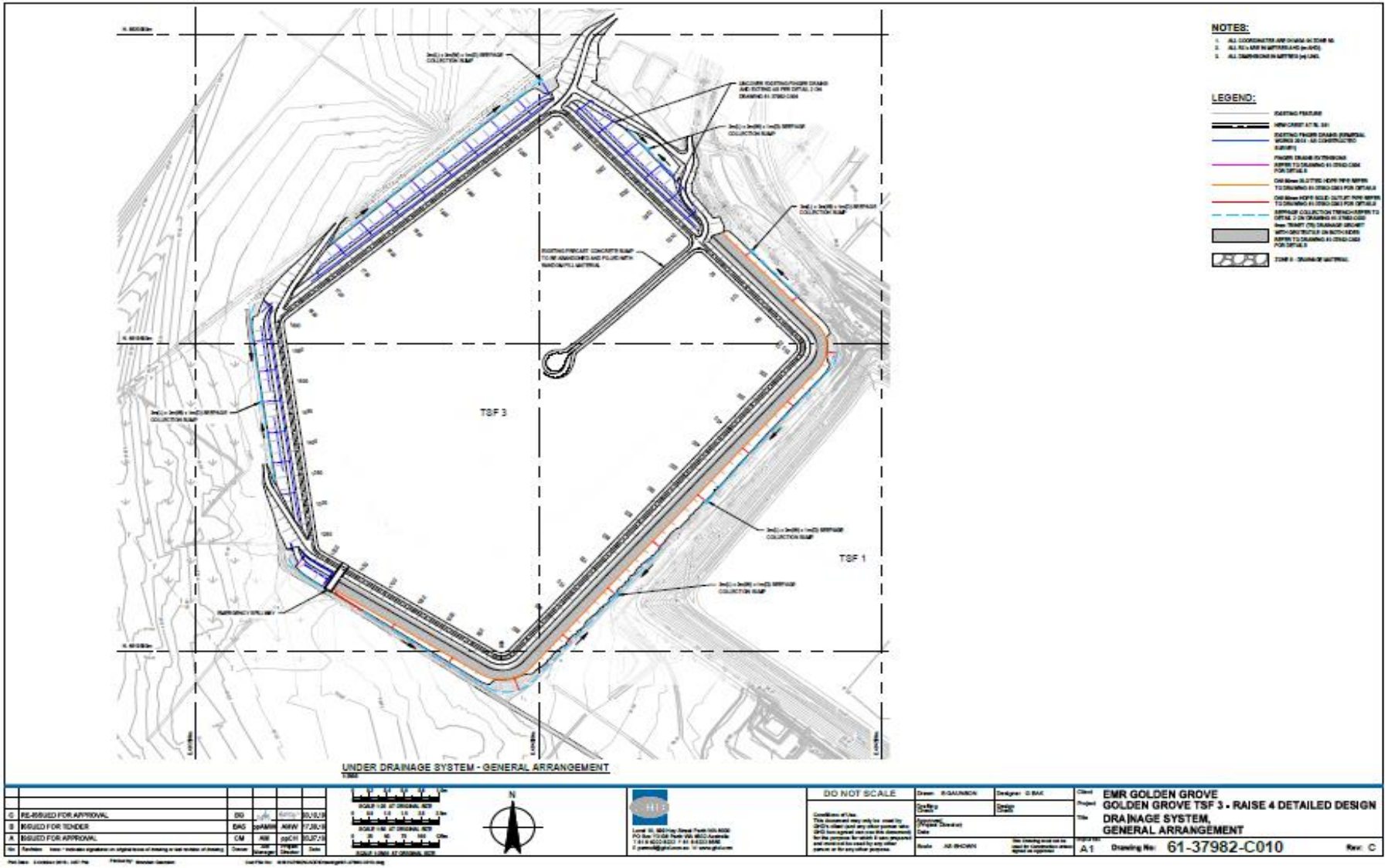
LEGEND:
RAISE 4
DECANT ACCESSWAY
RAISE 3
DECANT ACCESSWAY
RAISE 2
DECANT ACCESSWAY
RAISE 1
DECANT ACCESSWAY
STARTER DECANT
ACCESSWAY
DECANT ACCESSWAY
'C' SECTION
DO NOT SCALE
EMR GOLDEN GROVE
GOLDEN GROVE TSF 3 - RAISE 4 DETAILED DESIGN
CROSS SECTION,
DECANT ACCESSWAY
A1
Drawing No: 61-37982-C007
Rev: C


