Government of Western Australia
Department of Water and Environmental Regulation

# Works Approval

| | |
|---|---|
| **Works approval number** | W6433/2020/1 |
| **Works approval holder** | Northern Star (Kanowna) Pty Ltd |
| **ACN** | 010 511 789 |
| **Registered business address** | Level 1<br>388 Hay Street<br>SUBIACO WA 6008 |
| **DWER file number** | DER2018/001042-3~75 |
| **Duration** | 14/05/2021 to 13/05/2025 |
| **Date of issue** | 13/05/2021 |
| **Premises details** | Kanowna Belle Gold Mine<br>Yarri Road<br>KANOWNA WA 6431<br>Part of Mining Tenements: M27/18, M27/22, M27/23, M27/37, M27/49, M27/57, M27/92, M27/103, M27/122, M27/123, M27/127, M27/159, M27/164, M27/232, M27/245, M27/287, M27/420 and L27/62, L27/83 and L27/87.<br><br>As defined by the premises maps in Schedule 1. |

| Prescribed premises category description (Schedule 1, *Environmental Protection Regulations 1987*) | Assessed production capacity |
|---|---|
| Category 5: Processing or beneficiation of metallic or non-metallic ore. | 2,500,000 tonnes per annum |

This works approval is granted to the works approval holder, subject to the attached conditions, on 13 May 2021, by:

Alana Kidd

Digitally signed by Alana Kidd
Date: 2021.05.13 12:57:05 +08'00'

Alana Kidd
**Manager, Resource Industries**
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

# Works approval history

| Date | Reference number | Summary of changes |
|---|---|---|
| 13/05/2021 | W6433/2020/1 | This works approval application for Category 5 – processing or beneficiation of metallic or non-metallic ore. To undertake construction and time limited operations for the Stage 1 embankment raise (up to RL 357.5 m) on the existing above ground Tailings Storage Facility (TSF), known as TSF2. |

# Interpretation

In this works approval:

(a) the words 'including', 'includes' and 'include' in conditions mean "including but not limited to", and similar, as appropriate;

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

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

(d) any reference to an Australian or other standard, guideline, or code of practice in this works approval:

  (i) if dated, refers to that particular version; and

  (ii) if not dated, refers to the latest version and therefore may be subject to change over time;

(e) unless specified otherwise, any reference to a section of an Act refers to that section of the *Environmental Protection Act 1986* (EP Act); and

(f) unless specified otherwise, all definitions are in accordance with the EP Act.

**NOTE:** This works approval requires specific conditions to be met but does not provide any implied authorisation for other emissions, discharges, or activities not specified in this works approval.

# Works approval conditions

The works approval holder must ensure that the following conditions are complied with:

## Construction phase

### Infrastructure – Stage 1 TSF2 embankment raise

**1.** The works approval holder is only authorised to construct the TSF2 embankment raise as per specifications listed in Table 1 below.

**Table 1: Stage 1 TSF2 construction heights**

| Stage | Construction crest height in reduced level (RL) m | Total tailings deposition in tonnes (t) | Construction status |
|---|---|---|---|
| Stage 1 (Cell 2 and Cell 1) | Up to 357.5 | Up to 6,762,376 | Stage 1 (Cell 2 and Cell 1) embankment raise construction authorised by this works approval |

**2.** The works approval holder must:

(a) construct and/or install the infrastructure listed in Table 2;

(b) in accordance with the corresponding design and construction/installation requirements; and

(c) at the corresponding infrastructure location,

as set out in Table 2.

**Table 2: Design and construction/installation requirements – Stage 1 embankment raise**

| Item | Infrastructure | Design and construction/installation requirements | Infrastructure location |
|---|---|---|---|
| **Category 5: Processing or beneficiation of metallic or non-metallic ore** | | | |
| 1. | Cell 2 TSF2 embankment raise (located within Mining Tenement M27/92 and situated directly north of TSF1) | • Remove gravel wearing course to a nominal depth of 150 mm and prepare Cell 2 perimeter embankment foundation area (clear, remove unsuitable material, scarify and moisture condition).<br>• Borrow, transport, place, moisture condition and compact tailings material to Cell 2 perimeter embankment.<br>• Place and compact fill in 300 mm layers to form the required Cell 2 embankment profile and continue construction to the required crest level.<br>• All Cell 2 raised embankment walls are to be rolled and compacted to a minimum 95% of SMDD (maximum dry density (standard compaction)) and placed within a moisture content tolerance of -/+ 2% of its optimum | TSF2 embankment raise design as shown in Figure 3 and Figure 4 of Schedule 2 |

| Item | Infrastructure | Design and construction/installation requirements | Infrastructure location |
|---|---|---|---|
| | | moisture content.Trim batters, borrow, transport, place and traffic compact non-acid forming (NAF) mine waste capping (minimum of 500 mm thick) to downstream side of Cell 2 perimeter embankment to protect from erosion.<br>• All Cell 2 embankment crests sloped inwards to shed water into TSF2.<br>• Stormwater runoff diverted away from TSF2.<br>• Settlement markers to be installed at no greater than 250 m spacings around the entire Cell 2 perimeter to monitor freeboard. | |
| 2. | Cell 1 TSF2 embankment raise (located within Mining Tenement M27/92 and situated directly north of TSF1) | • Remove gravel wearing course to a nominal depth of 150 mm and prepare Cell 1 perimeter embankment foundation area (clear, remove unsuitable material, scarify and moisture condition).<br>• Borrow, transport, place, moisture condition and compact tailings material to Cell 1 perimeter embankment.<br>• Place and compact fill in 300 mm layers to form the required Cell 1 embankment profile and continue construction to the required crest level.<br>• All Cell 1 raised embankment walls are to be rolled and compacted to a minimum 95% of SMDD and placed within a moisture content tolerance of -/+ 2% of its optimum moisture content.<br>• Trim batters, borrow, transport, place and traffic compact non-acid forming (NAF) mine waste capping (minimum of 500 mm thick) to downstream side of Cell 1 perimeter embankment to protect from erosion.<br>• All Cell 1 embankment crests sloped inwards to shed water into TSF2.<br>• Stormwater runoff diverted away from TSF2.<br>• Settlement markers to be installed at no greater than 250 m spacings around the entire Cell 1 perimeter to monitor freeboard. | TSF2 embankment raise design as shown in Figure 3 and Figure 4 of Schedule 2 |

## Seepage recovery network – new TSF2 seepage recovery bores

**3.** The works approval holder must design, construct and install the five new TSF2 seepage recovery bores in accordance with the requirements specified in Table 3.

