Government of Western Australia
Department of Water and Environmental Regulation

Decision Report

Application for Works Approval

Part V Division 3 of the *Environmental Protection Act 1986*

Works Approval Number	W2940/2025/1
Applicant	Kalgoorlie Consolidated Gold Mines Pty Ltd
ACN	009 377 619
File number	APP-0026905
Premises	Fimiston Processing Plant Black Street, KALGOORLIE WA 6430 Legal description Mining tenements M26/308, M26/778 and M26/725
Date of report	19 June 2025
Decision	Works approval granted

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1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the premises. As a result of this assessment, works approval W2940/2025/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision report, the Department of Water and Environmental Regulation (the department; DWER) has considered and given due regard to its regulatory framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary

On 16 December 2024, Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM; the applicant) submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

The application is to undertake construction works relating to the Fimiston II Extension TSF, Cell G (Cell G) above ground Tailings Storage Facility (TSF), adjoining the south wall of the approved Fimiston II Extension TSF, Cell E at the Fimiston Processing Plant (the premises). The premises is directly adjacent the town of Boulder and South Kalgoorlie in the Goldfields region of Western Australia.

The premises relates to the category and assessed production / design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in works approval W2940/2025/1. The infrastructure and equipment relating to the premises category and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are outlined in works approval W2940/2025/1.

2.3 Applicant and premises overview

Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM), a wholly owned subsidiary of Northern Star Resources Ltd (NSR), that owns and operates the Fimiston Operations.

The Fimiston Operations are located immediately east of the City of Kalgoorlie-Boulder, approximately 600 km east of Perth. Northern Star Resources (NSR) are in the process of expanding the Fimiston Processing Plant, which will result in a throughput increase from approximately 13 Mtpa to approximately 27 Mtpa.

The extension of Fimiston II TSF from five cells (A/B, C, D, E and F) to six will safely provide additional storage for the tailings generated as part of the plant expansion. This works approval application includes construction and time limited operations of the additional sixth cell (proposed Cell G) to the facility.

There will be no increase to the current prescribed Category 5 assessed production of 14,500,000 tonnes per year as per current licence L6420/1988/14, though there is a current works approval (W6689/2022/1) issued for the Fimiston Mill expansion which will see an increase in Category 5 assessed production to 30,000,000 tonnes per year (to be assessed under licence amendment).

The Fimiston II Extension TSF, Cell G prescribed premises is located within mining leases M26/308, M26/725 and M26/778 held by Northern Star (KLV) Pty Ltd and Northern Star (Saracen Kalgoorlie) Pty Ltd, wholly owned subsidiaries of NSR.

2.4 Fimiston II Extension TSF, Cell G

The existing Fimiston II TSF has previously been classified as a 'Category 1, High Hazard' when assessed against the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS 2013), '*Code of practice: Tailings storage facilities in Western Australia*'.

In line with existing operations at the premises, tailings will be split between Fimiston I, Fimiston II, Kaltails TSF and proposed Fim III TSF, with deposition ratio varying annually (Figure 4). Tailings deposition will be distributed among all facilities and the new Cell G will reduce the rate of rise on existing facilities, which the applicant believes will reduce the rate of increase of the phreatic surface and having a net positive influence on the stability of the existing facilities.

The design of the Fimiston II Extension TSF, Cell G is consistent with the approved design of E and F cells, incorporating experience gained with operating the Fimiston I, Fimiston II, and Kaltails TSFs. In particular, the design includes:

- An underdrainage system extending beneath the TSF floor along the upstream toe of the starter embankment and into the TSF along the existing channels. The applicant seeks to improve consolidation of the tailings, particularly during early operations. The underdrainage system will also reduce the volume of water reporting to the groundwater through seepage.
- A deposition plan that will focus on avoiding a zone of saturated tailings developing near the upstream toe during initial operations by promoting development of the tailings beach and formation of the supernatant pond.
- Inclusion of an infrastructure corridor that will allow for a surface water diversion channel, pipeline, monitoring and production bores, and road infrastructure.
- Instrumentation (vibrating wire piezometers) installed in the starter embankments and deposited tailings near the upstream toe, to monitor pore pressure and provide early warning of any deviations from the design assumptions during operations.

TSF raises will be constructed with downstream and upstream side slopes of ~1V:4H and ~1V:1.5H, consistent with the slope batters on the existing Fimiston II TSF.

Where necessary, surface water management measures will be put in place to manage stormwater runoff from future embankment raises and stormwater will be diverted away from Fimiston II Extension TSF, Cell G consistent with existing practice on Fimiston TSFs.

Tailings will be actively discharged into Cell G through multiple spigots around the perimeter, with deposition adjusted as required to maintain the supernatant pond around a centralised decant pump, located near the centre of the TSF basin.

Supernatant water from Cell G will be removed via floating turret pump-out decant systems, as is the current practice on Fimiston facilities.

2.5 Earthworks

The geometry of the proposed embankments and future embankment raises will be like those currently employed at the Fimiston II TSF (Figure 1):

- Overall downstream batter slope (external batters): 1V:4H
- Nominal upstream batter slope (internal batters): 1V:2H
- Nominal crest widths: 6.0 m

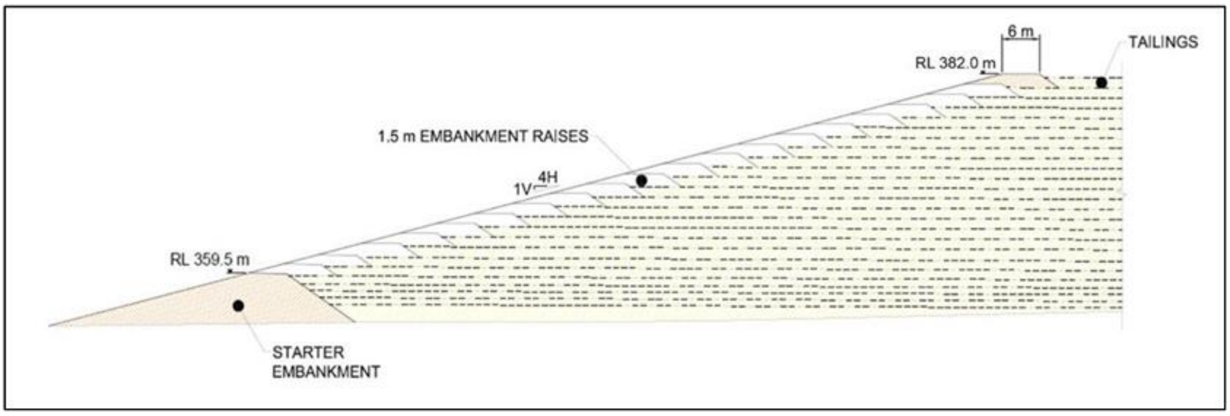


Figure 1: Fimiston II Extension TSF, Cell G embankment design

Stater embankment construction

The starter embankment for Fimiston II Extension TSF, Cell G will be constructed to a maximum height of approximately 8 m using select, low permeability borrow materials sourced from stockpiles or excavated from within the TSF basin.

The embankment fill will be moisture conditioned to a minimum of -1 / +2% of the optimum moisture content (OMC), placed in 300 mm thick layers and compacted to 98% standard maximum dry density (SMDD) to form the starter embankment.

In areas where a starter embankment is not necessary for tailings containment (areas where the natural topography elevation exceeds the elevation of the maximum starter embankment height), a starter bund has been proposed to increase stormwater retention capacity and to divert surface water from entering this facility during the initial stages of operation.

Embankment raise construction

The proposed method of embankment raises for Fimiston II Extension TSF, Cell G will be consistent with the method currently used for the existing TSFs with tailings excavated from adjacent tailings beach as fill for construction of each embankment raise.

As part of each wall raise, the freeboard zone on the tailings beach is then prepared to receive the raise by initial trafficking by an excavator followed by placement of borrowed tailings material along the formation alignment to bring the tailings beach up to the formation level. This ‘freeboard’ layer is then compacted in preparation for the first complete layer of tailings fill.

Excavation is carried out using excavators equipped with low ground pressure tracks that progressively work around the perimeter of the beach immediately upstream of the raise footprint, leaving at least 5m between the borrow zone and the upstream toe of the wall raise. The excavated tailings are placed onto the perimeter embankment in layers not exceeding 500 mm in compacted thickness.

A heavy, vibratory pad-foot roller provides compaction, and compaction control tests are undertaken for quality assurance. After the final layer for the raise has been placed and compacted, a 2% inward crossfall is achieved on the crest, directing surface water into the TSF basin. Both the upstream and downstream batters are then trimmed using an excavator, and a safety bund is constructed to prevent vehicles going doing the outside of the TSF. The tailings delivery pipeline forms a safety bund preventing vehicles or people going into the TSF.

