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1. INTRODUCTION

1.1 BACKGROUND

Liontown Resources Limited (Liontown) plans to develop the proposed Kathleen Valley Lithium-Tantalum Project (the Project), which is located 680 km northeast of Perth and approximately 45 km north northwest of Leinster in the Northern Goldfields region of Western Australia.

It is proposed the Project will include:

- Two small open pit mines located south of Jones Creek.
- One underground mine which will extend to about 450 m in depth. This includes ventilation shafts and will be accessed by three declines, the portal of one which will be external to the pits. Two paste plants will be constructed to provide paste fill for underground stopes.
- Processing plant including supporting activities such as a Process Water Pond, Run of Mine (ROM) Pad and low-grade ore stockpiles. Ore will be processed at 2.5 Mtpa initially with an increase in throughput to 4 Mtpa in 2029.
- Two tailings storage facilities (TSFs) consisting of three cells, with the second facility (third cell) being constructed about 12 years after Project commencement.
- One temporary waste rock dump (WRD). Waste rock will be used for construction of TSF embankment lifts over time and no permanent WRD will be required post closure.
- A borefield and water conveyance infrastructure.
- An integrated energy facility comprised of a natural gas power plant, solar farm and wind turbines to provide power for the Project.
- An on-site accommodation village located north of Jones Creek and the mining and ore processing facilities.
- Roads including connection from the Goldfields Highway and internal roads and tracks.
- Supporting infrastructure such as laydown areas, workshops, on-site offices, power transmission lines, a water treatment plant, landfill, magazine, surface water management infrastructure and topsoil stockpiles.

The Project is expected to have a life of approximately 23 years.

1.2 PURPOSE

Liontown aims to develop Kathleen Valley Lithium Project to process spodumene bearing pegmatites to produce a spodumene concentrate for sale via export or processing within Western Australia. The Project will comprise the development of two small open pits and an underground mine with physical ore processing in order to produce a saleable product.

The Government of Western Australia's Department of Water and Environmental Regulation (DWER) regulates industrial emissions and discharges to the environment through a works approval and licensing process, under Part V of the *Environmental Protection Act 1986* (EP Act). Industrial premises with potential to cause emissions and discharges to air, land or water are known as prescribed premises and trigger regulation under the EP Act. Prescribed premises categories are outlined in Schedule 1 of the *Environmental Protection Regulations, 1987*.

This Works Approval application is submitted to DWER to obtain approval for the construction and commissioning of key components of the Project to allow for the mining and processing of ore.

This application specifically seeks approval for the construction and commissioning of the following items of infrastructure:

- Process Plant to produce spodumene and tantalum concentrates.
- TSF1 for permanent disposal of tailings.
- Paste plants for underground stope fill with cemented tails fill.
- Electric power generation facility.
- Wastewater treatment plants.
- Landfill facility.

This application does not request approval for construction of TSF2 noting this will not be required until about Year 12 of the Project. A separate application will be made closer to commencement of construction of TSF2.

Information presented in this document aims to assist DWER in assessing the adequacy of proposed pollution prevention and control measures to ensure adverse environmental impacts are prevented or minimised to levels where appropriate environmental standards can be complied with.

1.3 Project Summary

1.3.1 Location

The Project is located 680 km northeast of Perth and approximately 60 km north northwest of Leinster in the Northern Goldfields region of Western Australia. The Project is located on several tenements as shown in Table 1 and is situated across Crown Reserve 8560 (Kathleen Town Common) and Yakabindie Pastoral Station.

1.3.2 Tenure

The Project is situated within four Mining Leases M36/265, M36/459, M36/460 and M36/696. The proposed borefield is located on two Miscellaneous Licence applications L36/255 and L36/256 and the proposed magazine is located on General Purpose lease application G36/52.

The tenements relevant to the Project are solely held by LRL (AUST) Pty Ltd, a wholly owned subsidiary of Liontown. Other entities retain gold and nickel rights within these tenements. Evidence of ownership is provided in Attachment 1A. A tenement summary is provided in Table 1 with a tenement plan presented in Figure 2 of Attachment 2.

