



Application for Licence

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

Licence Number	L9335/2022/1
Applicant	Thunderbird Operations Pty Ltd
ACN	611 351 743
File number	DER2022/000219
Premises	Thunderbird Mineral Sands Project Legal description - Mining tenement L04/85 and part of M04/459 As defined by the coordinates in Schedule 2 of the licence As defined by the premises maps attached to the issued licence
Date of report	14/12/2022
Decision	Licence granted

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

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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 operation of the premises. As a result of this assessment, licence L9335/2022/1 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 and overview of premises

On 23 May 2022, 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 for a licence relating to mineral sand mining, wastewater treatment and landfill activities at the premises. Stage One of mining is to commence under this licence. The process plant and above ground TSF will be applied for as amendments to the licence after construction under works approval W6072/2017/1. The premises is approximately 75 km southwest of Derby.

The premises relates to the categories and assessed production capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in licence L9335/2022/1. 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 licence L9335/2022/1.

Background

The proposed Thunderbird Mineral Sands Project is a large-scale mineral sands (also known as heavy mineral sands) mine on the Dampier Peninsula within the west Kimberley region, approximately 75 km south-west of Derby and 90 km north-east of Broome, in the Shire of Broome. The ore reserve is 15.6 million bank cubic meters (BCM)¹ (31.2 million tonnes) of valuable heavy mineral in an ore body of 340 million BCM of predominantly quartz sand. The products proposed to be extracted from the ore, as detailed in the amendments to works approval W6088/2017/1, are:

- magnetic concentrate (MC), a low-grade ilmenite product;
- non-magnetic concentrate (NMC) product containing zircon and rutile; and
- paramagnetic concentrate (PMC) co-product containing titanium units in combination with iron oxides and monazite.

The life of mine is planned to be 40 years.

W6072/2017/1 was granted in 2018 to authorise the initial works in relation to the preliminary mining. W6088/2017/1 was issued on 21 August 2018 to authorise the construction of mineral sand processing, wastewater treatment and landfill infrastructure. Subsequent amendments to W6088/2017/1 have been made as the proposed processing methods have been revised and further wastewater treatment is planned.

¹ Bank cubic metres - the volume of the original rock in situ prior to blasting and excavation.

The works authorised by W6088/2017/1 have been staged, with the stages named Phases 2 – 5. Phase 2 was the construction of the wastewater treatment plants and irrigation fields and the landfill. Phase 2 had been partially completed at the time of the application for a licence with an environmental compliance report provided for WWTP1 and the landfill, including a bioremediation pad.

Stage 1 mining is not included in any of the Phases of works authorised by W6088/2017/1 as it does not include construction and all clearing is done under the authorisation of Ministerial Statement 1080.

The infrastructure of wastewater treatment plant 1 (WWTP 1) located at the accommodation camp and the landfill located at the mining operations area have been constructed and are operating under time limited operation conditions on W6072/2017/1. Stage 1 of mining above the groundwater table, prior to processing, is to be commenced under this licence.

Prescribed activities under licence L9335/2022/1

Category 8 – Mineral sands mining

Category 8 includes the following activities:

- clearing large areas of land;
- transporting large volumes of topsoil, overburden, rocks, and sand with earthmoving and mining equipment;
- dewatering, and storage and disposal of dewatering effluent;
- wet (dredging) or dry mining of ore;
- wet or dry concentration of mineral sands ore to produce heavy mineral concentrate (HMC), and sand and clay tailings;
- onsite or offsite secondary processing producing ilmenite, rutile, zircon, leucoxene, monazite, staurolite, kyanite or garnet, and process tailings from HMC;
- onsite disposal of waste generated from offsite mineral sands processing (not including downstream chemical manufacturing); and
- disposal of sand, clay, and ore processing tailings either separately or together into specific containment structures or into mined voids. (DWER 2018)

The successive clearing of the mining area and rehabilitation is regulated under Ministerial Statement 1080 to produce habitat suitable for the Greater Bilby.

The Stage 1 activities that are Category 8 activities and managed under the conditions of this licence are:

- transporting large volumes of topsoil, overburden, rocks, and sand with earthmoving and mining equipment;
- dry mining of ore; and
- wet or dry concentration of mineral sands ore to produce heavy mineral concentrate (HMC), and sand and clay tailings; in Stage 1 this step will be confined to screening of ore and stockpiling of material until the construction of the processing plant.

Bulk mining techniques of the deposit, employing heavy earthmoving equipment, will be employed to achieve the proposed processing rate of 12.5 million tonnes per annum (Mtpa).

For mine planning purposes, the deposit area has been divided up into blocks approximately 200 m long by 100 m wide. These will be sequentially mined, backfilled and rehabilitated commencing at the north eastern extent of the deposit. (Figure 1)

The mining sequence will typically be:

- Vegetation and topsoil removed and stored for future rehabilitation.

- Unmineralised overburden removed and either:
 - Stored adjacent to the pit void area for later use.
 - Transported directly to mined areas for pit backfill.
- Mineralised (low grade) overburden will be removed and either:
 - Stockpiled atop future ore blocks and opportunistically used for process feed.
 - Transported directly to mined areas for pit backfill.
- Ore will be excavated and transported to a Mining Unit Plant (MUP) located on the mining excavation floor, close to the active mine face. The MUP will screen out coarse material to be returned to the mine void or used for ongoing site infrastructure. (Figure 2). Once the processing infrastructure is constructed the screened ore will be pumped as a slurry to a wet concentrator plant. It is noted the MUP will be mobile, and its location will move during the mine life within the pit voids.