2.6 Freeboard assessment

A freeboard assessment was conducted by WSP (WSP 2024) for the Fimiston II Extension TSF, Cell G starter embankment and at the end of deposition.

Storage-area-elevation relationships for each of the basins of the new cells were developed based on the design by WSP. Beach contours were developed assuming a beach slope of 1V:200H.

The freeboard assessment assumed worst-case, in that the pre-storm operating pond occupied the maximum surface area allowed under KCGM's internal operational criteria for the Fimiston TSFs (15% of the basin area) and that the decant facility is not operating during rainfall events (i.e., all rainfall from the storm event is retained on the surface of the TSF).

Figure 2 demonstrates the pond associated with a 1 in 100-year (72 hour) storm event (including operational pond) on top of the maximum tailings beach at the final stage of deposition for the Fimiston II Extension TSF, Cell G starter embankment.

The minimum distance between the pond and starter embankment crest is approximately 200 m, and results from WSP's assessment of the freeboard indicate that the likelihood of overtopping of Cell G during normal operations is extremely unlikely.

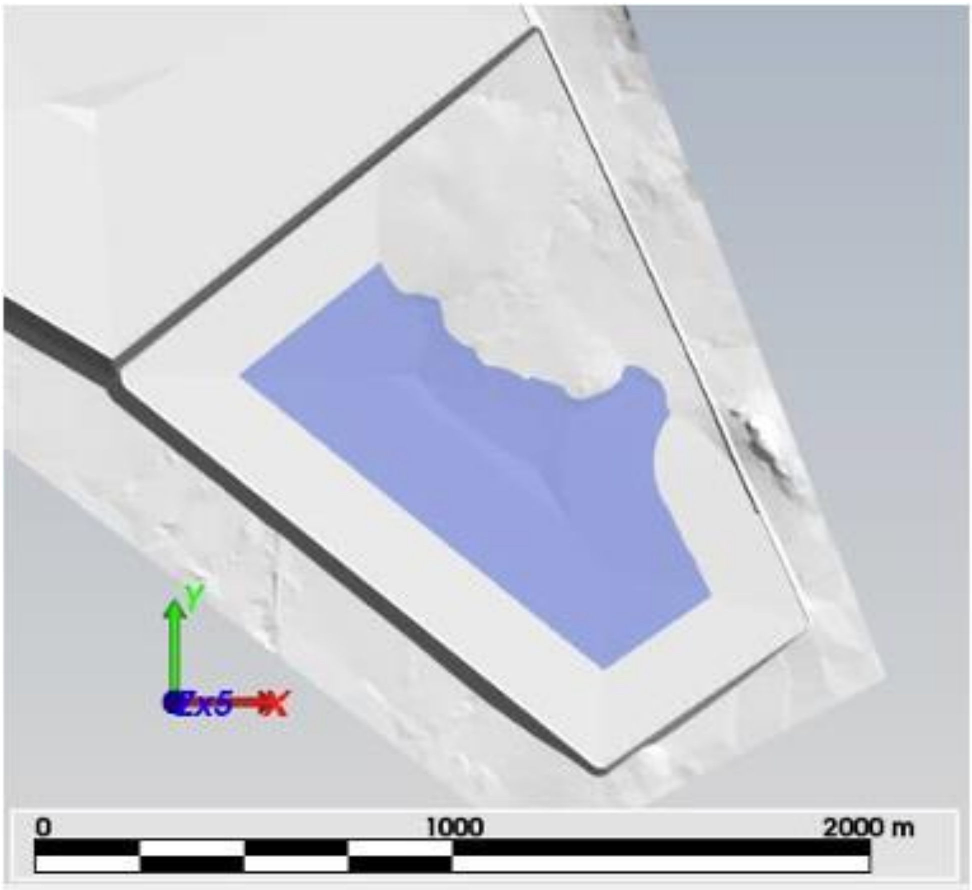


Figure 2: 1 in 100-year (72 hour) storm event pond – starter embankment

2.7 Pipelines

Pipelines are designed in accordance with the International Cyanide Management Code. Pipelines are operated, and monitored through a telemetry system with leak detection and regular inspections, in which:

- The system will automatically shut down pumping in the event of a pipe failure.

- Any small leaks are reported through daily inspections and repaired.
- All pipelines are in secondary containment corridors, with windrows and appropriately sized scour pits located at low points in topography in the event of a pipeline spill; and
- Personnel are educated in spill procedures and clean up.

2.8 Water recovery

Decant systems

A pump-out decant system will be used to remove supernatant water from the surface of the TSF. A turret system fitted with a skid mounted or surface pump is proposed. This is the same system that is currently employed on the premises.

This system can abstract water from a pond to a minimum depth of 250 mm. This system will allow the pond depth and pond surface area to be maintained at the minimum practical amounts. Water will be pumped from the decant system, over the crest of the TSF to newly constructed Decant Pond 3 for temporary storage and chemical cyanide destruction. Water will be transferred from this pond to the Fimiston Processing Plant for re-use in the processing circuit.

At the start of the Fimiston II Extension TSF, Cell G operation, additional trenches and sumps might be required to allow the decant pond to form near the location of the decant access. The recovery of remote ponds may be required during early operation of Cell G before a consistent tailings beach has been formed.

Additional pumping locations with adequate access will be developed during detailed design to manage incidental rainfall associated with large events during early operations. During early operations (prior to full tailings beach development) there will be direct hydraulic connections to the underdrainage system and any overlying ponded water will assist in prompt removal of incidental rainfall from within the TSF basin.

Water return facilities

It is proposed to utilise the existing Decant Pond 3, located on the downstream side of the facility to temporarily store water recovered from Fimiston II Extension TSF, Cell G during normal operations. The water will be temporarily stored and then sent back to the process plant to undergo cyanide destruction prior to re-use in the processing circuit.

2.9 Underdrainage

The applicant will implement an underdrainage system to promote controlled seepage and reduce the phreatic surface level within the tailings stack. The applicant believes the benefits of underdrainage include:

- Decreases in the volume of seepage into the environment which may affect groundwater conditions.
- Water is captured by the underdrainage system which can be reused at the Fimiston processing plant.
- Reduction of phreatic levels within the TSF such that they remain as low as practicable. This largely benefits slope stability of the perimeter embankments.

The underdrainage system is comprised of two major components and will be consistent with underdrainage design recently implemented at the E and F cells. The components will be constructed with a series of perforated collection pipes encompassed by a dual filter system, constructed on grade to facilitate gravity flow towards the lowest section of the embankment footprint for collection.

The underdrainage components are shown in Figure 3 and follow the following design:

- A series of perforated strip drains located at ~40 m intervals adjacent to the upstream toe of the starter embankment to reduce the phreatic surface development within the tailings, adjacent to the confining embankment.
- A herringbone style network of perforated drains beneath the ultimate supernatant pond location to promote controlled seepage and limit the potential for groundwater mounding.