**Table 3: Design and construction/installation requirements – new TSF2 seepage recovery bores**

| Infrastructure | Design and construction/installation requirements | Seepage recovery bore locations | Timeframe |
|---|---|---|---|
| New TSF2 seepage recovery bores:<br>• SM9<br>• SM10<br>• SM11<br>• SM12<br>• SM13 | • Installation of a minimum five TSF2 seepage recovery bores, with demonstrated sufficient recovery yields by a suitably qualified hydrogeologist.<br>• Drilling and construction of the seepage recovery bores will be in accordance with the *Minimum Construction Requirements for Water Bores in Australia*.<br>• The vertical (top of casing) and horizontal position of each seepage recovery bore must be surveyed and subsequently mapped by a suitably qualified surveyor.<br>• A seepage recovery bore location map (using aerial image overlay) must be prepared and include the location of all seepage recovery bores and their respective identification numbers. | Proposed Seepage Recovery Bores as shown in Figure 6 | Must be constructed and determined to be operational by no later than 90 calendar days from the commencement of time limited operations for Cell 2 under Condition 9. |

## Native vegetation health assessment

**4.** Within 90 calendar days of construction works commencing for item 1 (Cell 2) under Condition 2, the works approval holder must undertake a health assessment of three native vegetation monitoring plots (each 20 m wide and 20 m long) located:

(a) in the downstream drainage line of TSF2;

(b) within the zone of rising groundwater influence; and

(c) situated outside of the approved clearing footprint issued under clearing permit CPS 7808/1.

**5.** The native vegetation health assessment for Condition 4 must be undertaken by a suitably qualified botanist and the following actions are to be undertaken at a minimum for individual trees and/or shrubs that are greater than or equal to 2 m in height:

(a) species recorded;

(b) tagged with identification tags and plotted on a native vegetation health assessment map, to allow any changes in condition to be tracked over time;

(c) stem diameters measured at 1.5 m and recorded, to indicate age;

(d) canopy conditions to be assessed using the diagrams in Figure 1 for comparison. A score is to be given for each component (9, 7, 5, 3, 1 for crown density and dead branches and 5, 4, 3, 2, 1 for epicormic growth) and the scores totalled to give a health assessment score for each tree and/or shrub. Canopy condition is to be described as poor (1-5) or moderate (6-11) or good (12-17) or very good (18-23) (Ladd 1996); and

(e) any yellowing (chlorosis) in leaves assessed and recorded.