Table 1: Project Tenements

Tenement	Tenement Holder	Area (ha)	Grant Date	Expiry Date
M36/265	LRL Pty Ltd	103.30	28/06/1993	27/06/2035
M36/459	LRL Pty Ltd	326.75	04/05/1999	03/05/2041
M36/460	LRL Pty Ltd	947.90	04/05/1999	03/05/2041
M36/696	LRL Pty Ltd	506.00	13/01/2022	12/01/2043
G36/52	LRL Pty Ltd	9.59	N/A	N/A
L36/255	LRL Pty Ltd	11.99	N/A	N/A
L36/256	LRL Pty Ltd	10.00	N/A	N/A

Table 3: Prescribed Premise Categories

Category Number	Description of Category	Production or Design Capacity Threshold	Relevant Project Infrastructure
5	Processing or beneficiation of metallic or non-metallic ore; premises on which: a) Metallic or non-metallic ore is crushed, ground, milled or otherwise processed. b) Tailings from metallic or non-metallic ore are reprocessed. c) Tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam	50,000 t or more per year	Processing Plant, TSF1 and Paste Plants
52	Electric power generation: premises (other than premises within category 53 or an emergency or standby power generating plant) on which electrical power is generated using a fuel	20 MW or more in aggregate (using natural gas)	Electric power generation facility
54	Sewage facility; premises: a) on which sewage is treated (excluding septic tanks) or b) from which treated sewage is discharged onto land or into waters.	More than 100 m³/day	Wastewater treatment plants (WWTP)
89	Putrescible landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer, as amended from time to time) is accepted for burial.	More than 20 but less than 5,000 t per year	Landfill facility

1.3.5 Timeline for Development

Subject to all regulatory approvals for the Project being received, Liontown anticipates construction works will commence in August 2022, with commissioning expected to be complete by April 2024. Operation of the Kathleen Valley Lithium-Tantalum Project is scheduled to commence in Q4 2024.

The Project is expected to have a lifespan of 23 years.

The proposed schedule for the Project is described in Table 4.

Table 4: Proposed Schedule for the Kathleen Valley Lithium-Tantalum Project

Infrastructure	Proposed Construction Commencement	Commissioning Period (weeks)
Processing Plant -Stage 1 (2.5 Mtpa)	Commencing Q3 2022, competed in Q1 2024	24 Weeks
Processing Plant -Stage 2 (4 Mtpa)	Commencing 2027, competed in 2028	24 Weeks
TSF1 (cells 1 and 2)	Commencing Q3 2022, completed in Q1 2024	12 weeks
TSF2 (cell 3)	Commencing in Year 11 of operations to be completed for use in year 12 of operations	12 weeks
Electric power generation facility	Commencing Q3 2022, completed in Q1 2024	26 weeks
Wastewater Treatment Plant	Commencing 2022, completed in Q3 2023	16 weeks
Landfill facility	Commencing Q3 2022, progressing to Q2 2023	N/A

1.4 EXISTING ENVIRONMENT

A description of the existing environment at the Project site is provided in Attachment 7 of the Works Approval Application and is not repeated here.

2. SCHEDULE 1 CATEGORIES FOR THE PROJECT

2.1 PROCESS PLANT (CATEGORY 5)

Key characteristics of the Process Plant are presented in Table 5.

Table 5: Key Characteristics of the Process Plant

Project Operations	Continuous (24 hours per day, 7 days a week, 365 days a year)
Flowsheet	Crushing, grinding and floating to produce spodumene and tantalum concentrates
Type of Plant	Flotation
Ore Processing Rate	Throughput 2.5 Mtpa expanding to 4.0 Mtpa in Year 4 of operations
Spodumene Concentrate Production	500 – 700 ktpa
Tantalum Concentrate Production	3 - 5 ktpa

The Process Plant area includes the ore processing equipment, fuel storage and dispensing facility, washdown area, process water tanks, ore stockpiles and associated electrical transformers. The Process Plant will be located southwest of the proposed open pits and south of the proposed underground box cut portal. The ROM Pad will be positioned on the eastern end of the Process Plant, central to the mining activities allowing direct access from the pits / portals to the ROM Pad.

The Process Plant consists of a mineral processing concentrator with associated services and ancillaries. The plant will operate 24 hours a day to crush, wash and separate ore and waste materials. The process flow sheet is shown as Figure 1.