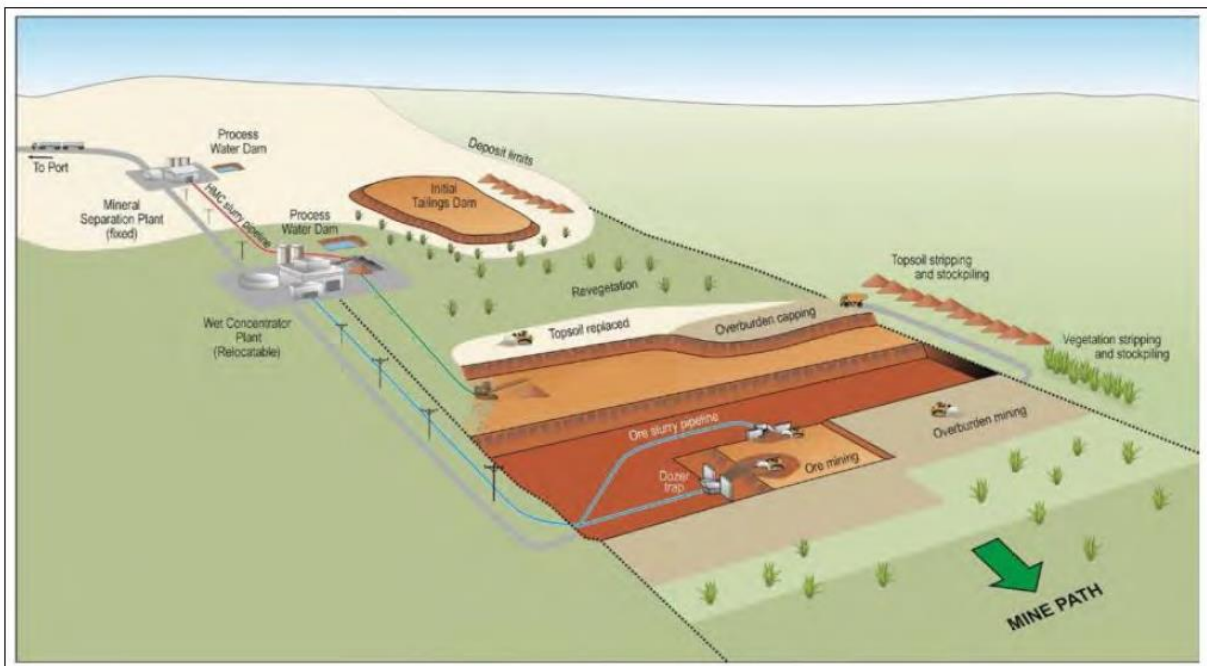


Figure 1: Conceptual mining method schematic

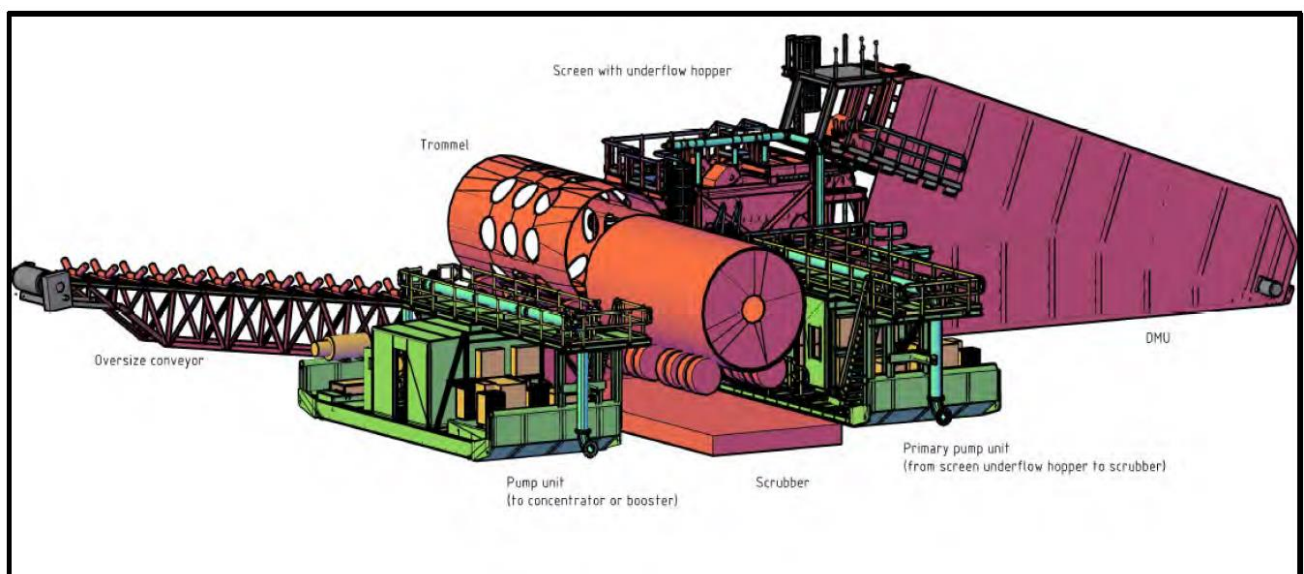


Figure 2: Mining Unit Plant (MUP) to be located within the mine void

The initial mining phase is restricted to mining up to a depth of 38 metres below ground level (mbgl) with a surface footprint of 206 hectares (ha). The depth of the Broome Sandstone Aquifer

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within the footprint area is at or below the deepest of the proposed pit floor levels (90 m to 75m AHD). The applicant advises that the initial mining will be above the water table and mine dewatering will be minimal, comprising collection and management of wet season rainfall. Regulation under Category 6: Mine Dewatering is not expected to be required for Stage One of mining.

Category 54 – Sewage facility

WWTP1 for the accommodation camp consists of a containerised five stage wastewater treatment process housed in a 40 foot sea container with external balance and irrigation tanks. Polishing infrastructure has also been constructed to increase quality of effluent discharged to the environment. Treated effluent is discharged to a spray field via an above ground sprinkler arrangement. (Appendix 2: Figure 4 and Figure 5)

The WWTP1 is designed for a maximum capacity of 100 m³/day, accommodating for 350 L per person per day for up to 250 people, and producing a total estimated output of 70 m³/day. Peak influent flow to WWTP1 is 16 m³/hr. The WWTP process is summarised in Table 1.

Table 1: WWTP 1 process stages and infrastructure

Stage	Infrastructure	Description
1	Sewage pump station	Raw sewage is gravity fed from its source via buried piping into suitably located pump pits/stations prior to being pumped to the WWTP1.
2	Inlet Screen	Raw effluent passes through a screen to remove coarse suspended solids (inorganic waste) from the wastewater.
3	Balance tank (22 kL poly tank)	This tank provides a controlled flow twice daily into primary tank one.
4	Primary tank 1	An anaerobic tank for holding/mixing to introduce sludge drawn from the clarifier to the influent.
5	Primary tank 2	An anoxic tank which allows bacteria to convert oxidised nitrogen in solution to nitrogen gas.
6	Primary tank 3	An aeration tank where oxygen provided via a mixing aerator controlled via timers set to maintain dissolved oxygen levels between 1 – 2 mg/L. This allows for oxidation of nutrients, reduction of ammonia, BOD, COD and the like.
7	Clarifier tank	The tank where the suspended activated sludge is settled out. Influent is dosed and mixed with Poly Aluminium Chloride (PAC) which binds the particles together. Treated effluent passes into the chlorine contact tank. Settled sludge is pumped to primary tank 1.
8	Chlorine contact tank	This tank is where chlorine is added via tablet form to reach and maintain a chlorine residue of around 2 mg/L. This tank also allows for 30 minutes retention and contact time before entering the final irrigation tank.
	Polishing plant	This plant filters the effluent prior to collection in the irrigation tank.
9	Irrigation tank	The treated effluent is held in this tank and discharged through the irrigation flow meter to the spray field.
10	Spray field	The spray field is a fenced off area which incorporates sprinklers to dispose of the treated wastewater through irrigation.
11	Sludge thickening tank (9.5 kL poly tank)	This is used to thicken excess sludge ready for removal via a waste disposal truck. The effluent from this process overflows into a sump and is returned to the balance tank.

The resultant effluent quality that is to be disposed of via the irrigation field is provided in Table 2.

Table 2: WWTP 1 effluent specifications

Analyte	Units	Value
Biochemical oxygen demand (BOD)	mg/L	<20
Total suspended solids (TSS)	mg/L	<30
Total nitrogen	mg/L	<20
Total phosphorous	mg/L	<2
Free chlorine	mg/L	0.5-2.0
pH	-	6.5-8.5
<i>E. coli</i>	Cfu/100 mL	<10

The spray field has been constructed within an area of 7.2 ha. The irrigation is via hammerhead sprinkler systems that are designed to irrigate an area of 30m diameter each sprinkler.

A compliance report was provided for the construction of the WWTP was provided on 30 May 2022 and reviewed during validation of the application of this licence. The construction was found to be compliant with the works approval and suitable to commence limited time operations under the works approval.

Category 89 – Putrescible landfill

The landfill is sized to deal with waste generated from 300 construction workers over a two year period and 180 permanent staff for the remainder of the project life. The volume of waste to be dealt with over the project life span is calculated to be 43,800 m³ (a nominated design capacity of 1,100 tpa).

The total area of the landfill is 240mx340m (81,600m²) with each cell approximately 40 m long by 20 m wide by 4 m deep. The design approved under W6088/2017/1 was for cells approximately 30 m x 10 m x4 m, the increase in size of each cell is length and width rather than depth. The 40 m design length incorporates a ramp down into the trench where waste will be deposited and compacted prior to additional waste being deposited.