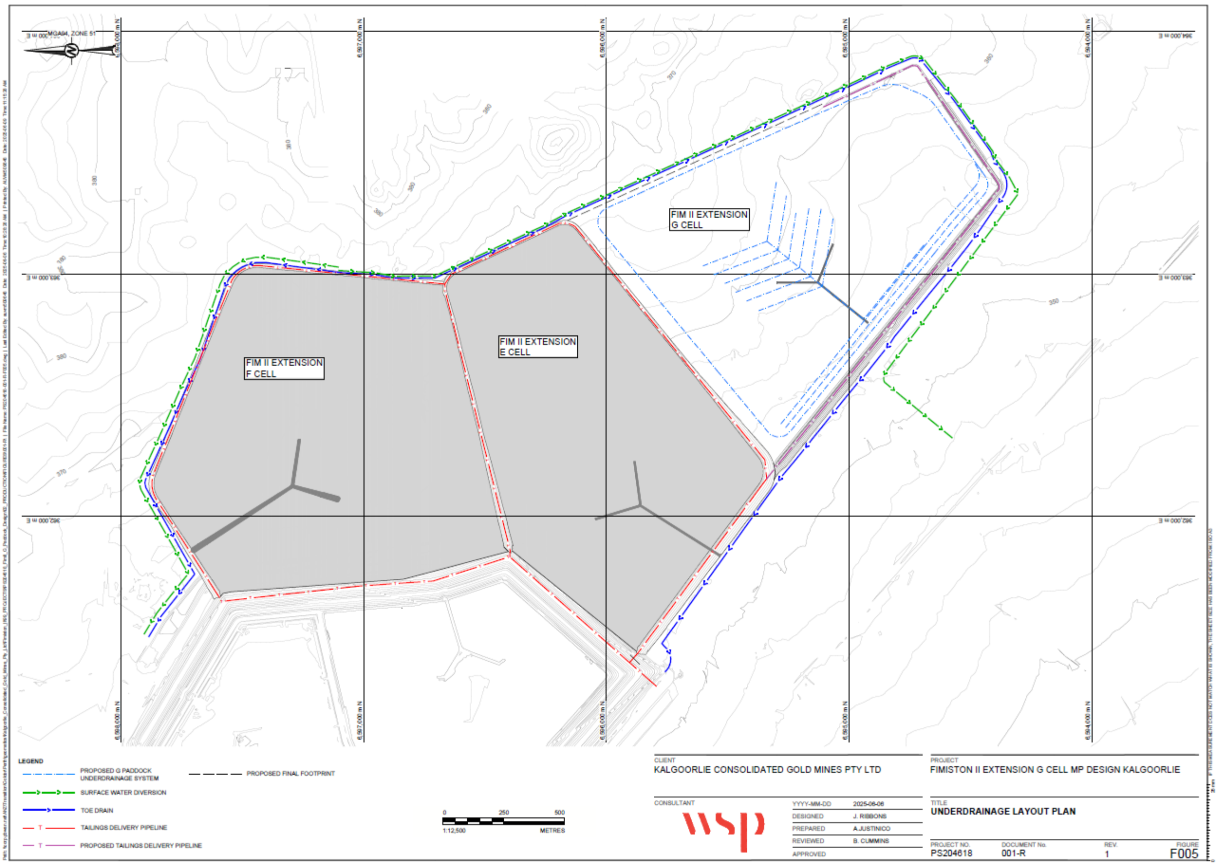


Figure 3: Fimiston II Extension TSF, Cell G underdrainage layout plan

2.10 Monitoring and production bores

Monitoring bores

One compliance monitoring bore MB F106 is located within the footprint of Cell G and will need to be decommissioned prior to construction.

Six new monitoring bores are proposed to be installed around Cell G - two to the east, two to the south and two to the west (Figure 4).

The final locations and construction details for these bores will be determined from a review of infrastructure locations, tenement boundaries and access constraints. These bores are proposed to be added to L6420/1988/14 as compliance bores for groundwater depth monitoring.

The new compliance bores will be installed during construction of the Fimiston II Extension TSF, Cell G, to allow baseline groundwater depths to be measured prior to tailings deposition to the cell.

Stage 1 production bores

Any potential seepage migration pathways within the clayey sediments and weathered bedrock around the perimeter of the TSF will be identified from groundwater depth trends in the operational area bores.

If they are deemed to be required, production bores will be installed targeting those groundwater flow pathways and will be operated to control groundwater depths in the receiving environment. Designs for the production bores will be determined from the monitoring data collected during operations.

If found to be required, between 5 and 15 production bores may potentially be installed over life-of-mine (LOM). The installed pumping capacity in each bore is expected to be around 0.5 L/s, and the average operating rate for each bore is expected to be less than 0.5 L/s. Bore construction depths are expected to average 30 m. If seepage is identified in the operational area monitoring bores, and installation of the production bores is found to be required, it is likely that at least some of the bores will be installed around two years after commencing operation of the Fimiston II Extension TSF, Cell G .

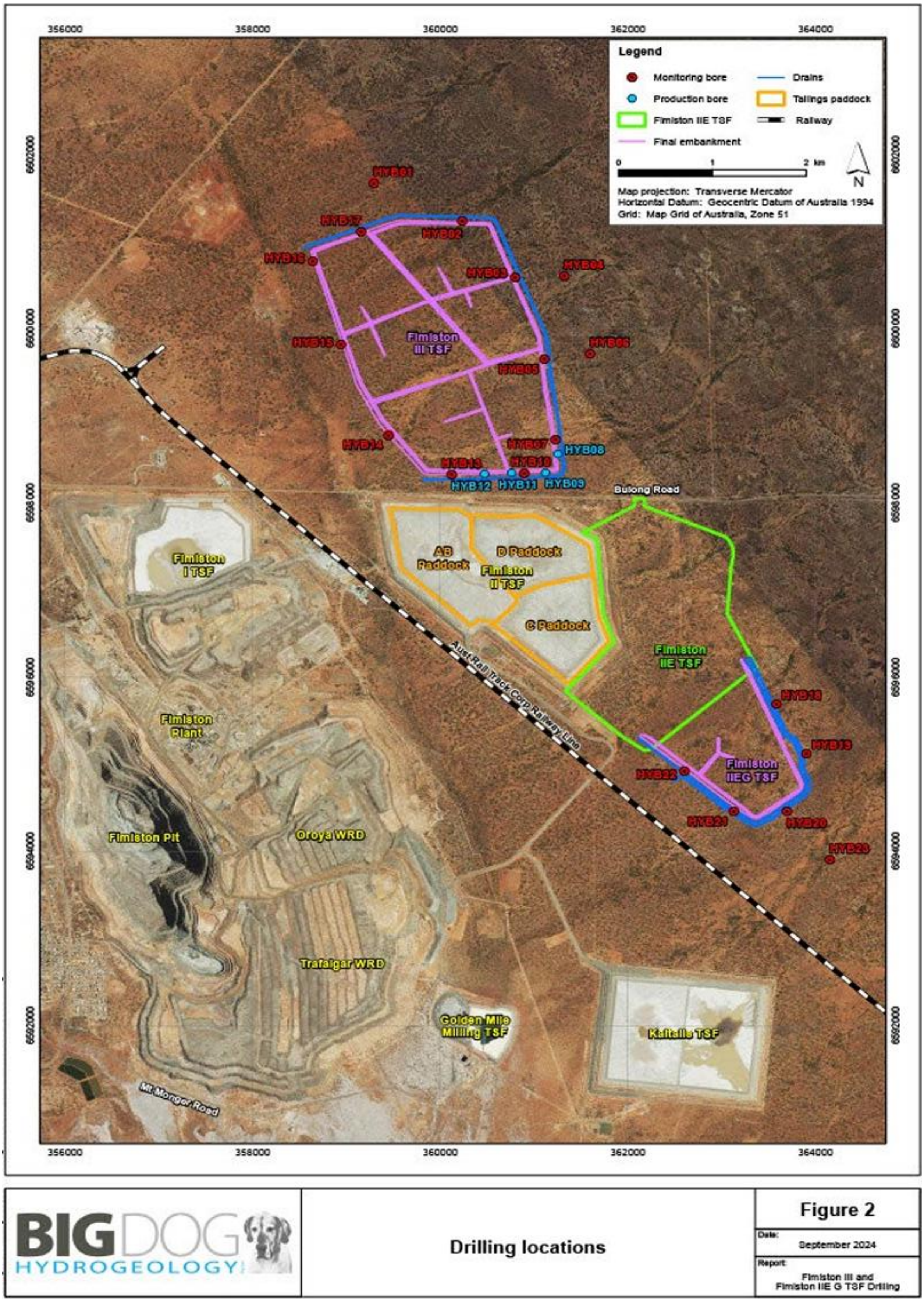


Figure 4: TSF layout and locations of proposed monitoring bores

2.11 Tailings physical and chemical characteristics

Key tailings physical characteristics are summarised in Table 1 below. Tailing values have remained consistent through previous submissions to the department.

Table 1: Key tailings physical characteristics

Material characteristic	Unit	Value
Particle size distribution	% passing 75 µm	55 to 85
Slurry concentration	% solids	45 to 55%, with a potential increase to 60%
Average tailings solids density (particle density)	Specific gravity	2.9
Average in situ dry density	t/m3	~1.6
Time to achieve maximum dry density in winter	days	6 to 14
Beach slope	Vertical: Horizontal	1:150 to 1:200
Shear strength	Drained	Friction angle (ϕ`) = 30° to 35°

The applicant has previously supplied geochemical results that indicate that tailings are non-acid forming, and that tailings liquor is hypersaline and expected to have total cyanide (CN total) concentrations of 150 to 200 mg/L, dominated by weakly complex forms of cyanide. The weakly dissociable forms of cyanide are expected to degrade rapidly to the extent that weak acid dissociable cyanide (CNWAD) concentrations would be less than 125 mg/L.

Ongoing monitoring of the CNWAD levels of the supernatant pond water have generally shown the levels to be significantly lower than this benchmark, partly attributed to a decrease in the CN operating target concentration to the leach circuit.

2.12 Water balance

A water balance assessment for the facility has been developed by the applicant to estimate typical water recovery during the operation of the TSF. This is based on meteorological data, tailings production rates, estimated tailings retained moisture, and seepage rate.

The water balance estimate is based on the following assumptions:

- Average tailings particle density of 2.9 t/m^3 for the tailings solids.
- Design slurry density of 55% solids by mass.
- A deposition split for the existing TSFs (Fimiston I, Fimiston II, and Kaltails), TSFs under construction (Fimiston II Extension E and F cells), and future TSFs (Fimiston II Extension TSF, Cell G, and Fimiston III).
- Average annual rainfall of 281 mm/year and an evaporation rate of 2,616 mm/year, based on monthly BOM data for the area.
- An average seepage rate of 7 L/s based on the seepage assessment.
- Retained water content of the beached tailings based on a settled dry density of 1.6 t/m^3, equivalent to a void ratio of 1 and average saturation of 90%.
- A liquor density of 1.1 t/m^3 for the water, to account for its salinity.