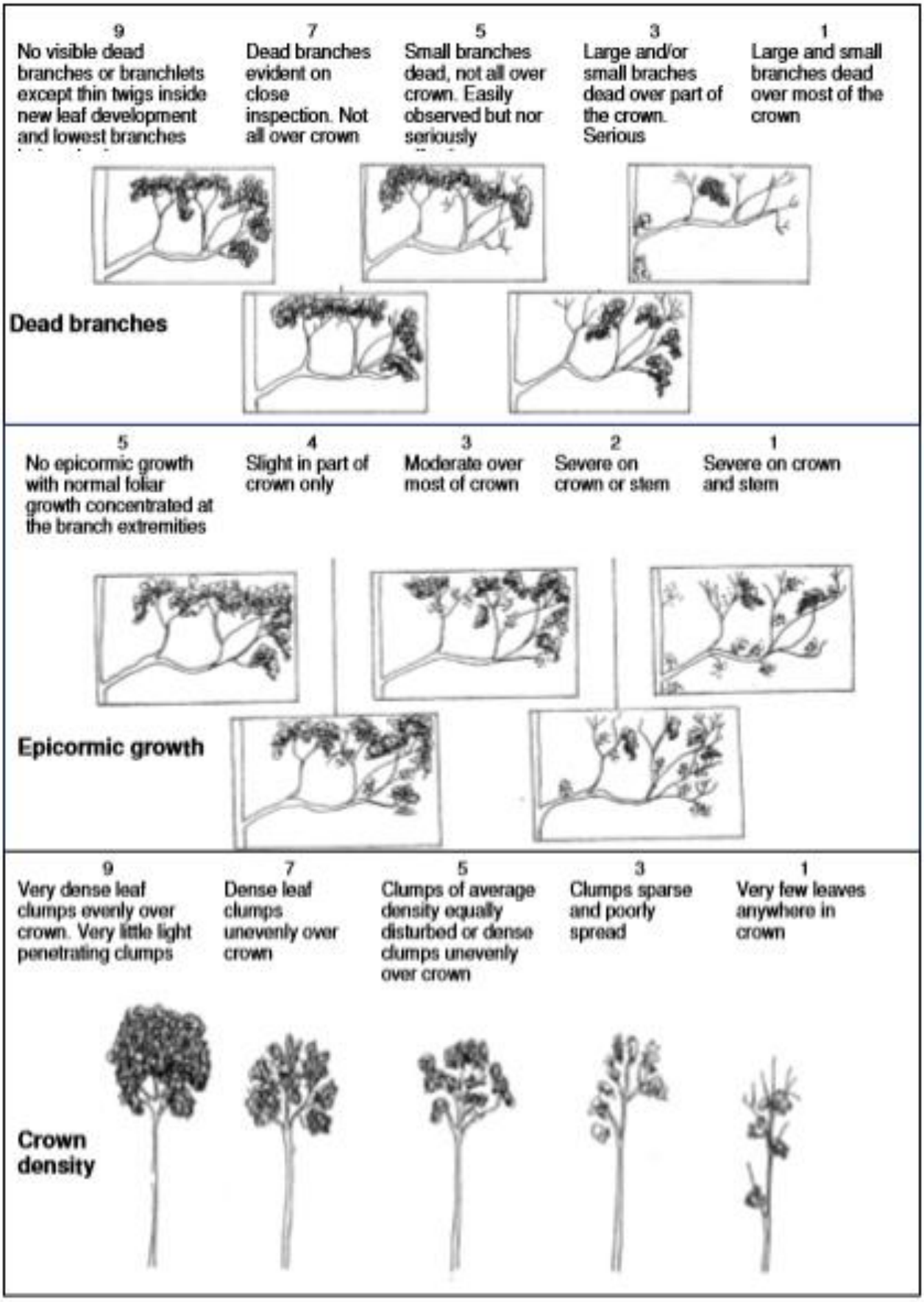


**Figure 1: 3-point canopy assessment (Ladd 1996)**

**6.** The works approval holder must submit a native vegetation heath assessment report no more than 60 calendar days after the botanist's in-field assessment, the report must include the following at a minimum for each native vegetation monitoring plot:

(a) depth to groundwater (standing water level (SWL)) of the closest groundwater monitoring well;

(b) location (including distance and direction from TSF2);

(c) photographs and records demonstrating the presence and condition of native vegetation features; and

(d) records of other disturbances, including clearing, bushfires, presence of vehicle access tracks.

### Compliance reporting

**7.** The works approval holder must within 30 calendar days of an item of infrastructure required by Condition 2 being constructed and/or installed:

(a) undertake an audit of their compliance with the requirements of Condition 2; and

(b) prepare and submit to the CEO an Environmental Compliance Report on that compliance.

**8.** The Environmental Compliance Report required by Condition 7, must include as a minimum the following:

(a) certification by a suitably qualified geotechnical engineer that the items of infrastructure or component(s) thereof, as specified in Condition 2, have been constructed in accordance with the relevant requirements specified in Condition 2;

(b) as constructed plans and a detailed site plan for each item of infrastructure or component of infrastructure specified in Condition 2;

(c) photographic evidence of the installation of the infrastructure;

(d) be signed by a person authorised to represent the works approval holder and contains the printed name and position of that person; and

(e) a quality assurance/quality control (QA/QC) certificate from an independent third party which demonstrates that the compacted fill material on the embankment walls meets the requirements specified in Condition 2.

## Time limited operations phase

### Commencement and duration

**9.** The works approval holder may only commence time limited operations for an item of infrastructure identified in Condition 2 where the Environmental Compliance Report as required by Condition 7 has been submitted by the works approval holder for that item of infrastructure.

**10.** The works approval holder may conduct time limited operations for an item of infrastructure specified in Condition 2 (as applicable):

(a) for a period not exceeding 180 calendar days from the day the works approval holder meets the requirements of Condition 9 for that item of infrastructure; or

(b) until such time as a licence for that item of infrastructure is granted in accordance with Part V of the EP Act, if one is granted before the end of the period specified in Condition 10 (a).

## Operational requirements

**11.** Only tailings sourced from the premises are permitted to be deposited into TSF2, tailings from a different source are not permitted to be deposited into TSF2.

**12.** The works approval holder must ensure that the premises infrastructure listed in Table 4 and located at the corresponding infrastructure location is maintained and operated in accordance with the corresponding operational requirement set out in Table 4.

**Table 4: Infrastructure requirements during time limited operations**

| No. | Infrastructure | Operational requirements | Infrastructure location |
|---|---|---|---|
| **Category 5: Processing or beneficiation of metallic or non-metallic ore** | | | |
| 1. | Toe drains | Removal of any surface water that collects in the peripheral drains (toe drains) around TSF2 to reduce the volume that may seep into the ground. | TSF2 as shown in Figure 5 of Schedule 3 |

## Monitoring

### Groundwater quality monitoring

**13.** The works approval holder must undertake groundwater monitoring and reporting in accordance with licence L5029/1992/11 with the additional analyte 'Mercury' added to the TSF2 sampling and analysis suite in Table 3.5.1 (Condition 3.5 of licence L5029/1992/11).

### Monitoring of TSF2 water balance

**14.** The works approval holder must undertake monitoring of the water balance for TSF2 each monthly period, and (as a minimum) record the following information:

(a) site rainfall;

(b) evaporation rate;

(c) decant water recovery volumes;

(d) volume of tailings deposited;

(e) estimate of seepage losses; and

(f) volumes of seepage recovered through the seepage recovery bore network and toe drains.

## Compliance reporting – Time limited operations

**15.** The works approval holder must submit to the CEO a report on the time limited operations within 30 calendar days of the completion date of each time limited operations for Cell 2 and Cell 1 or 90 calendar days before the expiration date of the works approval, whichever is the sooner.

**16.** The works approval holder must ensure the reports required by Condition 15 include the following:

(a) a summary of the time limited operations (including timeframes);

(b) a summary of the monitoring results required under monitoring for Condition 14. Supplied information must include the following at a minimum:

(i) monitoring results for Condition 14 represented as a bloc model with estimated volumes.