The most significant environmental risk identified in the assessment of the facility in the works approval was contamination of groundwater, this risk is not significantly increased as the cells will not be deeper than the original proposed design.

Each cell will be surrounded by an earthen bund of approximately 1 m in height to prevent surface water runoff entering the cell. Additionally, a firebreak of at least 3 m will be maintained around the perimeter of the facility.

An appropriately sized, fauna proof fence surrounds the boundary of the landfill facility with entrance and exit gates and appropriate signage.

Bioremediation facility

A bioremediation facility is included in the landfill facility footprint. This was not assessed under W6088/2017/1 as it is not a prescribed activity in Schedule 1 of the *Environmental Protection Regulations 1987*. Bioremediation is however, an activity directly related to category 8 as the carrying out of mining will generate a significant volume of hydrocarbon contaminated soils due

to maintenance of vehicles and equipment, or spills or leaks from containment of hydrocarbons. It is also infrastructure that is included as part of the landfill regulated under this licence.

The facility is comprised of two cells, each 25 m x 50m. Each cell is HDPE lined and bunded with a layer of protective soil to prevent damage to the HDPE membrane. The two lengths of each the cell will be approximately 1 m high. The front and rear access to the cell will be a ramped 0.5 m high earthen bund so that vehicles can access the cell and runoff is contained. A shallow V-drain is around the perimeter to divert stormwater away from the area.

For the design of the landfill and bioremediation cells and the design of the landfill facility refer to Appendix 2: Figure 6 and Figure 7.

Naturally occurring radiological material

Mineral sands mining and processing may result in the concentration of Naturally Occurring Radiological Material (NORM). This can produce radiological risks. Ore at the premises will have NORM of less than the 1 Bq/g definition of a radioactive substance (0.71 Bq/g Uranium and 0.26 Bq/g Thorium).

The future ore concentrates from the processing of mineral sands at this premises will have a higher level of radioactivity, but the levels are still expected to be low enough to be exempt from transport regulations for radioactive material.

The management of radiological risks from (NORM) is undertaken jointly by the Department of Mines, Industry Regulation and Safety (DMIRS) and the Radiological Council of Western Australia (RCWA). DWER defers the management of risks from NORM to these government agencies.

2.3 Part IV of the EP Act

The Thunderbird Mineral Sands Project has been assessed under Part IV of the EP Act by the Environmental Protection Authority (EPA). It is subject to the requirements of Ministerial Statement 1080 (MS 1080). The EPA's assessment is provided in EPA Report 1606.

MS 1080 was published on 10 August 2018. There are no conditions directly related to management or control of emissions and discharges.

Included in the statement are conditions to manage groundwater abstraction and minimise direct and indirect impacts to the following:

- Terrestrial fauna, including:
 - *Macrotis lagotis* (Greater Bilby); and
 - Dampier Peninsula goanna.
- Aboriginal Heritage.

Potential impacts to the *Macrotis lagotis* (Greater Bilby) and Dampier Peninsula goanna, including any monitoring requirements, have not be considered in the Part V assessment given these have been considered under MS 1080.

MS 1080 provides requirements in relation to clearing of native vegetation within the mine site development envelope. Clearing activities have therefore not been duplicated within the licence assessment however, uncleared vegetation remains a receptor of discharges and emissions from activities regulated under the licence within the licence application environmental risk assessment.

3. 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.

3.1 Source-pathways and receptors

3.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises 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 applicant controls
Category 8 – Mineral sands mining			
Dust	Movement of mining plant Screening of material by MUP Stockpiling of material Dust lift off from stockpiles Dust from material movement on conveyors	Airborne	Land disturbance will be kept to the minimum necessary for the project. During high winds, topsoil stripping and spreading activities will be restricted if dust cannot be adequately controlled. Vehicle traffic will be confined to defined roads and tracks Disturbed areas will be rehabilitated upon completion of activities or where progressively able to do so.
Noise	Operation of mining plant Operation of MUP		No controls have been proposed however, results of noise modelling (WSP, 2016) demonstrated that noise levels were compliant with criteria in the Noise Regulations for all of the nearest noise sensitive receptors. As the modelling included noise associated with ore processing activities, the applicant anticipates that noise emissions from just the mining will be below relevant noise criteria at nearby noise sensitive receptors. The DWER notes that the assumption by the applicant is that only the noise of mining needs consideration. There is however, expected to be construction of the processing facility and tailings storage facility occurring during the initial mining period. The department does not expect this to be a significant impact however as it limited in time compared to the ongoing noise of operation.
Hydrocarbons	Active mining area and, workshops.	Overland flow contaminating stormwater	• Diversion bunds divert surface water flows around active mine areas. • All drainage from the mine excavation will be directed into holding

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Emission	Sources	Potential pathways	Proposed applicant controls
	Vehicles and fixed plant.		sumps and used for dust suppression or used within ore processing. • No hydrocarbons will be stored within the mine pits. • Hydrocarbon spills from earthmoving equipment or light vehicles within the mine pits will be cleaned up and contaminated soils will either be remediated or removed from site by a licensed third party. • Spill kits will be located at strategic locations throughout the project area and employees trained in their use. • Mobile vehicles deemed a higher spill risk such as service trucks will carry their own spill kits. • Heavy and light vehicle maintenance will be undertaken in designated workshop areas located on concrete pads constructed so that they drain to an oil water separator system. • Heavy and light vehicles will be washed down in a purpose built wash down facility. Sediment from the washdown pad will be collected in a concrete sump and washdown water treated via a process to separate solids and hydrocarbons from water. • Fuel storage, fixed plant and power generation equipment will be sited away from surface waters. • All hydrocarbon and chemical storages will be designed and constructed in accordance with Australian Standards AS1940 and AS1692. • Spills will be captured within bunds and recovered.

Emission	Sources	Potential pathways	Proposed applicant controls
Solid waste containing acid forming materials (Overburden and low grade ore from mining) Acid/metals contaminated soil/ water	Removal of overburden in preparation for mining ore exposing contaminating material Placing of ore/overburden in stockpiles. Groundwater or rainwater coming into contact with acid forming material.	Direct contact with soil/vegetation. Exposure of potentially acid forming (PAF) material to air or water. Removal of acidified PAF from mine. Rainfall or groundwater leaching metals from mined material. Transport through soil to groundwater and vegetation.	• Diversion bunds will be constructed to divert surface water flows around active mine areas. • All drainage from the mine excavation will be directed into holding sumps and used for dust suppression or used within ore processing. • Mining will be above the groundwater table. The applicant advises: • The majority of mine waste will be Non Acid Forming (NAF) and Barren (having neither acid producing nor acid neutralisation potential). • Levels of soluble salts, metals and metalloids in seepage from these materials will be low, even under mildly acidic conditions. • Concentrations of water soluble elements of environmental significance in mine wastes were generally very low to non-detectable and below ANZECC livestock drinking water guidelines (only current beneficial use of groundwater). Therefore a low risk of mine waste leachates from circum-neutral waters adversely impacting the surrounding environment by rainfall or groundwater interaction. • Seepage from mine wastes will have extremely low levels of salinity. • Dilute acid leach testing mobilised low levels of aluminium and iron, consistent with a natural presence of hydrated aluminium and iron oxides from weathering and groundwater interactions. The results were marginally above the ANZECC livestock drinking water guideline of 5 mg/L under these artificially acid conditions. • Concentrations of all other environmentally significant metals and metalloids were extremely low in all samples and below corresponding ANZECC livestock drinking water guidelines. (MBS 2016)