- An estimated decant pond size of 15% of the tailings beach area, in line with existing operations.
- No stormwater run-off to be received from areas outside the cells, and inflow precipitation to be a result of rainfall within the enclosed TSF area only.
- Runoff coefficient of 1.0 on the entire tailings beach.
- Evaporation coefficients of 0.6, 0.3 and 0.1 for the wet, drying and dry beach factors, respectively, and 0.7 for the pond.

Annualised water balance results for Fimiston II Extension TSF, Cell G for the expected range of deposited percent solids are summarised in Table 2.

The table provides the total expected inflows and outflows for the Cell G, when on average ~13% of all Fimiston tailings are deposited into the TSF during its operational life.

Based on the deposition rates for each year, the applicant estimates that on average approximately 26% of return water will be available for recycling via the decant return system, with maximum return volumes amounting to approximately 33%.

The applicant's water balance assumes that all the seepage reporting to the underdrainage system will be recycled. Evaporation and retained tailings water account for the rest of the outflow or losses.

Measurement of the key items that contribute to the water balance (slurry concentration, tailings tonnage, return water, and tailings moisture content) will be conducted during operations to refine the water balance.

Table 2: Predicted water balance for Fimiston II Extension TSF, Cell G

Total inflow	**Mm^3**	**%**	**Total outflows**	**Mm^3**	**%**
Process water	2.5	88	Evaporation	0.9	33
Precipitation	0.3	12	Retained water	0.9	33
			Seepage	0.2	8
			Return water	0.7	26
Total	**2.8**	**100**	**Total**	**2.8**	**100**

2.13 Surface water hydrological assessment

The Fimiston II TSF is broadly located in the catchment of Hannan Lake, which is a saline playa lake located about 10 km south of Kalgoorlie. This catchment is about 18 km long and between 8 km and 13 km wide. Surface gradients range between 3 m/km parallel to the central floodway and greater than 10 m/km across the catchment.

There are numerous braided streams present across the proposed Cell G footprint and surface water design measures (surface water drains) will be required to divert flow away from the TSF embankments. At a local level, the Fimiston II TSF site lies in a pediment that slopes in a south-westerly direction.

As part of the wider Fimiston South project, an update to the detailed hydrological study undertaken by WSP was carried out to assess hydrological impacts on the Eastern Floodway to account for KCGM mine developments including a proposed expansion to the Fimiston South Waste Rock Dump (WRD), the extension of Fimiston II (including Cell(s) E, F and G), and the Fimiston III TSF (Big Dog 2022).

As part of this study, peak flows were estimated for a 1:20 AEP (5%), and a 1:50 AEP (2%) which were 120 m^3/s and 210 m^3/s, respectively.

Conceptual diversion drains for all mine developments (Fimiston South WRD, Fimiston II Extension, and Fimiston III TSF) have been developed by the applicant to accommodate the peak flows listed above.

To improve conveyance of surface water flows and reduce the hydrological impacts of the proposed landforms, the applicant proposes that the Fimiston II TSF extension involves construction of a primary surface water diversion channel:

- An extended diversion channel is proposed to collect flows from all drainage lines intersected by the landform to be conveyed around the eastern face of the proposed TSFG expansion into the existing downstream stormwater management infrastructure.
- This diversion seeks to maximise the return of upstream flows to pre-development drainage lines in downstream catchments and minimise changes to the existing hydrological regime.
- The discharge location selected by the applicant was immediately south of the existing Fimiston II TSF and upstream of the Trans Australian Railway embankment, selected on the basis that the existing railway culverts have sufficient flow capacity to convey peak runoff from a 2% AEP flood event as per Australian Rail Track Corporation (ARTC) design guidelines.

An update to the Eastern Floodway hydrological model has been completed to assess the peak flows associated with the selected 1:100 AEP (1%) design event for the Fimiston II diversion channels. Peak flows associated with this event are approximately 284 m^3/s.

To manage the identified peak flows for the chosen design event, the diversion drains are required to be an excavated channel with the following characteristics:

- Minimum cut depth 1.4m
- Minimum base width: 4m
- Batter slopes: 1V:3H
- Minimum grade: 0.3%

These drains would extend around the perimeter of the Fimiston II facility, and tie into the sub catchments upslope of the existing railway which flow in a south-westerly direction through railway culverts towards the Eastern Floodway. Indicative alignments of the surface water diversion channels are represented by the pink/blue dashed lines in Figure 5.

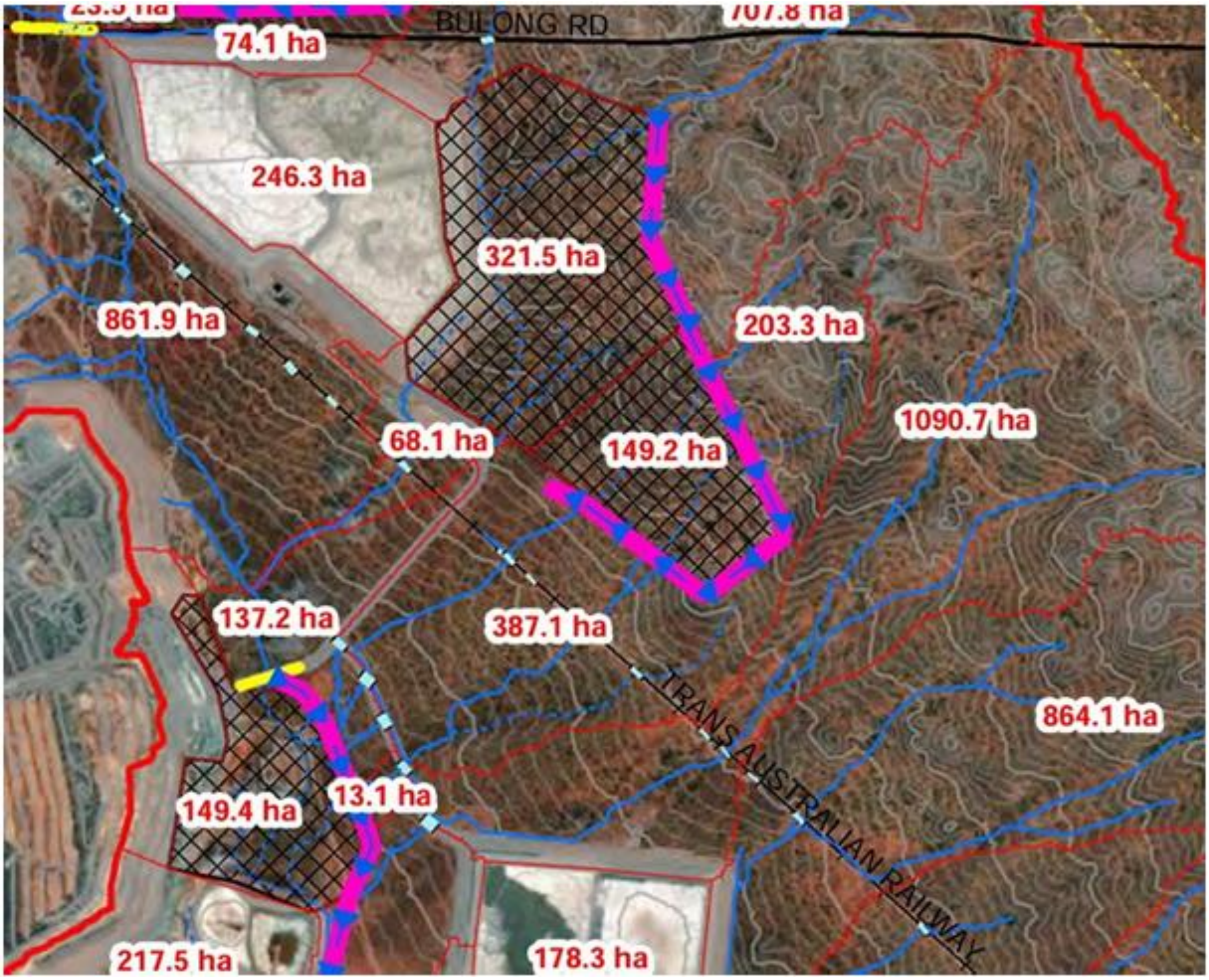


Figure 5: Indicative diversion channel alignments

2.14 Groundwater hydrogeological assessment

There are three major active groundwater systems in the project area:

- Ferricrete and alluvial sedimentary system; sand, gravel and fractured ferricrete within clay deposits between 5 to 40 m below ground level. These deposits are present in the lower elevation areas at the centre of the surface water catchments.