(c) a summary of the environmental performance of all infrastructure as constructed or installed;

(d) a review of performance and compliance against the conditions of the works approval; and

(e) where the manufacturer's design specifications and the conditions of this works approval have not been met, what measures will the works approval holder take to meet them, and what timeframes will be required to implement those measures.

## Seepage management

### Provision of an updated TSF2 Seepage Management Plan

**17.** The works approval holder must submit to the CEO an updated *Kanowna Belle Seepage Management Plan – TSF1 & TSF2* (AGE 2019) within 30 calendar days of the completion date of each time limited operations for Cell 2 and Cell 1 or 90 calendar days before the expiration date of the works approval, whichever is the sooner. The report must include the following at a minimum:

(a) a clear statement of the scope of work carried out;

(b) a description of the field methodologies employed;

(c) a summary of the field and laboratory QA/QC program;

(d) copies of the field monitoring records and field QA/QC documentation;

(e) an assessment of reliability of field procedures and laboratory results;

(f) a tabulated summary of results, as well as all raw data provided in an accompanying Microsoft Excel spreadsheet digital document/file (or a compatible equivalent digital document/file), with all results being clearly referenced to laboratory certificates of analysis;

(g) a diagram with aerial image overlay showing all groundwater monitoring wells, seepage recovery bores and depicting groundwater level contours, flow direction and hydraulic gradient (relevant site features including discharge points and other potential sources of contamination must also be shown);

(h) an interpretive summary and assessment of monitoring data for the TSF1 and TSF2 groundwater monitoring wells. The monitoring data must span from January 2019 to the most recent data available at the time of drafting the updated Seepage Management Plan, clearly demonstrate the commencement of tailings deposition into TSF2 (September 2019) and include a single result obtained from the earliest measurement taken at each groundwater monitoring well for historical reference;

(i) an interpretive summary and assessment of the results against relevant assessment levels for water, as published in the Guideline: Assessment and management of contaminated sites;

(j) trend graphs for monitoring data as required in item (h) to provide a graphical representation of historical results and to support the interpretive summary;

(k) actual efficiencies of surface water removal that collects in the peripheral drains (toe drains) around TSF2;

(l) actual efficiencies of TSF2 seepage recovery bores (SM1, SM2, SM3, SM4, SM5, SM6, SM7, SM8, SM9, SM10, SM11, SM12 and SM13); and

(m) taking into consideration the results of the above items (a-l) and the results of the native vegetation health assessment as required by Condition 6, undertake a review on whether the objectives in the existing *Kanowna Belle Seepage Management Plan – TSF1 & TSF2* (AGE 2019) are still appropriate (specifically the recommendation that groundwater levels are to be maintained at a depth of at least 3 mbgl). Provide sufficient detail and justification for each seepage management target (including SWL limit, which must take into consideration allowances for rises in groundwater levels associated with recharge from rainfall events) including the proposed actions to be taken and the timeframes to achieve targets.

Note 1: General guidance on report presentation can be found in the department's *Guideline: Assessment and management of contaminated sites*.

## Records and reporting (general)

**18.** The works approval holder must record the following information in relation to complaints received by the works approval holder (whether received directly from a complainant or forwarded to them by the department or another party) about any alleged emissions from the premises:

(a) the name and contact details of the complainant, (if provided);

(b) the time and date of the complaint;

(c) the complete details of the complaint and any other concerns or other issues raised; and

(d) the complete details and dates of any action taken by the works approval holder to investigate or respond to any complaint.

**19.** The works approval holder must maintain accurate and auditable books including the following records, information, reports and data required by this works approval:

(a) the works conducted in accordance with Condition 2;

(b) any inspection of infrastructure that is performed in the course of complying with Condition 2, with the record of each inspection signed by the responsible person;

(c) any maintenance of infrastructure that is performed in the course of complying with Condition 12;

(d) monitoring programmes undertaken in accordance with Conditions 13 and 14; and

(e) complaints received under Condition 18.

**20.** The books specified under Condition 19 must:

(a) be legible;

(b) if amended, be amended in such a way that the original version(s) and any subsequent amendments remain legible and are capable of retrieval;

(c) be retained by the works approval holder for the duration of the works approval; and

(d) be available to be produced to an inspector or the CEO as required.

# References


1. AGE 2019, AGE *Kanowna Belle Seepage Management Plan – TSF1 & TSF2*, 26 April 2019, Bowen Hills, Queensland.
2. Ladd 1996, *Ecology/Ecological Principles – Unit Manual*, Murdoch University, Perth, Western Australia.


# Definitions

In this works approval, the terms in Table 5 have the meanings defined.

**Table 5: Definitions**

| Term | Definition |
|---|---|
| ANZ 2018 | means the *Australian and New Zealand guidelines for fresh and marine water quality.* |
| books | has the same meaning given to that term under the EP Act. |
| Category / categories | categories of prescribed premises as set out in Schedule 1 of the *Environmental Protection Regulations 1987* (WA). |
| CEO | means Chief Executive Officer.<br>CEO for the purposes of notification means:<br>Director General<br>Department administering the *Environmental Protection Act 1986*<br>Locked Bag 10<br>Joondalup DC WA 6919<br>info@dwer.wa.gov.au |
| Condition | a condition to which this works approval is subject under section 62 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. |
| discharge | has the same meaning given to that term under the EP Act. |
| emission | has the same meaning given to that term under the EP Act. |
| Environmental Compliance Report | means a report to satisfy the CEO that the conditioned infrastructure and/or equipment has been constructed and/or installed in accordance with the works approval. |
| EP Act | *Environmental Protection Act 1986* (WA). |
| Guideline: Assessment and management of | means the document titled *Assessment and management of contaminated sites, Contaminated sites guidelines* (Department of Environment Regulation, December 2014), as amended from |