The Process Plant will use the following key operations to produce a spodumene concentrate for export:

- Feed preparation using two-stage crushing.
- SAG milling for the 2.5 Mtpa circuit, expanded to a semi autogenous mill-ball (SABC) circuit for the 4.0 Mtpa circuit.
- Magnetic separation (LIMs and WHIMs) and gravity recovery of tantalum.
- Primary desliming and caustic conditioning.
- Three-stage flotation: Rougher, cleaner, recleaner.
- Concentrate thickening and filtration.
- Concentrate storage.
- Tails thickening and disposal with provision to grind and pump to the underground mine for paste fill.

Detailed information on each aspect is provided in the following sections.

The Process Plant area layout is shown in Figure 1 and Figure 2.

2.1.1 Feed Preparation

Ore will be fed from the ROM bin to the primary crusher by a variable speed apron feeder, which will discharge over a vibrating grizzly. Primary crushed ore will discharge to the secondary crusher, which will operate as an open circuit.

The secondary crushed ore surge bin will have surge capacity. Excess crushed ore will overflow from the bin onto a stockpile feed conveyor which will discharge to a stockpile. A sump pump will be provided for spillage management in the area.

The primary crushing facility will include dust collection after the crusher and additional dust suppression sprays which will be used as required. The secondary crushing facility will include dust collection after the crusher.

2.1.2 Semi Autogenous Grinding

Ore will be ground in a SAG mill. Allowance has been made in plant design for later installation of a ball mill.

Ore will be reclaimed from the secondary crushed ore surge bin. The SAG mill will be equipped with an approximately 5,500 kW drive. Spillage from the area will be picked up by two sump pumps, one at the feed and one at the discharge end of the milling area.

Oversize pebbles from the SAG mill will discharge onto the pebble transfer conveyor and will be conveyed to the pebble crushing circuit.

2.1.3 Magnetic Separation

Cyclone overflow from the SAG mill will feed two Low Intensity Magnetic Separators (LIMS). The LIMS will remove any ferrous materials from the feed stream and protect the Wet High Intensity Magnetic Separators (WHIMS) located downstream. The LIMS magnetics stream will gravitate to the combined LIMS / WHIMS magnetics hopper.

The LIMS non-magnetics stream will gravitate to a vibrating trash screen for removal of any trash that would block the matrix of the WHIMS. Trash will report to a bunker for disposal while undersize will gravitate to the WHIMS feed hopper. The trash screen undersize will be pumped to a feed distribution box ahead of the WHIMS. From here, slurry will gravitate to two single WHIMS units where any weaker magnetics from the feed stream that may affect downstream processing will be removed. The WHIMS magnetics stream will gravitate to the combined LIMS / WHIMS magnetics hopper. The WHIMS non-magnetics stream will gravitate to the agitated primary deslime feed tank.

For high tantalum grade feeds, the combined magnetics stream will be pumped to the tantalum recovery circuit.

2.1.4 Tantalum Recovery

Combined LIMS / WHIMS magnetics will be processed through a tantalum recovery circuit, which will include gravity upgrade on spirals and tables together with a filter and dryer. Provision for future installation of an additional magnetic separator has also been made.

The dried concentrate will initially discharge into a bin ahead of loading into bulk bags. Bulk bags will be stored on site and periodically loaded into shipping containers for transport to an offsite treatment facility.

The tails stream from the spirals and tables will be processed via a secondary LIMS, with the non-magnetics being sent to the deslime cyclones to have the remaining Li_2O removed, and the magnetics being sent to the process tails thickener to be treated and sequestered with the flotation tails in either underground paste fill or the TSF.

2.1.5 Desliming and Caustic Conditioning

The combined WHIMS / LIMS non-magnetics stream will be pumped to the agitated primary deslime feed tank from where it will be treated by hydrocyclones fitted for desliming at 20 µm. The cyclone underflow will gravitate to a caustic scrubbing tank. Overflow from the hydrocyclones will report to the process tails thickener for water recovery.

The cyclone underflow will be dosed with caustic soda at approximately 350 g/t and agitated to scrub and freshen the surface prior to addition of collector. This high energy scrub will generate additional slimes and a second stage of desliming will be completed. The overflow from the secondary slime hydrocyclones will report to the process tails thickener for water recovery

2.1.6 Flotation

The flotation feed stream will be conditioned in a series of two agitated tanks. Collector and soda ash activator will be pre-mixed before being dosed in a conditioning tank. The overflow of the first conditioning tank will report to the flotation circuit.