  The groundwater production and monitoring facilities at Fimiston are collectively known as the Eastern Borefield. The Eastern Borefield predominantly draws groundwater from the ferricrete and alluvial sedimentary system, and this is the groundwater system through which seepage from the Fimiston TSFs travel.

- Paleochannel systems; a localised but extensive network of alluvial sands at around 60 m depth. This system is well defined and is the primary source of process water for Fimiston and by other mining operations.

- Fractured bedrock system; where groundwater flow occurs in fractured and weathered zones within basement rocks at depth. Fimiston Pit is entirely situated within the fractured bedrock zone. Regional investigations in the Eastern Goldfields suggest these formations typically have very low primary permeability and are not expected to store or transmit large quantities of groundwater except through major secondary structures.

  Some portions of the Eastern Borefield may extract small amounts of groundwater from the upper weathered portion of bedrock but flows from this unit are generally low.

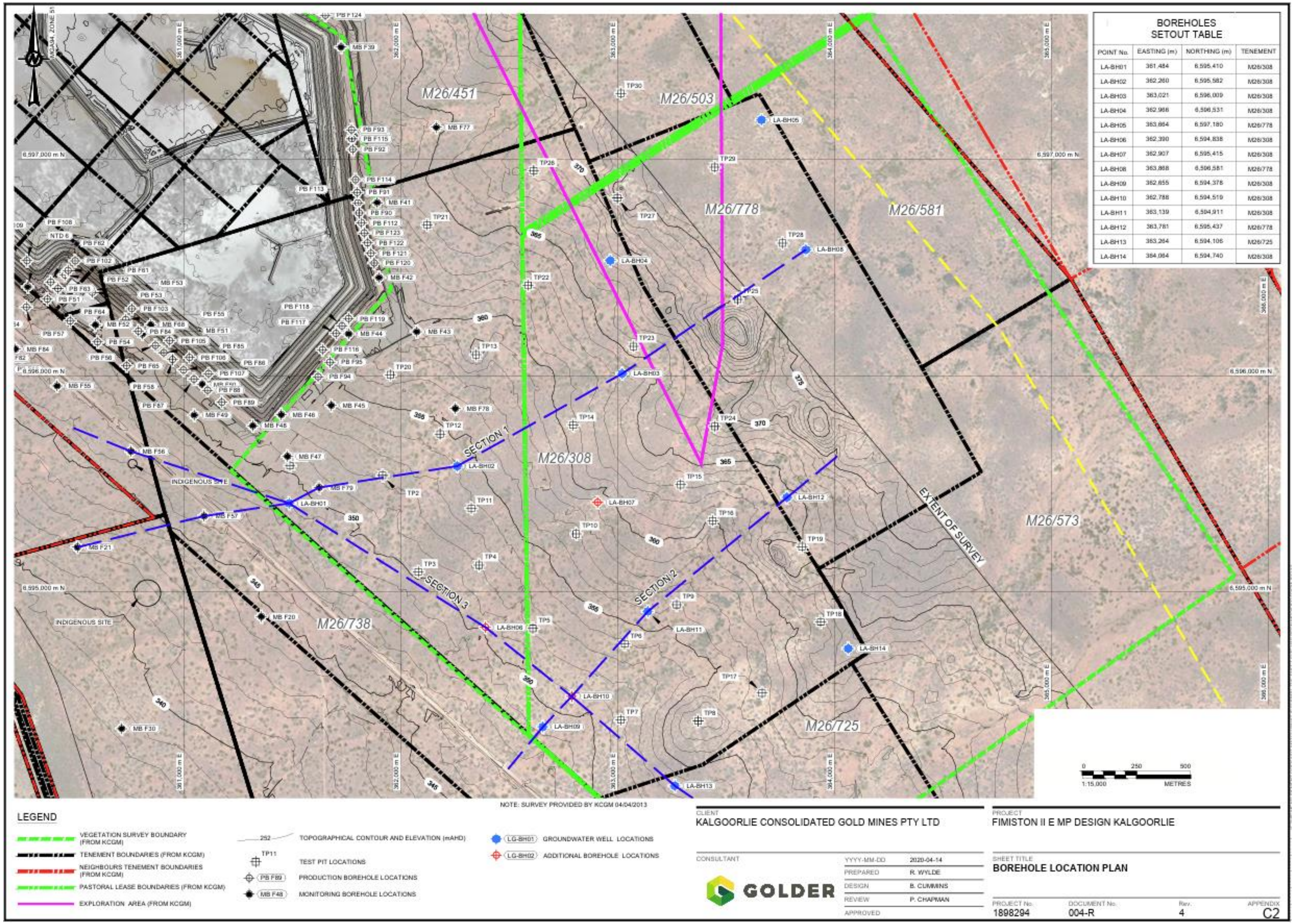
In general, groundwater at Fimiston is naturally saline with TDS concentrations ranging between 25,000 and 170,000 mg/L with higher TDS concentrations observed in monitoring bores nearer to TSFs and paleochannels. Groundwater pH is neutral to slightly alkaline in paleochannel and fractured bedrock groundwater systems. Ferricrete and alluvial groundwater system has naturally low pH, with an observed range between 2.8 to 4.

A hydrogeological investigation was carried out by Golder Associates (2019, now WSP Global) for the Fimiston II Extension footprint area (including Cell(s) E, F, and G). The investigation included drilling, installation of monitoring wells and in situ hydraulic testing. A total of 14 boreholes were drilled to depths between 25 and 36 m (Figure 6). Groundwater was not observed during drilling except for LA-BH01; however, groundwater was later observed in several of the wells. Eleven boreholes were completed as groundwater monitoring wells.

The Fimiston II Extension is located to the east of the central drainage and higher conductivity units, including well developed ferricrete and thicker alluvial/colluvium sequences, which are generally located at the western portion of the site. Moving eastwards, away from the central drainage, the material is generally weathered basement of low to very low hydraulic conductivity. The exception to this is localised alluvial/colluvial gravels, calcrete, and ferricrete, which vary between 0 m – 5 m deep across the site.

The boundary from the thicker alluvial/colluvial sequence to the shallow weathered basement is spatially variable and affected by shallow drainage pathways running north-east to south-west towards the central drainage.

Groundwater is generally around 20 to 25 m below ground level (mbgl) in the western portion of the Fimiston II Extension and well below the depth of investigation (35 m) in the north-eastern portion. The exception to this is close to the existing Fimiston II TSF, where localised mounding effects groundwater levels, with groundwater at 13 mbgl at LA-BH01 (300 m from the Fimiston II TSF cells). The mounding effects decrease rapidly as evidenced by deeper groundwater at nearby LA-BH02 (24 mbgl, 800 m from the existing Fimiston II TSF cells).



BOREHOLES SETOUT TABLE

POINT No.	EASTING (m)	NORTHING (m)	TENEMENT
LA-BH01	361,484	6,595,410	M26/308
LA-BH02	362,260	6,595,582	M26/308
LA-BH03	363,021	6,596,009	M26/308
LA-BH04	362,988	6,596,531	M26/308
LA-BH05	363,864	6,597,180	M26/778
LA-BH06	362,390	6,594,838	M26/308
LA-BH07	362,907	6,595,415	M26/308
LA-BH08	363,868	6,596,581	M26/778
LA-BH09	362,655	6,594,378	M26/308
LA-BH10	362,788	6,594,519	M26/308
LA-BH11	363,139	6,594,911	M26/308
LA-BH12	363,781	6,595,437	M26/778
LA-BH13	363,264	6,594,106	M26/725
LA-BH14	364,084	6,594,740	M26/308

Figure 6: Fimiston II geological and hydrogeological borehole location plan

2.14.1 Seepage and groundwater mounding

Tailings are discharged into current TSFs as a slurry containing around 50% by weight of finely ground rock particles. Tailings are deposited to cells on a rotational basis, with each cell being used for several months at a time, before being left for the tailings to consolidate and dry out.

Existing TSFs are unlined, resulting in excess hypersaline water leaching into the ferricrete and alluvial sedimentary system. To manage this, the applicant undertakes a program of groundwater abstraction and drainage to ensure groundwater does not rise to within the licenced separation distance (typically 4 m) of natural surface. This is in-line with the revised Fimiston Seepage and Groundwater Management Plan (FSGMP 2020).

Monitoring of decant ponds at existing TSFs indicates that seepage from TSFs is likely to have a neutral to alkaline pH, TDS greater than 100,000 mg/L.

A seepage assessment, as part of a hydrogeological review, was conducted by Big Dog Hydrogeology (Big Dog 2022) for the Fimiston II Extension TSF, Cell G at the proposed maximum height of 30 m.