| Term | Definition |
|---|---|
| contaminated sites | time to time. |
| m | metres |
| Minimum Construction Requirements for Water Bores in Australia | means the document titled *Minimum Construction Requirements for Water Bores in Australia – Third edition* (National Uniform Drillers Licensing Committee, February 2012), as amended from time to time. |
| m/s | metres per second |
| mm | millimetres |
| monthly period | means a one-month period commencing from the first day of a month until the last day of the same month. |
| No. | typographic abbreviation of the word number(s). |
| NAF | non-acid forming |
| pipeline(s) | pipelines carrying tailings or decant water |
| premises | the premises to which this works approval applies, as specified at the front of this works approval and as shown on the premises map (Figure 2) in Schedule 1 to this works approval. |
| prescribed premises | as defined under the EP Act. |
| QA/QC | quality assurance/quality control |
| RL | reduced level |
| significant rainfall event | a significant rainfall event is defined based on the Bureau of Meteorology website for the location of Kalgoorlie-Boulder (http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016). A significant rainfall event has been based on Intensity Frequency Duration (IFD), being 24 hours rainfall duration at 20% Annual Exceedance Probability (AEP). Note that a 20% AEP is equivalent to a 4.48 Annual Recurrence Internal (ARI). |
| SMDD | maximum dry density (standard compaction) |
| SWL | Standing water level |
| suitably qualified botanist | means a person who holds a tertiary qualification specialising in environmental science or equivalent, and has a minimum of two (2) years work experience in Western Australian flora identification and undertaking flora surveys native to the bioregion being inspected or surveyed, or who is approved by the CEO as a suitable environmental specialist for the bioregion, and who holds a valid flora licence issued under the *Biodiversity* |

| Term | Definition |
|---|---|
| | *Conservation Act 2016.* |
| suitably qualified geotechnical engineer | means a person who:<br>(a) holds a Bachelor of Engineering recognised by the Institute of Engineers; and<br>(b) has a minimum of five years of experience working in the area of geotechnical engineering<br>or is otherwise approved by the CEO to act in this capacity. |
| suitably qualified hydrogeologist | means a person who holds a tertiary qualification specialising in environmental science or equivalent and has a minimum of five years of experience working in the area of hydrogeology, including investigation and assessment of groundwater resources, or who is otherwise approved by the CEO to act in this capacity. |
| time limited operations | refers to the operation of the infrastructure and equipment identified under this works approval that is authorised for that purpose, subject to the relevant conditions. |
| TSF2 | Tailings Storage Facility 2 |
| works approval | refers to this document, which evidences the grant of the works approval by the CEO under section 54 of the EP Act, subject to the conditions. |
| works approval holder | refers to the occupier of the premises being the person to whom this works approval has been granted, as specified at the front of this works approval. |

**END OF CONDITIONS**

# Schedule 1: Maps

## Premises map

The boundary of the prescribed premises is shown in the map below (Figure 2).