Emission	Sources	Potential pathways	Proposed applicant controls
Surface water (altered flows)	Surface modifications due to constructed infrastructure, earthworks and mining	Overland flow/pooling/water starvation	- Natural drainage contours will be maintained where possible. - Pipelines will be buried when crossing watercourses to prevent impediment of flow. - Roads and access tracks will be constructed with appropriate surface water drainage structures to minimise impacts on surface water flows. - Where necessary, suitable floodways, drains and culverts will be installed to transfer flow past infrastructure such as the Accommodation Village and Mine Site and return it to its natural flow path. - A surface water management plan will be implemented if required.
Category 54 – Sewage treatment			
Untreated/partially treated sewage	Rupture of pipeline causing untreated sewage discharge to land Overflow of tanks within treatment plant.	Direct contact with soil and vegetation. Pooling of effluent on the soil surface. Increased nutrients in soil at irrigation field.	- Pipes are buried reducing potential release of sewage onto land surface. - Pump pits transferring sewage to the plant are controlled by pre-set level floats. - The balance tank has sufficient capacity to contain peak flows over 12 hours.
Treated sewage/ Effluent	Applied to native vegetation using reticulated sprinklers		- Nutrient levels in the treated effluent and the size of the irrigation are expected to meet the risk category of B for eutrophication risk in Table 2 of the Water Quality Protection Notice 22: <i>Irrigation with nutrient-rich wastewater</i>. This is the level required for sandy soils greater than 500m from surface water. - The spray field irrigation area includes a 5m buffer beyond the extent of the sprinklers range.
	Rupture of pipeline/overflow of irrigation tank causing treated sewage discharge to land		- The irrigation tank is controlled using level floats. - Final water quality, post polishing stage, is expected to meet the levels of E.coli, BOD, pH and TSS, required for medium to low

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Emission	Sources	Potential pathways	Proposed applicant controls
			human contact within the Department of Health <i>Guidelines for the non-potable uses of recycled water in Western Australia</i> .
Odour	Treatment of sewage	Airborne.	The WWTP and irrigation area will be maintained in accordance with the manufacturer's specifications.
Biosolids from sewage treatment	Thickening of excess sludge from treatment plant	Direct application to land.	Sludge is removed annually and disposed of at a registered waste site by an approved contractor.
Category 89 – putrescible landfill			
Dust	Disposal and covering of waste into landfill cell	Airborne.	No specific dust control measures have been proposed by the applicant, however there is an estimated water balance that provides for 1 GL/year to be used for general mine use including dust suppression (mining proposal 76994). This indicates that water trucks and sprays on dust generating infrastructure are to be used on the premises. The DWER also notes that there are no sensitive receptors and the disposal of waste will be episodic not continual in nature.
Leachate	Seepage from landfill trenches	Transport through soil to groundwater	- The landfill will be operated by placing waste into cells and covering with excavated materials to serve as a capping layer between waste cells. - Stormwater bunds have been constructed to direct runoff around the landfill.
Litter	Uncovered waste	Dropped from vehicles during transport Wind blown Spread by feral animals and vermin Contamination of surface water	- Thunderbird Operations will undertake pest animal control in co-operation with regional control programs or as required. - Waste receptacles (rubbish bins) will have lids secured. - Domestic wastes will only be disposed of into the purpose built landfill. - The landfill will be operated by placing waste into cells and covering with excavated materials to serve as a capping layer between waste cells.

Emission	Sources	Potential pathways	Proposed applicant controls
			- The landfill facility is fenced with fauna proof fence. - Recyclable wastes will be collected in a laydown area and transported offsite for recycling. - Packaging wastes associated with reagents will be minimised through bulk buying and returning empty containers to suppliers where possible. - No hydrocarbons and/or chemicals will be disposed of other than into the bioremediation facility.
Associated activities - bioremediation			
Hydrocarbon contaminated soil	Disposal of contaminated soil from operational areas of the prescribed premises	Direct discharge to land	- Each cell of the bioremediation pad is lined with a competent HDPE liner. - The side walls are 1m high. - An earthen bund of 0.5 m will be maintained at the front and rear of the cells.

3.1.2 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 34 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
Mt Jowlaenga pastoral station and homestead	The pastoral station is present across the northern part of the project and the homestead is approximately 7.5 km from proposed mine site and landfill, and 2.5km from the proposed WWTP. The homestead is identified as abandoned by the applicant.
Yeeda Pastoral Station	The pastoral station is present to the south and east of the project and the site access road crosses it. The nearest boundary of the pastoral lease is approximately 7km from the premises boundary.
Environmental receptors	Distance from prescribed activity
Underlying groundwater (TDS values between 110mg/L to 200mg/L)	Broome Sandstone aquifer underlying premises. The water table elevation over the Thunderbird deposit ranges from about 62 m AHD in the south to about 75 m AHD in the north at the edge of the deposit. The depth to groundwater is more than 20 m over most of the Premises. Stage 1 of mining is restricted to the ore body above the groundwater level. Construction of groundwater monitoring bores under conditions in works approval W6088/2017/1 is to be carried out in conjunction with the construction of the tailings storage facility.
Surrounding Vegetation	Mattiske (2016) notes most of the Premises comprises red sandy flats supporting pindan 3 vegetation, which is common and widespread through the broader Kimberley region.
Threatened and priority fauna	<i>Leggadina lakedownensis</i> – <i>kerakenga</i> (northern short tailed mouse). Priority 4. Recorded on the western edge of the mining tenement in 2013. <i>Apus pacificus</i> – fork-tailed swift. Migratory species. Recorded on the mining tenement 2013. <i>Macrotis lagotis</i> – bilby. Vulnerable. Recorded several times across both leases. A Terrestrial Fauna Environmental Management

	Plan: Thunderbird Mineral Sands Project has been developed to meet the requirements of the MS 1080. It is developed to 'provide a framework to ensure that impacts on conservation significant terrestrial fauna, particularly the Greater Bilby and Dampier Peninsula Goanna, attributable to the project are minimised and impacts do not conflict with the EPA objective for terrestrial fauna'.
Surface Water Drainage	The Fraser River is located approximately 7 km north of the Premises, with tributaries that extend down to the north of the Premises. The headwaters of Fraser River South is located approximately 4 km south of the Premises
Acid Sulphate Soils/AMD generating material	Below water table – located around 85m bgl Not being disturbed/exposed in the current proposal.
Naturally Occurring Radioactive Material (NORM)	Mineral sands (being mined and processed at the mine site) contain levels of naturally occurring radioactive materials (NORM); Radiological risks are regulated by DMIRS.