NOTES:
LEGEND:
D DECANT TOWER DETAIL
E DECANT ACCESSWAY VEHICLE TURNING "HAMMERHEAD"
DO NOT SCALE
EMR GOLDEN GROVE
GOLDEN GROVE TSF 3 - RAISE 4 DETAILED DESIGN
CROSS SECTIONS,
DECANT TOWER AND ACCESSWAY
A1
Drawing No: 61-37982-C008
Rev: C


NOTES:
LEGEND:
UPSTREAM
DOWNSTREAM
NEW EMBANKMENT RAISE 4
EXISTING EMBANKMENT RAISE 3
EXISTING EMBANKMENT RAISE 2
EXISTING EMBANKMENT RAISE 1
EXISTING QUARTZ EMBANKMENT
TAILINGS
EMERGENCY SPILLWAY
B SECTION
EMERGENCY SPILLWAY CREST PROFILE
1 DETAIL
PRELIMINARY
DO NOT SCALE
EMR GOLDEN GROVE
GOLDEN GROVE TSF 3 - RAISE 4 DETAILED DESIGN
CROSS SECTIONS,
EMERGENCY SPILLWAY
A1
Drawing No: 61-37982-C006
Rev: C


NOTES:
LEGEND:
TSF 3
TSF 1
UNDER DRAINAGE SYSTEM - GENERAL ARRANGEMENT
DO NOT SCALE
EMR GOLDEN GROVE
GOLDEN GROVE TSF 3 - RAISE 4 DETAILED DESIGN
DRAINAGE SYSTEM,
GENERAL ARRANGEMENT
A1
61-37982-C010
C

Appendix 2: Summary of Licence Holder comments

The Licence Holder was provided with the draft Amendment Report on 17 February 2020 for review and comment. The licence holder responded on 19 February 2020 and waived the remaining comment period. A summary of the licence holder's comments and DWER's response is provided in the table below.

Additional notification regarding condition 1.2.10 was provided to the licence holder on 20 February 2020 and a corresponding response was received on 20 February 2020. The licence holder's comment and DWER's response is noted in the table below.

Report section/ condition	Summary of Licence Holder comment	DWER response
Section 2.2 TSF3 raise 4 works – emergency spillway	Confirmed a revetment mattress will be installed at the emergency spillway from the 380 RL downstream	Noted in this amendment report section 2.2
Section 2.2 TSF3 operation	Advised there is no specified target return water rate (for the TSF decant pond). Surface water on the TSF is to be minimised and not exceed 6 hectares at any one time – this will be monitored by way of visual markers on the embankment and the use of a monthly UAV survey.	The Licence Holder's application advises that the TSF3 performance monitoring will include monitoring of decant pond level and TSF piezometer pressures on a weekly basis. An updated trigger, action and response plan will be developed for the TSF piezometer monitoring. Condition 5.2.2 requires the Licence Holder to report decant and seepage water recovery volumes; estimate seepage losses; and, provide an assessment of the potential impacts of TSF3 on groundwater as part of the Annual Environmental Report submission.
Section 2.2 TSF3 raise 4 works – modified decant tower	The TSF3 decant return system will incorporate: ▪ A rock filter (which will surround the decant tower). However, decant pumps will be positioned external (adjacent) to the decant tower with floating suctions. Site has found that this pump configuration is superior to that of a submersible pump in the decant tower.	Condition 1.2.10 requires construction/installation of a decant return system as proposed by the licence holder. Decant return pumps will be installed external to the decant tower. In addition, the existing decant tower will be modified and maintained as an additional option to support decant water recovery.

Report section/ condition	Summary of Licence Holder comment	DWER response
	▪ The decant pumps will be Godwin HL225 pumps driven by 110kw motors. The pump capacity will be 550m3/hr.	
Section 2.2 TSF3 operation	Confirmed the decant return water pipelines will be fitted with flow meters as per the slurry pipelines. The flowmeters are monitored remotely via the plant control room.	Condition 1.2.10 requires the licence holder to install flow meters on the tailings slurry and decant return water pipelines.
Condition 1.2.10 Table 1.2.7	EMR has no objection to updated condition 1.2.10 *(statement corresponding to DWER notification issued on 20 February 2020 – "in the draft amended licence issued on 17 February 2020, Condition 1.2.10 Table 1.2.7 did not specify a "completion date" in relation to the TSF3 embankment raise. Please note the licence will specify a completion date of 12 months from the date the licence amendment is issued as our assessment does not apply for an indefinite period. Please advise if EMR has any objection to this condition").*	Condition 1.2.10 (c) requires the licence holder to complete the TSF3 embankment raise 4 works within 12 months following the grant of the licence amendment.