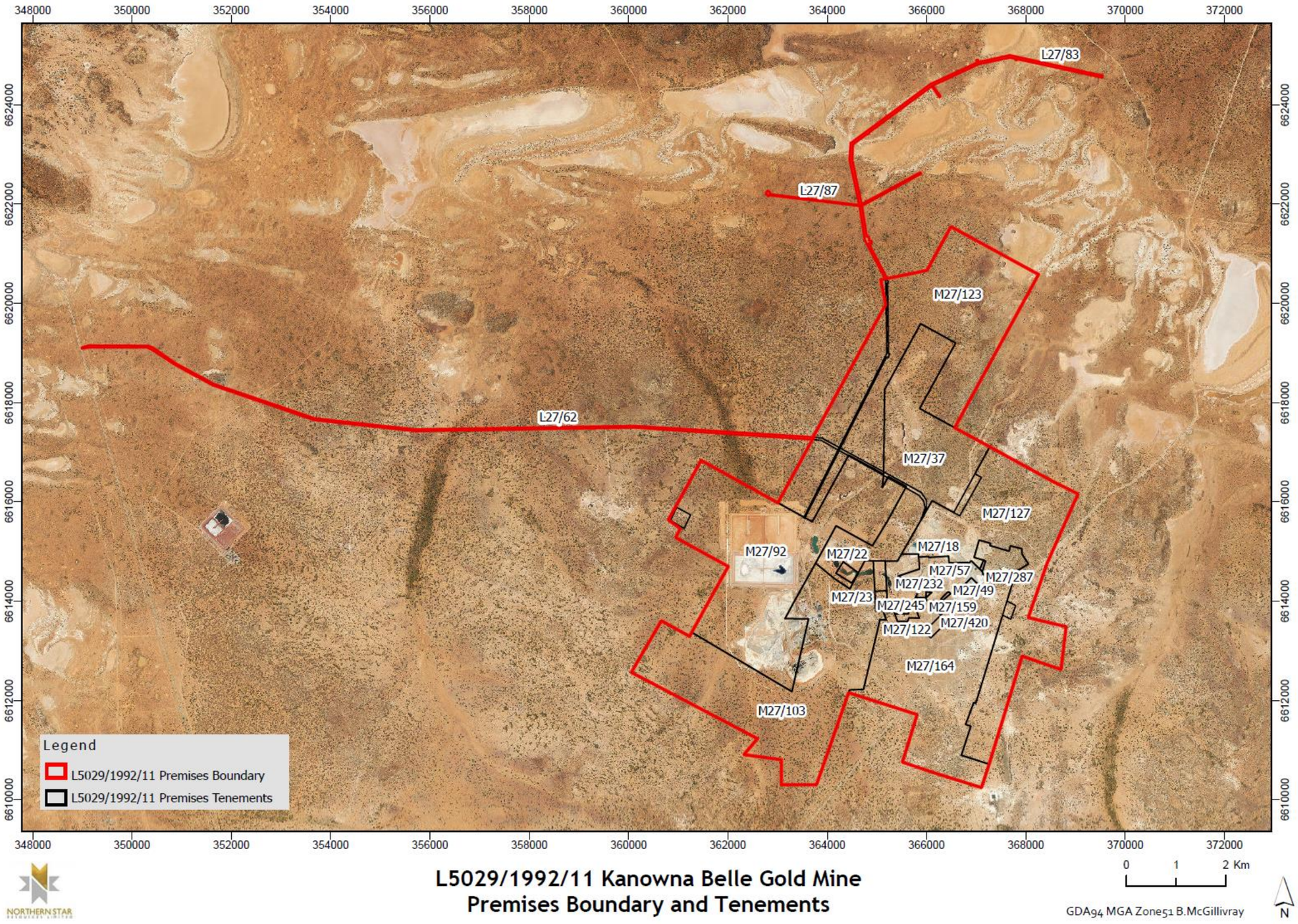


**Figure 2: Map of the boundary of the prescribed premises**

# Schedule 2: TSF2 embankment raise design

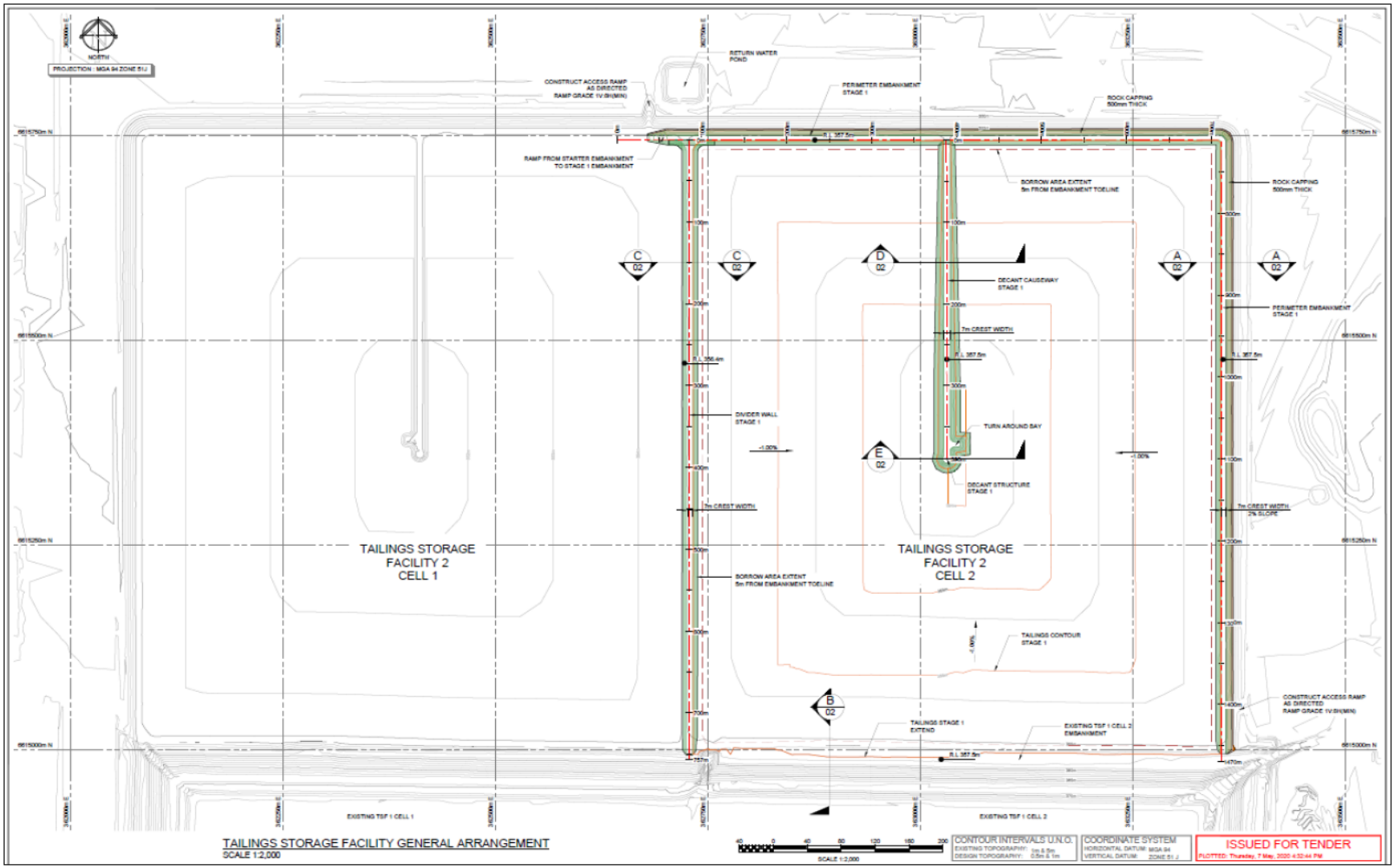


**Figure 3: General design of embankment raise (Stage 1)**

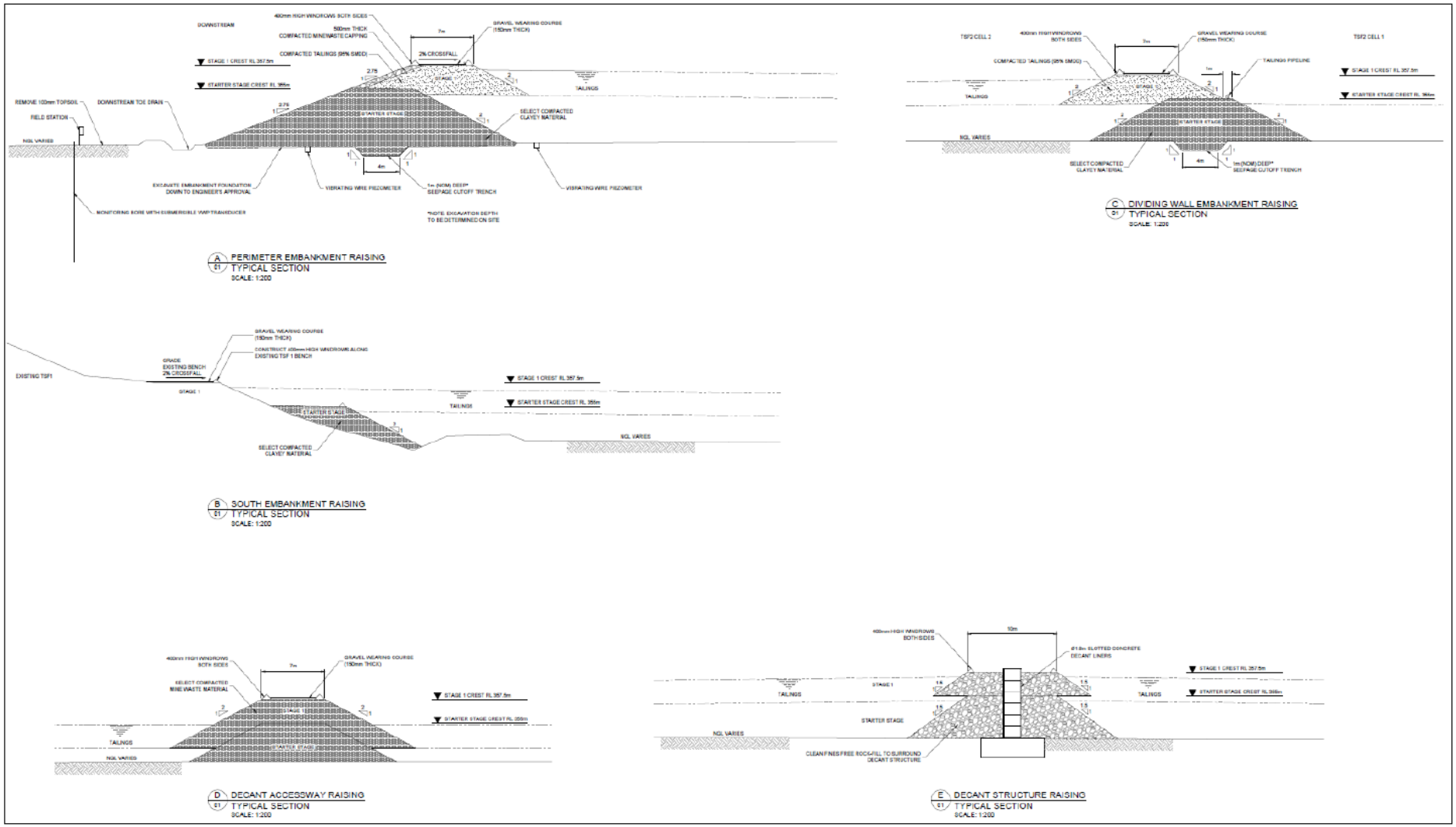


**Figure 4: TSF2 typical sections and details**

# Schedule 3: Location of TSF2 and bore network

## Location of TSF2 bore network

The location of TSF2 groundwater monitoring wells are shown in Figure 5 and the seepage recovery bores are shown in Figure 6.