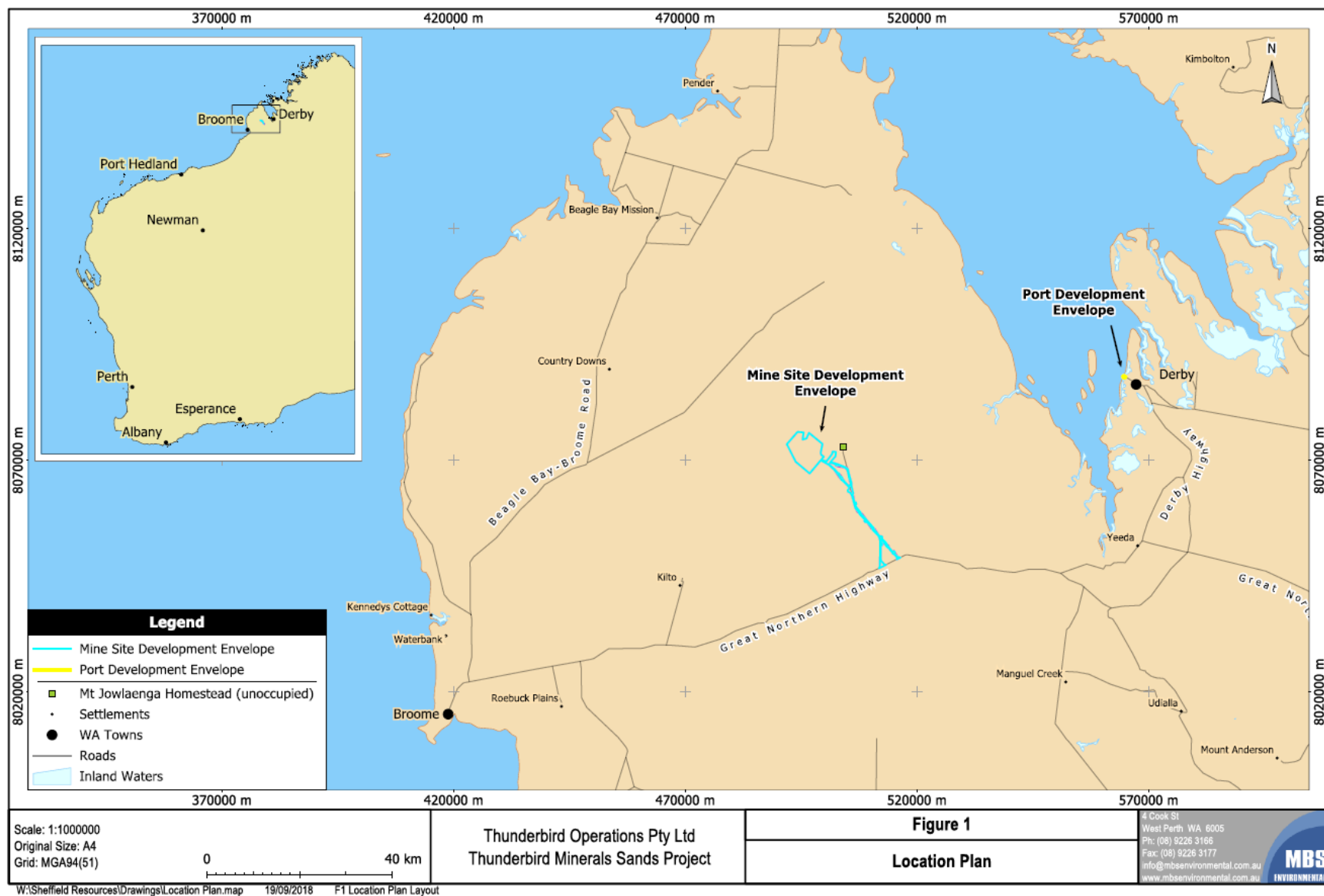


Figure 3: Distance to sensitive receptors

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3.2 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 3.1. 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 3.1), 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 licence 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.

Licence L9335/2022/1 that accompanies this decision report authorises emissions associated with the operation of the premises i.e. Category 8, 54 and activities.

The conditions in the issued licence, as outlined in Table 55 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

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

Risk events					Risk rating ¹	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood			
Operation								
Cat 8 – Mineral sands mining above the water line	Dust	Air/windborne pathway causing impacts to health through smothering	Priority fauna (e.g. bilbies) Surrounding vegetation	Refer to Section 3.1	C = Slight L = Possible Low Risk	N	Condition 1 Standard condition – requirement to use water trucks as needed to suppress dust.	No specific details have been provided for dust suppression in the supporting document, but reference has been made to use of water for dust suppression.
	Noise	Air/windborne pathway causing impacts to	Priority fauna (e.g. bilbies)	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Y	No specific conditions are required	
	Overburden/mine waste/ Acidic soil/ Acidic water	Covering of vegetation and fauna habitat. Contamination of soil by leaching of overburden. Contamination of groundwater by leaching of contaminants from non-saturated layers or exposure of saturated layer to air.	Priority fauna (e.g. bilbies) Surrounding vegetation Surrounding soil Groundwater.	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	Y	Condition 1 Standard condition to include mining to remain above groundwater level. If groundwater breached cease mining and investigate.	No measures to manage acid leaching have been proposed in this stage of the mining as it is considered a low risk as long as mining is above the groundwater level. Conditioning to regulate the mining to remain above groundwater level supports the risk of this emission remaining low.
	Hydrocarbons	Contaminated soil potentially contaminating stormwater. Stormwater soaking through soil to groundwater.	Surface water and groundwater Stock in neighbouring stations drinking surface water or groundwater.	Refer to Section 3.1	C = Minor L = Possible Moderate Risk	Y	Condition 1 Standard condition to include bunding and surface water sump management	
Cat 54: Sewage plant – treatment of sewage and disposal of treated effluent through irrigation.	Effluent	Overland runoff potentially causing ecosystem disturbance or impacting surface water quality. Ponding in irrigation field causing death of vegetation. Nutrient concentration causing native vegetation death and increased weed growth	Native vegetation	Refer to Section 3.1	C = Minor L = Possible Moderate Risk	Y	Condition 1, 2 and 4 Standard condition – includes buffer between sprinkler extent and spray field perimeter. Management to avoid ponding. Limits set on nutrient levels.	Limits are set for nutrient levels as the sizing of the irrigation field to minimise impact is reliant on the nutrient levels in the water discharge.
Category 89: Putrescible landfill – disposal of putrescible waste to trenches	Putrescible waste	Direct discharge to land – insufficient coverage or spillage outside of trench causing material to be spread into wider environment by wind or vermin. Contamination/poisoning of food and water sources	Local native and threatened fauna – predation by vermin attracted by waste, poisoning by ingestion of waste.	Refer to Section 3.1	C = Minor L = Possible Moderate Risk	Y	Condition 1 and 3 Standard condition – include covering requirement, fauna proof fence. Waste condition limiting type of waste disposed of.	
	Leachate	Seepage from landfill trenches contaminating groundwater.	Groundwater	Refer to Section 3.1	C = Minor L = Possible Moderate Risk	Y	Condition 1 and 3 Standard condition – include bunding Waste condition limiting type of waste disposed of.	
Bioremediation facility – disposal of hydrocarbon contaminated material	hydrocarbon contaminated material	Contaminated soil potentially contaminating stormwater. Stormwater soaking through soil to groundwater.	Surface water and groundwater Stock in neighbouring stations drinking surface water or groundwater.	Refer to Section 3.1	C = Slight L = Possible Low Risk	Y	Condition 1 and 3 Standard condition – include lining, disposal of treated material. Waste condition limiting type of waste disposed of.	

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 underline text** depicts additional regulatory controls imposed by department.

4. 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 on 11 July 2022	None received	N/A
Shire of Broome advised of proposal on 11 July 2022	The Shire of Broome reply on 05/08/2022 is summarised below: No development approval is required from the Shire for the works subject of this [licence]. The Shire is satisfied that the proposal is generally consistent with the requirements of Local Planning Scheme No. 6. The applicant is not exempt the requirement to obtain a Building Permit from the Shire of Broome under the provisions of the Building Act. The proposed sewerage facility will also require approval from the Department of Health and the application is to be lodged with the Shire of Broome.	Noted, no action required.
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal 11/07/2022	None received	N/A
Yeeda Pastoral Company advised of proposal on 11/07/2022	None received	N/A
Joombarn-buru Aboriginal Corporation via Kimberley Land Council on 11/07/2022	None received	N/A
Applicant was provided with draft documents on 1/11/2022	The applicant responded on 7/11/2022. Refer to Appendix 1	Refer to Appendix 1

5. Conclusion

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

Licence: [L9335/2022/1](#)

References

1. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
2. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
3. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
4. DWER 2018. *Industry Regulation fact sheet Mineral sands mining or processing*,
5. MBS Environmental (MBS) 2016, Thunderbird Mineral Sands Project mine waste characterization,.
6. WSP Parsons Brinkerhoff (WSP) 2016, *Environmental Noise Impact Assessment Thunderbird Mineral Sands Project mine site development envelopment envelope*, WSP Parsons Brinckerhoff, Perth, Western Australia.
7. MBS Environmental (MBS) 2019, [Mining proposal 76994] Mining proposal: Thunderbird Mineral Sands Project construction and mining (Years 1 – 3), MBS Environmental, Perth, Western Australia.