Groundwater mounding is evident over a significant distance to the north and northeast of the Fimiston II TSF, indicative of relatively higher hydraulic conductivity conditions. To the east and south of the Fimiston II TSF, groundwater mounding is evident in the contours, but has limited extent away from the TSF, consistent with relatively lower hydraulic conductivity conditions.

The highest groundwater elevations are measured to the northeast of Cell D. Groundwater mounding is also evident to the northeast of the Fimiston I TSF.

Results from the Big Dog seepage assessment indicate that groundwater elevations can be maintained below the limit of 4 mbgl with required underdrainage and the installation of extraction bores. Active pumping is expected to continue for approximately 10 years after closure of the TSF, which is consistent with the existing KCGM mine closure plan.

Results of seepage modelling indicate the following:

- Provision of extraction bores, toe drains and beneath pond underdrainage systems will reduce the seepage through the TSF base by approximately 40% when compared to a ‘no intervention’ scenario.
- The maximum seepage rate of 15 L/s occurs after five years of operation, with seepage rates reducing to 7 L/s and 2 L/s by end of tailings deposition.
- Groundwater level is expected to remain below the SWL limit if the infrastructure proposed by the applicant is installed.
- The phreatic surface will develop away from the confining embankment with the inclusion of underdrainage. This will provide a benefit to embankment stability.

Annual audits of the Fimiston Seepage and Groundwater Management Plan (FSGMP) are carried out and included in the Annual Environmental Report for the Fimiston Operations (DWER licence L6420/1988/14). Quarterly groundwater monitoring reports are submitted in accordance with condition 24 of L6420/1988/14. A groundwater standing water level limit of >4 m below ground level is set by condition 24 of the licence for the compliance monitoring bores of the Eastern Borefield. Measurements based on depth below ground level are used as an indication of the groundwaters proximity to potential root zones of vegetation.

3. Part IV of the EP Act

The current Fimiston Gold Mine Operations Extension (Stage 2) and Mine Closure Plan is approved under Ministerial Statement 782 (MS 782), operated by Kalgoorlie Consolidated Gold Mines (KCGM).

KCGM propose the expansion of the Fimiston operations in Kalgoorlie by widening and deepening the Superpit by means of the Ivanhoe Cutback and include expansion of Fimiston II Tailings Storage Facility (TSF), a new Fimiston III TSF, an extended waste rock landform, topsoil stockpiles, relocated and modified Environmental Noise Bund, and other supporting infrastructure.

The proposal includes the additional clearing of up to 1,868 hectares (ha) of which 1,580 ha is native vegetation.

KCGM is currently seeking approval from the Environmental Protection Authority (EPA) under the *Environmental Protection Act 1986*, Part IV via a Revised Proposal to develop the Fimiston South Project and make changes to supporting infrastructure as mentioned above.

The submitted Revised Proposal is considered a significant amendment under Section 40AA of the EP Act, which allows conditions of previous Ministerial Statements to be reviewed during the assessment process. Conditions of Ministerial Statement 782 (MS 782) are expected to be amended to reflect new designs.

The EPA assessment is currently at Stage 4 – EPA Report and Recommendations released – appeals open.

4. Department of Energy, Mines, Industry Regulation and Safety

Numerous mining proposals have been submitted and approved under the *Mining Act 1978* since individual leases along the Golden Mile were combined in 1989 to form Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM).

Most recently, a mining proposal for the Fimiston II Extension TSF (Cells E and F) was approved in December 2020 (MP 90108). Separate Fimiston Tailings Mining Proposals are currently being prepared to include the expansion referred to as 'Fimiston South' and includes the Fimiston II Extension TSF, Cell G and Fimiston III TSF.

Disposal of tailings into the Fimiston II Extension TSF, Cell G will not occur prior to securing both a Works Approval and Mining Proposal.

In accordance with MS 782 and tenement conditions Northern Star Resources Ltd is required to submit a Mine Closure Plan (MCP) every three years to DEMIRS (as the lead agency), however MCP co-ordination is undertaken by both DEMIRS and DWER. The 2022 v1 MCP was updated to reflect the Fimiston South Project and submitted to DEMIRS and DWER in August 2022.

5. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk Assessments* (DWER 2020).

To establish a risk event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

5.1 Source-pathways and receptors

5.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered in this decision report are detailed in Table 3 below. Table 3 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 3: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Vehicle movements, earthworks etc.	Air / windborne pathway	A Dust Monitoring and Management Programme is included in the Fimiston Air Quality Management Plan. The objective of the programme is to ensure 24-hour average PM_{10} concentrations as a result of Fimiston Operations are less than 50 µg/m^3 at monitoring locations. Control strategies relevant to this works approval include: • Restricting activities as a function of wind direction, to ensure fugitive dust is not blown towards the City of Kalgoorlie-Boulder or other residential areas. • Applying dust suppression i.e. water trucks in areas that produce dust such as haul roads, service corridors and other active surface areas (this includes the TSF access roads). • Undertaking progressive rehabilitation to minimise exposed areas (this includes the TSF embankments).
Noise	Vehicle movements, earthworks etc.	Air / windborne pathway	The position of the Fimiston II TSF is on the far side of the Superpit open cut mine and the Fimiston Processing Plant to the nearest sensitive receptor, the City of Kalgoorlie-Boulder. The noise from these activities are likely to be a greater noise source than the construction activities of Cell G. There is also a noise bund situated between the mine and the city that further mitigates noise impacts. KCGM has been granted approval under regulation 17 of the *Environmental Protection (Noise) Regulations 1997*, to allow the level of noise emitted from the Fimiston Gold Mine Operations to exceed the standard prescribed under regulation 7 and 11. The Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016 was published in the Government Gazette on 22 March 2016. KCGM also has a Noise and Vibration Monitoring and Management Plan (Condition of MS 782) that includes the use of broadband reversing alarms.

Emission	Sources	Potential pathways	Proposed controls
Operation			
Tailings	Seepage through base and sides of TSF	Groundwater mounding coming into contact with vegetation root zones	Seepage of from the Fimiston TSFs is already managed in accordance with conditions of L6420/1988/14 and KCGM Fimiston Seepage and Groundwater Management Plan. Seepage controls include: • Fimiston II Extension TSF, Cell G designed to minimise seepage using an underdrainage system. • Groundwater monitoring will continue to be undertaken in accordance with conditions of L6420/1988/14. • Installation of new monitoring and production bores to replace those decommissioned during construction.
	Spills and leaks from pipelines	Direct contact with soil contaminating ground. Contamination of storm water. Direct contact with vegetation	In accordance with conditions of the licence (L6420/1988/14), all pipelines containing environmentally hazardous substances are either: • equipped with automatic cut-outs in the event of a pipe failure; or • provided with secondary containment sufficient to contain any spill for a period equal to the time between routine inspections. The main pipelines carrying tailings from the Fimiston Processing Plant to the Fimiston II TSF cells and decant water from the TSF to the processing plant are already established and operating, with detection equipment installed. Pipelines are located within earthen bunds so that any spills can be contained and cleaned up. • Overland stormwater flow is redirected away from the TSF to reduce the potential for contact with spills within the pipeline corridors.
	Overtopping of TSF	Direct contact with soil contaminating ground. Contamination of storm water. Direct contact with vegetation	• The minimum operational freeboard of 300 mm is marked for easy assessment of the tailings height at each spigot. • Minimum 500 mm total freeboard is maintained by maintaining a supernatant pond of less than 15% of the cell surface. (Total freeboard is the vertical distance between the highest point of the water in the cell and the lowest point of the perimeter crest.)

Emission	Sources	Potential pathways	Proposed controls
Decant water	Spills and leaks from pipelines	Direct contact with soil contaminating ground. Contamination of storm water. Direct contact with vegetation	In accordance with conditions of the licence (L6420/1988/14), all pipelines containing environmentally hazardous substances are either: (a) equipped with automatic cut-outs in the event of a pipe failure; or (b) provided with secondary containment sufficient to contain any spill for a period equal to the time between routine inspections. The main pipelines carrying tailings from the Fimiston Processing Plant to the Fimiston II TSF cells and decant water from the TSF to the processing plant are already established and operating, with detection equipment installed. Pipelines are located within earthen bunds so that any spills can be contained and cleaned up. Overland stormwater flow is redirected away from the TSF to reduce the potential for contact with spills within the pipeline corridors.

5.1.2 Receptors

In accordance with the *Guideline: Risk Assessment* (DWER 2020), the Delegated Officer has excluded the applicant's employees, visitors, and contractors from its assessment. Protection of these parties often involves different exposure risks and prevention strategies and is provided for under other state legislation.

Table 4 and Figure 7 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises *(Guideline: Environmental Siting* (DWER 2020)).