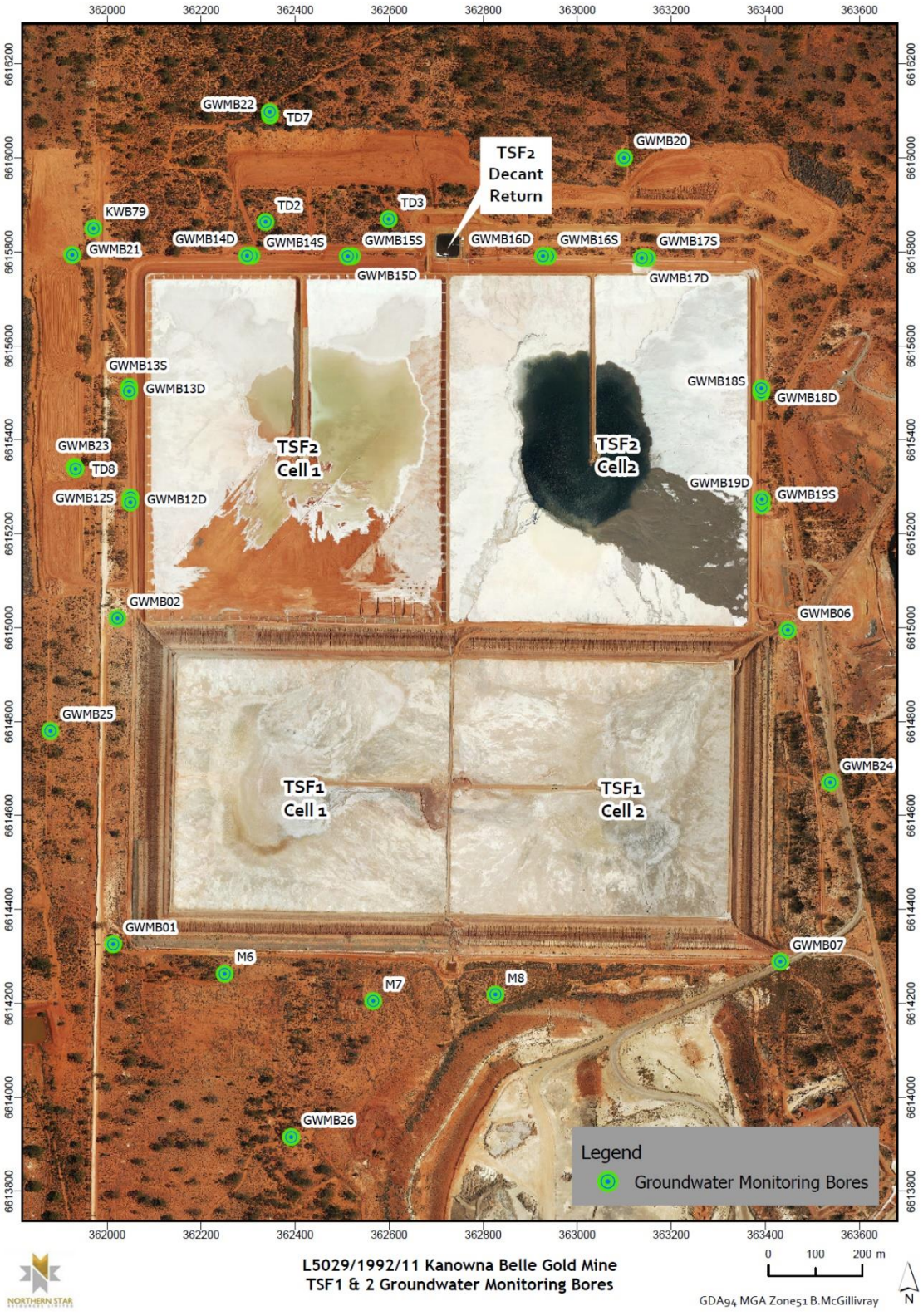


**Figure 5: Map demonstrating location of groundwater monitoring wells**

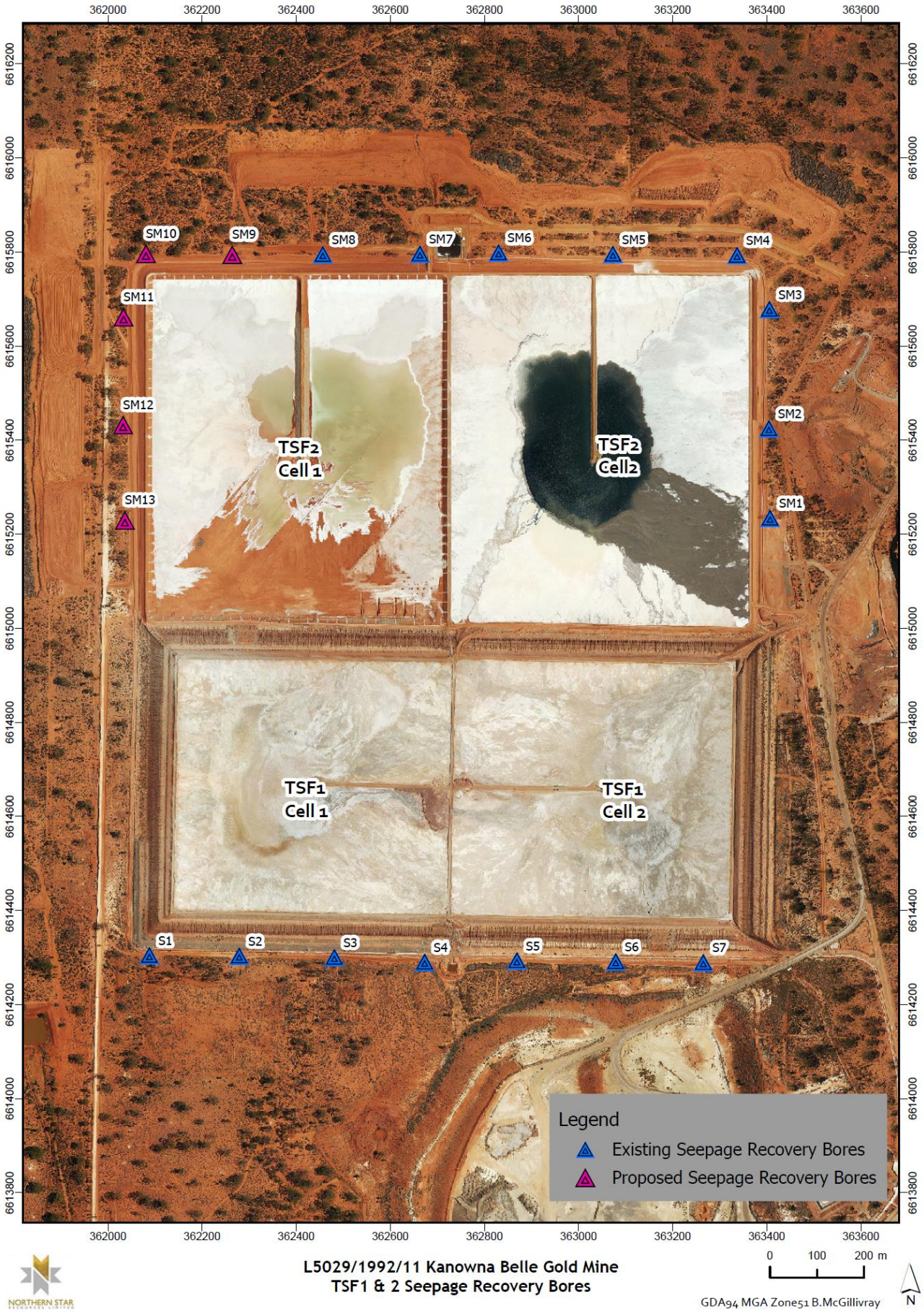


**Figure 6: Map demonstrating location of seepage recovery bores**