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

Condition	Summary of applicant's comment	Department's response
Table 1 Active Mine Pits: Drainage from the mine excavation must be directed into holding sumps and used for dust suppression.	Request additional flexibility to allow reuse of collected stormwater for dust suppression and ore processing. It is noted that in periods where there are large quantities of stormwater collected, the need for dust suppression may be low. Allowing collected water to be used for slurring of ore from the MUP to the wet concentration plant (WCP) or use within the WCP would allow more rapid removal of water from the pit area.	The use of this water in the ore processing will not alter the risk assessment of the mining or ore processing activities and, as the commencement of ore processing may be made under the time limited operations of the licence and prior to further licence amendment then this use of the water is required to be authorised within the licence. Condition amended.
Table 1 MUP Operational management requirements for the MUP	It is noted that a water cart will be active within the mine pit and it will be used as necessary to mitigate fugitive dust emissions within the pit including as ore is transferred to the MUP. Once ore is fed into the MUP, dust will be controlled through application of water from spray bars that are part of the MUP unit. As ore is screened, it is slurred in the liquefier chute and pumped from the MUP to the WCP.	Table 1 updated with details.
Table 1 Irrigation Sprayfield (a) The spray field irrigation area includes a 5m buffer beyond the extent of the sprinklers range. (b) Irrigation via the spray irrigator to be even and spray irrigators operate as per manufacturers specification. (c) The fence around entire perimeter of spray field is maintained. (d) Ensure spray drift does not extend beyond perimeter fence.	The need to prevent spray drift beyond the fence perimeter is questioned. As per the Environmental Completion Report, the sprayfield comprises predominantly uncleared native vegetation. The areas of vegetation clearing are limited to the external fence and slashing for the pipelines and sprinklers. The environmental values in the area immediately external to the fence are no different to the actual sprayfield. Spray drift beyond the external fence will be managed via placement of the sprinklers. No adverse impacts are however predicted if occasional spray drift in windy conditions was to occur. Management of irrigation to prevent ponding on ground surfaces is considered adequate to address adverse impacts.	Table 1 updated

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Condition	Summary of applicant's comment	Department's response
Table 3 Hydrocarbon Contaminated Soil Applicant to confirm capacity of the cells with allowance for freeboard.	As per the drawings provided the facility will have 2 cells (one active and 1 passive) with both cells 25 m wide x 50 m long and 0.5 m depth (capacity of 625 m3). The 0.5 m high bund at surface level will prevent entry of surface runoff into the operational cells. The cells will be operated so that the maximum fill level in the wet season is 0.3 m to allow freeboard of about 0.2 m which is equivalent to a 10% AEP for a 24 hour storm event.	
Decision report: Table 3 Last Row Bioremediation The side walls are 1m high	The design shows that the side wall is in fact 0.5 m high.	Corrected