The floatation circuit configuration includes a roughing stage followed by two stages of cleaning to produce an upgraded spodumene concentrate and a barren tailings stream.

2.1.7 Spodumene Concentrate Thickening and Filtration

The final spodumene flotation concentrate will be pumped to a concentrate thickener prior to filtration. The thickener feed slurry will be mixed with flocculant and coagulant prior to discharging into the thickener. The thickener overflow will report to the flotation water tank for recycling in the flotation plant. Thickened concentrate will be pumped to a filter feed distribution box ahead of the two belt filters.

2.1.8 Concentrate Storage

Spodumene concentrate (nominal moisture 8 – 10%) from the concentrate belt filters will be conveyed to a radial stacker stacking into the covered concentrate storage shed.

The concentrate storage shed will have a maximum capacity of 15,600 t (9,000 m^3). The concentrate storage shed has been designed for the 4.0 Mtpa nameplate capacity.

Tantalum concentrate will be stored in bulk bags in dedicated shipping containers adjacent to the reagents shed.

2.1.9 Tails Thickening

Tailings from the LIMS / WHIMS circuit together with slimes prior to the flotation circuit will report to a dedicated process tails thickener. The thickener feed slurry will be mixed with flocculant and coagulant prior to discharging into the thickener. Thickener underflow will be pumped to the tailings hopper. The process tails thickener overflow will gravitate to the process water tank for recycling in the front part of the process plant. Total tailings produced will be 35 Mt over the life of mine.

Rougher flotation tailings will report to a second flotation tails thickener. The thickener feed slurry will be mixed with flocculant and coagulant prior to discharging into the thickener. Thickener underflow will be pumped to the tailings hopper. The flotation tails thickener overflow will gravitate to the flotation water tank for recycling in the flotation circuit.

The combined process tails thickener and flotation tails thickener underflow streams, together with any tailings spillage will be pumped to either TSF or the paste fill plant. Approximately 50% of the tailings will be pumped to the TSF and 50% to the paste fill plant.

The underground mining operation is expected to require paste fill for support approximately 50% of plant operating time. As the primary grind in the process plant is too coarse for efficient paste fill, a tails treatment facility will be included prior to the separable remote paste fill facility located above the underground stoping facilities.

In order to prepare the material for paste fill the tailings will first be pumped to a cyclone distributor to classify the tailings at a target P80 of 125 µm. Product with a target P80 of 125 µm will join the remaining streams in the final tails hopper and will be pumped to the paste plant.

2.1.10 Concentrate Transport

Spodumene concentrate will be loaded from the concentrate storage shed onto trucks which will transport concentrate to Geraldton Port. The proposed concentrate handling method is compliant with Class 9 transport requirements and no special bulk shipping restrictions currently apply for UN 3077 mineral concentrates. The product is neither classified as a dangerous nor hazardous good in transit. It is a benign product and is not affected by typical atmospheric conditions (heat, cold, rain).

Tantalum concentrate will be transported in bulk bags to Geraldton for export. Radiation activity levels will be managed so that they are <10 Bq/g and will not be designated as a Dangerous Good and will not require a Radiation Transport Management Plan.

2.1.11 Process Reagents

A number of reagents will be used in the process plant. Reagents will be delivered by road in containers or in bulk. Bulk delivery will minimise waste generation due to packaging and where possible, containers will be sent back to the supplier for recycle or disposal.

All bulk reagents will be delivered into and stored within facilities onsite, located adjacent the processing plant. All chemical reagents will be stored within tanks or silos in appropriately bunded facilities whereby 110% of the largest vessel is contained and 25% of the total volume is contained according to Australian Standards (AS1940 and AS1692).

Sufficient stocks of reagents will be stored on site to ensure that supply interruptions due to port, transport or weather delays do not restrict production; typically 14 days capacity will be stored on site. Reagents, their purpose, delivery method and typical storage volume are provided in Table 6.