Table 4: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Residential receptors	Located at western edge of Fimiston Open Pit; approximately 1.8 km to the West of the TSF I and approximately 4.5 km to the West of the TSF II. Approximately 5.5 km to the West of the proposed works (Cell G) **This receptor is screened out due to distance from the facility.**
Environmental receptors	**Distance from prescribed activity**
Native vegetation (no conservation significant vegetation species; potentially affected vegetation communities widespread regionally)	Adjacent to the Fimiston I TSF mostly to the west and around the Fimiston II TSF.

Underlying groundwater (non-potable purposes) RIWI Act 1914 Proclaimed Groundwater Area	Located within the Goldfields Groundwater Area. Groundwater is hypersaline. Groundwater is generally around 20 to 25 m below ground level (bgl) in the western portion of the Fimiston II Extension.

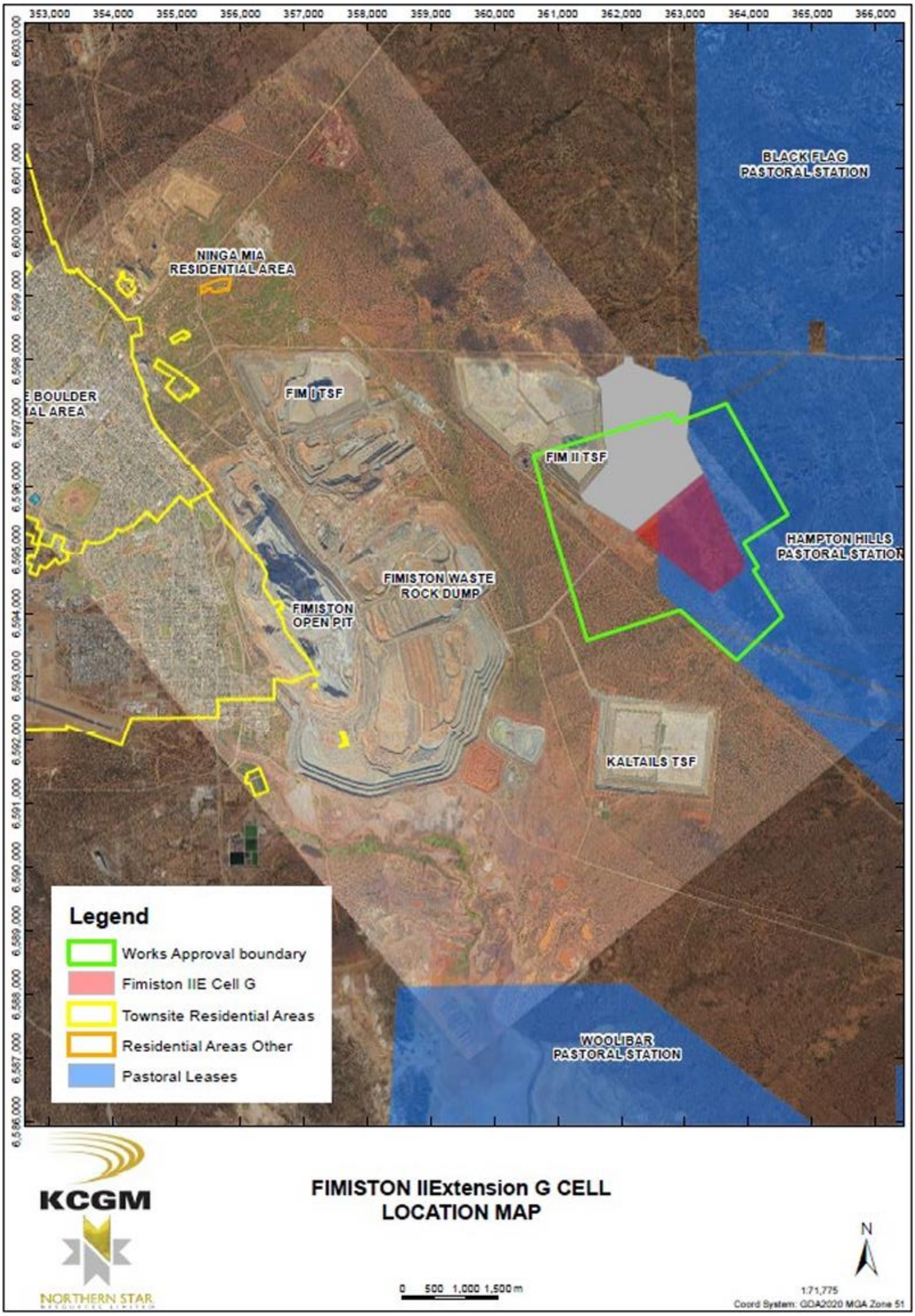


Figure 7: Distance to sensitive receptors

5.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account potential source-pathway and receptor linkages as identified in Section 5.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 5.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 5.

Works approval W2940/2025/1 that accompanies this decision report authorises construction and time-limited operations. The conditions in the issued works approval, as outlined in Table 5 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the premises i.e. Category 5 activities. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 5: Risk assessment of potential emissions and discharges from the premises during construction, and operation

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for works approval conditions
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
Construction								
Construction of Fimiston II Extension TSF, Cell G: Earthworks and vehicle movements	Dust	Air / windborne pathway causing impacts to health and amenity	Residences >5 km	Refer to 5.1	C = Slight L = Unlikely **Low Risk**	Y	N/A	The dust emissions are not likely to exceed those already produced by mining and processing activities. The Fimiston Air Quality Management Plan is active over the operations, including those not currently covered by the prescribed premises licence L6420/1988/14.
	Noise			Refer to 5.1	C = Slight L = Unlikely **Low Risk**	Y	N/A	The emissions are not likely to exceed the noise from the mining and processing operations. The Noise and Vibration Management Plan is active across all activities, including those not currently covered by the prescribed premises licence L6420/1988/14.
Operation (including time-limited-operations operations)								
Discharge of tailings into the Fimiston II Extension TSF, Cell G	Tailings and decant water from spills and leaks from pipelines	Direct contact with soil contaminating the ground surrounding the TSF and pipelines. Contamination of storm water from contact with contaminated soil. Direct contact with vegetation	Surrounding soil and vegetation causing impacts to health of vegetation including death of vegetation. Storm water coming into contact with contaminated soil causing the spread of contaminants into the surrounding environment.	Refer to 5.1	C = Moderate L = Possible **Medium Risk**	Y	Condition 1: Infrastructure table outlining the infrastructure to be constructed including specifications. Condition 9: Emission and discharge limit condition. Conditions 16 - 21: Identifies the emissions, discharge points and monitoring parameters required for operating the facility	These are standard conditions for works approvals where critical containment infrastructure is being authorised for time limited operations. The risk rating justifies the inclusion of emission management infrastructure such as bunding on pipelines, underdrainage and production bores
	Leachate	Seepage through base and sides of TSF entering soil and groundwater causing mounding of groundwater around the TSF.	Groundwater mounding coming into contact with root zones of surrounding vegetation causing health impacts and death.	Refer to 5.1	C = Moderate L = Possible **Medium Risk**	Y	Conditions 2 and 4: Monitoring and production bore installation conditions Condition 7: Baseline ambient environmental conditions – provides for the monitoring of background groundwater conditions in the bores constructed under condition 2 prior to tailings discharge to the new TSF cells. Conditions 16 - 21: Identifies the emissions, discharge points and monitoring parameters required for operating the facility.	These are standard conditions for works approvals where critical containment infrastructure is being authorised for time limited operations. The risk rating justifies the inclusion of emission management infrastructure such as seepage and groundwater recovery systems. The management of the seepage and groundwater will be via the already established Seepage and Groundwater Management Plan as detailed in Section 2.14.1 of this report Table 2 of Schedule 1 of the Licence (L6420/1988/14), identifies a total of 73 groundwater monitoring bores for the Eastern Borefield. One of these bores will be decommissioned during construction of the Fimiston II Extension TSF, Cell G and replaced with 6 new bores. These monitoring bores will be added to the licence when it is amended to authorise the operation of the new TSF infrastructure.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk Assessments* (DWER 2020).

Note 2: Proposed applicant controls are depicted by standard text. **Bold and underlined text** depicts additional regulatory controls imposed by department.

6. Consultation

Table 6 provides a summary of the consultation undertaken by the department.