Appendix 2: Infrastructure diagrams

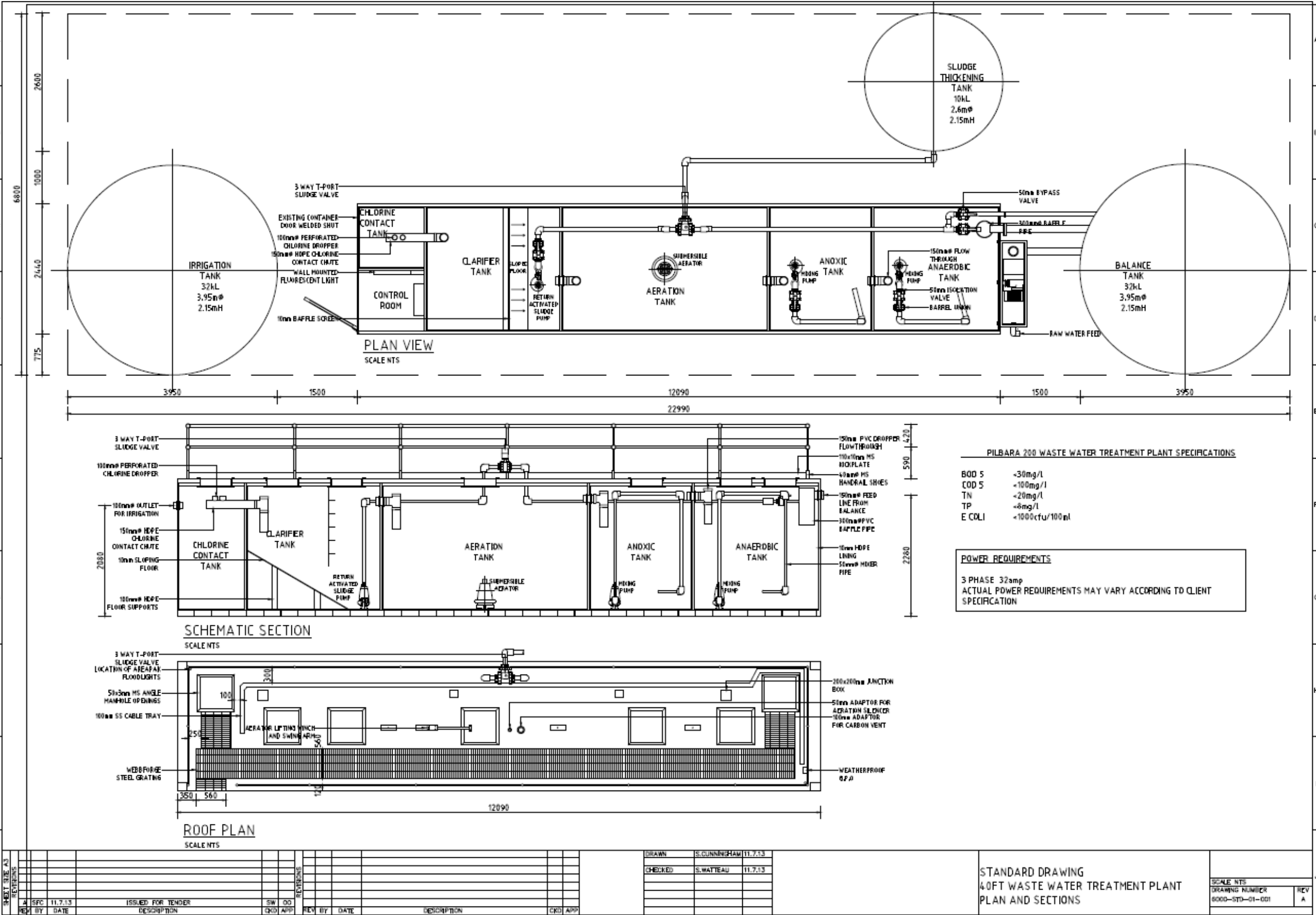


Figure 4: WWTP infrastructure

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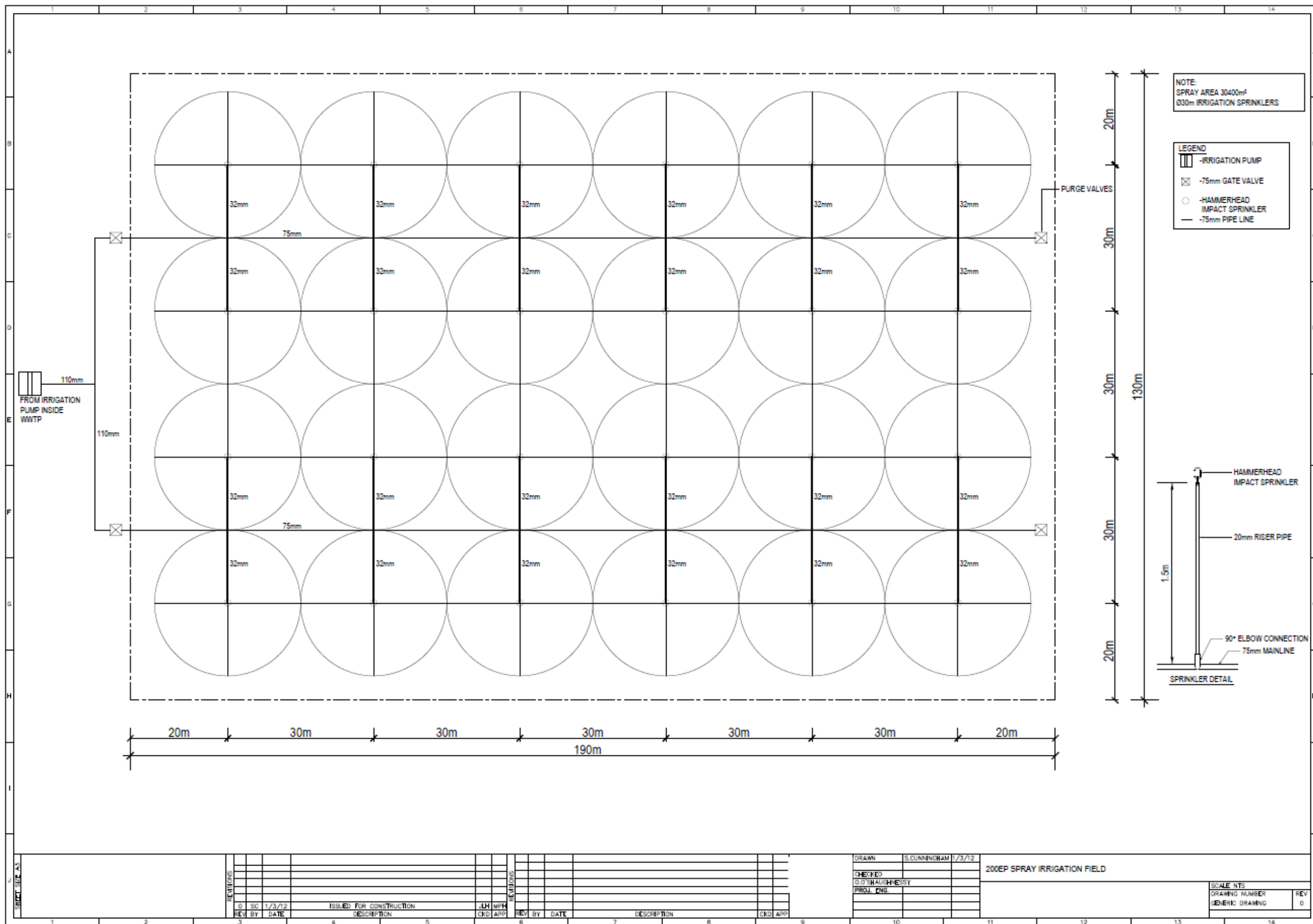


Figure 5: Sprinkler field with sprinkler detail

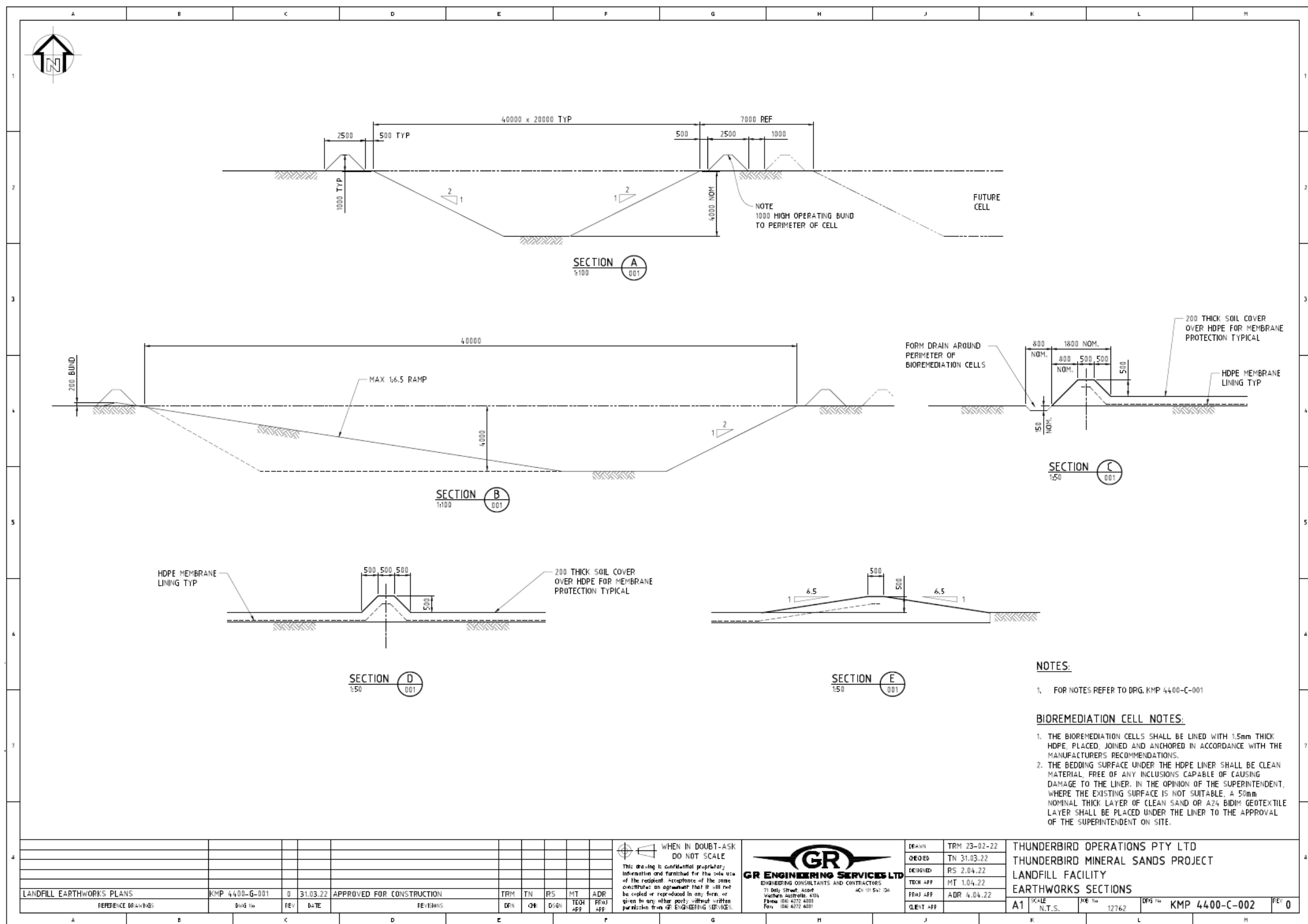


Figure 6: Landfill cell and bioremediation facility design

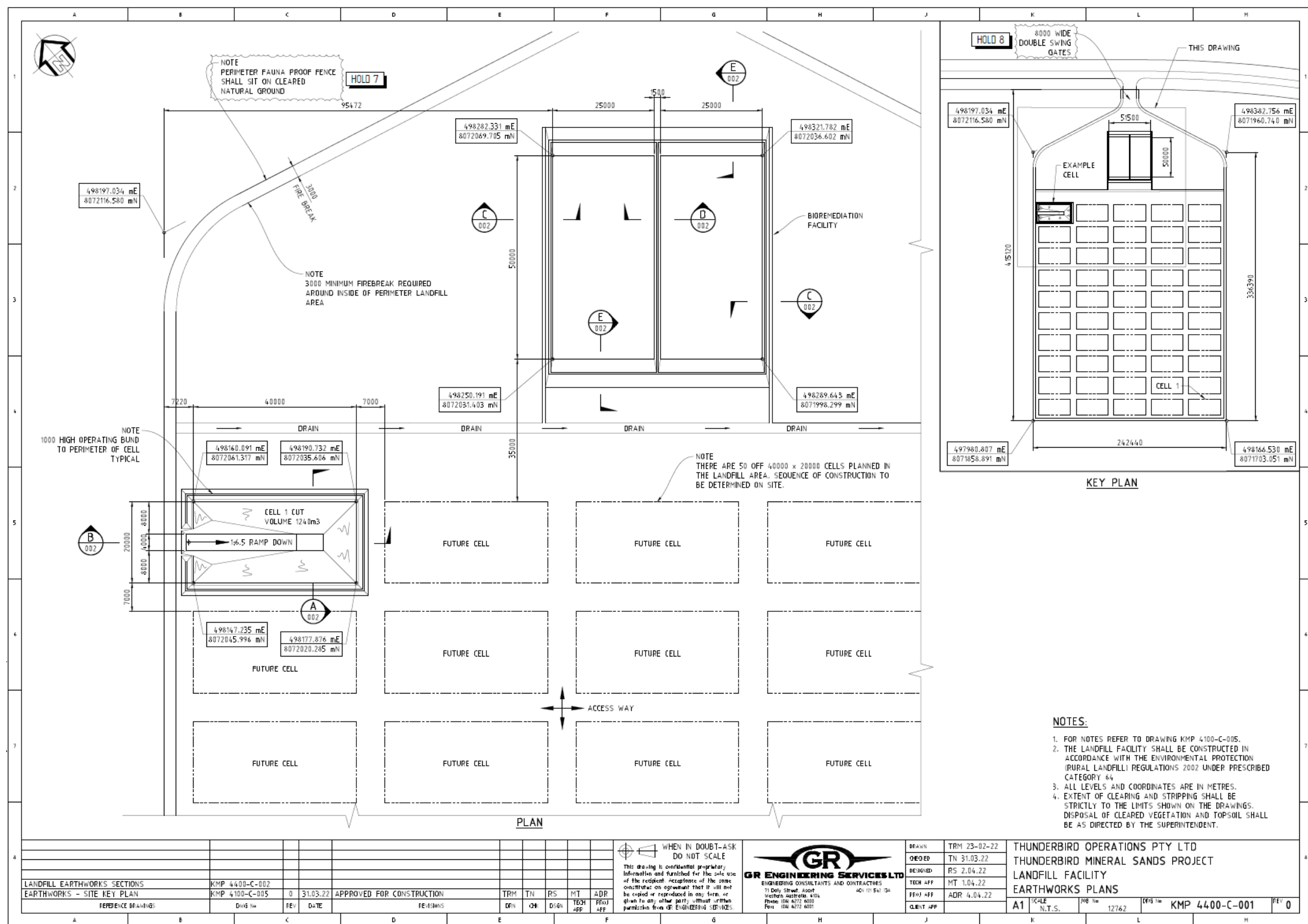


Figure 7: Layout of landfill facility

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Appendix 3: Application validation summary

SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)					
Application type					
Licence	☒	Relevant works approval number:	W6088/2017/1	None	☐
		Has the works approval been complied with?		Yes ☒ No ☐	
		Has time limited operations under the works approval demonstrated acceptable operations?		Yes ☒ No ☐ N/A ☐	
		Environmental Compliance Report submitted?		Yes ☒ No ☐	
		Date report received:	31/05/2022		
Date application received		23/05/2022			
Applicant and premises details					
Applicant name/s (full legal name/s)		Thunderbird Operations Pty Ltd			
Premises name		Thunderbird Mineral Sands Project			
Premises location		M04/459 (expires 24/09/39), L04/85 (expires 22/04/36)			
Local Government Authority		Shire of Broome			
Application documents					
HPCM file reference number:		DER2022/000219			
Key application documents (additional to application form):		Included with the application: Shape files of prescribed premises Attachment 2 – maps of premises Attachment 3B – Proposed activities (details of activities on the premises) Attachment 5: Other approvals and consultation documentation Attachment 6A – Emission details Attachment 7 – Siting Submitted separately Construction Compliance Report: Wastewater Treatment Plant, Landfill Facility – required by conditions 1-3 of the works approval W6088/2017/1 for the infrastructure described as Phase 2 in Table 1 of that instrument.			
Scope of application/assessment					
Summary of proposed activities or changes to existing operations.		Operation of • Wastewater Treatment Plant (WWTP1) (Category 54). To service accommodation village. • Putrescible Landfill (Category 89). To service accommodation village and mining operations. Situated on L04/85 • Mineral Sand Mining (Category 8) – only the mining of mineral sands above the water level is included with this application. The processing and tailings facilities are not constructed and no dewatering is required.			

SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)

Category number/s (activities that cause the premises to become prescribed premises)

Table 1: Prescribed premises categories

Prescribed premises category and description	Proposed production or design capacity	Proposed changes to the production or design capacity (amendments only)
Category 8: Mineral sands mining or processing	12.5 Mtpa	N/A
Category 54: Sewage facility	100 m3/day	N/A
Category 89: Putrescible landfill site	1,100 tpa	N/A

Legislative context and other approvals

Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes ☐ No ☒	Referral decision No: Managed under Part V ☐ Assessed under Part IV ☐
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes ☒ No ☐	Ministerial statement No: 1080 EPA Report No: 1606
Has the proposal been referred and/or assessed under the EPBC Act?	Yes ☒ No ☐	Reference No: 2016/648
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes ☒ No ☐	Mining lease / tenement ☒ M04/459 (expires 24/09/39), L04/85 (expires 22/04/36)
Has the applicant obtained all relevant planning approvals?	Yes ☐ No ☐ N/A ☐	Approval: Expiry date: If N/A explain why?
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes ☐ No ☒	CPS No: N/A Exemption as MS1080 authorises clearing
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes ☐ No ☒	Application reference No: N/A Licence/permit No: N/A No licence required
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes ☒ No ☐	Licence/permit No: GWL201977

SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)		
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes ☒ No ☐	Name: Canning-Kimberley Type: Proclaimed Groundwater Area Has Regulatory Services (Water) been consulted? Yes ☐ No ☒ N/A ☐ Regional office: North West
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes ☐ No ☒	Name: N/A Priority: P1 / P2 / P3 / N/A Are the proposed activities/ landuse compatible with the PDWSA (refer to <u>WQPN 25</u>)? Yes ☐ No ☐ N/A ☒
Is the Premises subject to any other Acts or subsidiary regulations (e.g. <i>Dangerous Goods Safety Act 2004</i> , <i>Environmental Protection (Controlled Waste) Regulations 2004</i> , <i>State Agreement Act xxxx</i>)	Yes ☒ No ☐	Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth) Mining Act 1978 Rights in Water and irrigation Act 1918
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes ☐ No ☒	
Is the Premises subject to any EPP requirements?	Yes ☐ No ☒	
Is the Premises a known or suspected contaminated site under the <i>Contaminated Sites Act 2003</i> ?	Yes ☐ No ☒	Classification: N/A Date of classification: N/A