Table 6: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website (10 March 2025)	None received	N/A
Local Government Authority (LGA) – City of Kalgoorlie-Boulder advised of proposal 4 March 2025	The LGA responded 1 May 2025 with concerns regarding the mining approval process for Fimiston and the potential impacts on the local community. The LGA state that it is essential that management plans for dust, noise and air quality are not only implemented on paper but are actively followed to mitigate any negative impacts on public health. The community's wellbeing should be a top priority, and the department is urged to ensure these management plans are regularly monitored and updated, as needed, to prevent any harm to the health of the residents. Additionally, in the event of serious health concerns raised by the community, the LGA strongly recommend that the applicant collaborate with the local city authorities to address these concerns promptly and transparently, rather than disregarding or ignoring calls for action. The LGA states that open communication and cooperative efforts are essential in maintaining the trust and safety of the community.	The department undertakes a risk-based approach to environmental assessment. Potential risks are assessed on emission-pathway-receptor basis. Potential emissions related to this application are listed in Table 5 and proposed controls are listed in Table 3. The department notes that the applicant has various management plans, and the works approval is issued with conditions related to the identified potential risk events. The department also notes that a prescribed premises contravening a condition of a works approval or licence may be committing an offense under sections 55 and 58 of the EP Act. Third parties are encouraged to report pollution, illegal dumping and other environmental matters to the Environment Watch hotline on 1300 784 782, or via the WA government website.
The applicant was provided with draft documents on 30 May 2025	The applicant sent comments on the draft documents on 9 June 2025 Refer to Appendix 1	Refer to Appendix 1

7. Conclusion

Based on the assessment in this decision report, the delegated officer has determined that a works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

References

1. Big Dog Hydrogeology (Big Dog) 2022, *Hydrogeological Review of the Fimiston I, Fimiston II, Fimiston IIE, and Fimiston III TSFs*, Albany, Western Australia.
2. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
3. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
4. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
5. Environmental Protection Authority (EPA) 2018, Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual, Environmental Protection Authority, Perth, Western Australia.
6. Golder and Associates (Golder) 2019, Technical Memorandum, *Fimiston II Extension Tailings Storage Facility – Stormwater Assessment,* West Perth, Western Australia.
7. Northern Star Resources Limited (NSR) 2024, *Fimiston II Extension TSF G Cell Works Approval Supporting Application rev 1.0*, Subiaco, Western Australia.
8. WSP Australia Pty Ltd (WSP) 2024, *Design Report to Support an Application to Extend the Fimiston II Tailings Storage Facility*, Perth, Western Australia.

Appendix 1: Summary of applicant's comments on risk assessment and draft conditions

Section or condition	Summary of applicant's comment	Department's response
<u>Works approval</u>		
All	Inconsistent naming convention is used throughout the document, please refer to the TSF as "Fimiston II Extension TSF, Cell G".	The Delegated Officer has made this change in the final works approval.
Condition 1: Construction phase Table 1, Item 1: Fimiston II Extension TSF, Cell G	Starter embankment and decant access causeway will have slightly different optimum moisture content and compaction and are required to be separated into individual design and construction requirements. The starter embankment will be constructed with moisture conditioned to a minimum of -1 / +2% of the optimum moisture content, compacted to a minimum of 98% standard maximum dry density, while the decant access causeway will be moisture conditioned to a minimum of ± 2% of the optimum moisture content, compacted to a minimum of 95% standard maximum dry density.	The Delegated Officer does not believe this proposed change will significantly increase environmental risk and no additional assessment is required. The Delegated Officer has made this change in final works approval.
Condition 1: Construction phase Table 1, Item 1: Fimiston II Extension TSF, Cell G	External, and not internal, toe drains will be constructed. These will be on the downstream side of the embankment.	The reference to 'internal toe drains' was included in the supporting document (WSP, 2024). The Delegated Officer notes, however, that design plans for the Fimiston II Extension TSF, Cell G show external toe drains. The Delegated Officer does not believe this change will result in a significant increase in environmental risk. The Delegated Officer has made this change in final works approval.
Condition 1: Construction phase Table 1, Item 2: Pipelines carrying tailings and decant return water	Remove the word 'existing' from infrastructure location. Make the infrastructure location requirement read "Installed within the pipeline corridor as shown in Schedule 1: Figure 2"	The Delegated Officer has made this change in the final works approval.

Section or condition	Summary of applicant's comment	Department's response
Condition 2: Construction of groundwater monitoring wells Table 2, Groundwater monitoring bores location	Six new monitoring bores will be installed as shown in Figure 4. The supporting document incorrectly states that only 5 new bores would be drilled, and 1 was existing, however this was a typo/error.	The Delegated Officer has made this change in the final works approval.
Condition 3: Submission date of well construction report.	The applicant requests that this be 90 calendar days (rather than 60 days) to allow sufficient time for the hydrogeologist to obtain sampling data and prepare bore construction report.	Allowing 60 calendar days for a well construction report is a standard condition, but the Delegated Officer does not believe that increasing this to 90 days will significantly increase environmental risk. The proposed change from 60 to 90 calendar days in condition 3 has been made.
Condition 5: Submission date of Critical Containment Infrastructure Report (CCIR).	The applicant requests that this be 90 calendar days (rather than 60 days) to allow sufficient time for civil contractors, geotechnical engineers, and site services team to compile all the required information for the CCIR.	Allowing 60 calendar days for a CCIR is a standard condition, but the Delegated Officer does not believe that increasing this to 90 days will significantly increase environmental risk. The proposed change from 60 to 90 calendar days in condition 5 has been made.
Condition 8: Time Limited Operations (TLO) commencement and duration.	The applicant requests that the requirement to postpone commencement of TLO, until after the CEO has notified the works approval holder that the Critical Containment Infrastructure Report (CCIR) meets the requirements of the relevant condition(s), be removed. The applicant would like to commence TLO as soon as the Critical Containment Infrastructure Report has been submitted to the department. If this condition cannot be amended, the applicant requests an Environmental Commissioning Phase to allow deposition to commence upon submission of the CCIR.	The purpose of the CCIR is for the department to confirm that the environmental controls on containment infrastructure are properly constructed before materials are deposited in the containment cell. The department considers it appropriate, on the basis of risk, to ensure that critical containment infrastructure meets its requirements prior to any form of operation commencing. With this type of infrastructure, the department recognises both the potential environmental impact, and the practical inability to easily rectify issues, once the containment infrastructure is in use. Once the CCIR has been submitted, the department will assess the report. No environmental commissioning, or operation of the containment infrastructure, can occur during this time. The inclusion of an Environmental Commissioning Phase, as a mechanism to circumvent the requirements of the Critical Containment Infrastructure Report is not appropriate and the Delegated Officer rejects the request to adjust condition 8 and

Section or condition	Summary of applicant's comment	Department's response
		rejects the request to include an environment commissioning phase to allow deposition to commence upon submission of the CCIR.
Schedule 1: Maps Figure 1: Map of the boundary of the prescribed premises	Correct map for premises boundary added.	The Delegated Officer noted this change.
Schedule 1: Maps Figure 2: Existing KCGM pipeline corridor between processing plant and TSFs	Pipeline corridors corrected in figure; new figure inserted.	The Delegated Officer noted this change.
Schedule 1: Maps Figure 4: Fimiston II Extension TSF, Cell G underdrainage design	A portion of the stormwater drain was missing in the figure; corrected figure inserted	The Delegated Officer noted this change.
<u>Decision report</u>		
All	Inconsistent naming convention is used throughout the document, please refer to the TSF as "Fimiston II Extension TSF, Cell G".	The Delegated Officer notes this comment and had adjusted reference to the TSF to be either "Fimiston II Extension TSF, Cell G", or "Cell G". The Delegated Officer considers this is enough of a consistent naming convention that will not impact the readability of the document.
All	Minor typographic corrections made	The Delegated Officer has made these changes in the final decision report.
Section 2.3: Applicant and premises overview	The ownership and management details of the applicant and premises were incorrectly written in the supporting document. Please update.	Revised wording has been supplied that accurately explain who the applicant is in relation to the operations on the premises and the Delegated Officer has updated this section in the decision report.

Section or condition	Summary of applicant's comment	Department's response
Section 2.5: Earthworks	The applicant clarified that the embankment fill will be moisture conditioned to a minimum of -1 / +2% of the optimum moisture content.	The Delegated Officer has made this change in the final decision report.
Section 2.9: Underdrainage Figure 3: Underdrainage layout plan	A portion of the stormwater drain was missing in the figure; corrected figure inserted	The Delegated Officer noted this change.
Section 2.10: Monitoring and production bores	The reference to five new monitoring and production bores needs to be updated as this is not accurate (was incorrectly written in the supporting document). Reword to: "Six new monitoring bores are proposed to be installed around the G Cell - two to the east, two to the south and two to the west." This reflects the figure that was provided.	The Delegated Officer has made this change in the final decision report.
Section 5.1, Table 3: proposed applicant controls	Delete reference to an "Annual vegetation monitoring adjacent TSF" as the current Fimiston Seepage & Groundwater Management Plan (FSGMP) does not include the requirement for annual TSF vegetation monitoring. KCGM has successfully implemented the FSGMP for more than 15 years via extensive network of seepage recovery bores; proactive monitoring of groundwater levels; interception trenches; and minimising supernatant pool on TSF. The new TSF design also incorporates underdrainage system to further reduce seepage.	Inclusion of this proposed control in the decision report was made in error. This was not a condition in the draft works approval. The Delegated Officer has made this change in the final decision report.