Table 6: Processing Reagents, Delivery and Storage

Reagent	Location for Use / Purpose	Site Delivery	Typical Site Storage
Soda ash	Flotation circuit	1 tonne bulk bags	38 m^3
Caustic Soda	Flotation conditioning	40 kL isotainers at 50% concentration	80 m^3
Collector	Flotation circuit	Bulk tanker isotainers transferred to two heated storage tanks	100 m^3
Frother	Flotation circuit	1,000 L IBCs	2 m^3
Sodium Silicate	Flotation circuit	1,000 L IBCs	2 m^3
Dewatering Aid	Concentrate belt filters	1,000 L IBCs	2 m^3
Coagulant	Thickening gent	1,000 L IBCs	2 m^3
Flocculant	Thickening agent	1 tonne bulk bags	32 m^3
Anti-foam reagent	Flotation circuit	1,000 L IBCs	2 m^3

2.1.12 Process Water Tank

A process water tank will be installed adjacent to the processing plant with a storage capacity sufficient for plant operations. The process water tank will be supplied from the process thickener overflow and decant return and topped up with raw water as required. This will be used for cyclone feed dilution, WHIMS feed dilution, tantalum circuit, screen sprays as well as service points.

Raw water will be stored in two interconnected tanks. This will provide the main surge from the borefield. Raw water will be supplied from the tanks to underground and open pit mining services, the crushing plant and for gland water use. Water will be pumped from the tanks to a water treatment plant if required for removal of any deleterious salts prior to use in reagent mixing and flotation. This treated water will be stored in a tank on site with water reticulated as required.

2.2 TAILINGS STORAGE FACILITY (CATEGORY 5)

2.2.1 Overview

Key characteristics of TSF1 are presented in Table 7.

Table 7: Key Characteristics for the Tailings Storage Facilities

Project Operations	Continuous (24 hours per day, 7 days a week, 365 days a year)
Consequence Category	'High' Category 1 (DMIRS), High A / 'Very Low' (ANCOLD)
Maximum rate of rise	4.1 m for TSF1
Average in-situ dry density	1.0 - 1.35 t/m^3
Construction method	Downstream lifts - zoned embankments
Beach slope	1 V in 100 H
Total tailings discharge	Discharge annual rate ranging from 0.86 to 1.4 Mtpa, for a total of approximately 14.72 Mt
Tailings characterisation	Non acid forming, non saline, benign
Final TSF height	Maximum height of 25.1 m
Tailings slurry density	55% solids by weigh

Two above ground, 4-sided, paddock-style TSFs will be constructed using both low permeability material won from the base of the TSF and waste materials from the WRD. The TSFs will be constructed in stages over the project life to store tailings from the Processing Plant. Tailings will discharged to TSF1 at an annual rate ranging from 0.86 to 1.4 Mtpa, for a total of approximately 14.72 Mt.

Due to the permeability of the underlying hardpan, the TSF1 design incorporates an impermeable high density polyethylene (HDPE) liner in the subgrade. Tailings geochemical testing undertaken (Section 7.3.3) indicates that the tailings material and supernatant water does not contain any hazardous materials or substances and will be benign. HDPE lining will be used to maximise water recovery from the TSFs.

Liontown Resources engaged Knight Piesold Pty Ltd (REC) to design the TSFs. The TSFs have been designed in accordance with *Code of Practice for Tailings Storage Facilities in Western Australia* (DMP 2013) and *ANCOLD Guidelines on Tailings Dam Planning, Design, Construction, Operation and Closure* (ANCOLD 2019). They will be constructed under the supervision of a suitably accredited engineer and in accordance with industry standards and guidelines. The TSF Design Report is provided in Appendix 1.

2.2.2 Tailings Characterisation

MBS were commissioned to undertake geochemical characterisation of tailings samples in 2021. The tailings samples were assessed geochemically for the potential of the material to contribute to acid, saline, and neutral leaching of environmentally significant metals and/or metalloids to the surrounding environment. The Tailings Characterisation Report is provided in Appendix 2.

The major findings of the assessment indicate:

- Tailings are classified as NAF largely due to containing very low total sulfur concentrations.
- Tailings will be enriched in the following elements - beryllium, bismuth caesium, lithium, rubidium, rhenium, tin, tantalum, tellurium, and thallium.
- Leachates generated from the tailing will be alkaline, non-saline, and generally contain low concentrations of major ions, metals, and metalloids including those described above which were 'enriched'.
- Aluminium was the only element in leachate that has potential to exceed a relevant environmental trigger value (DER 2014) non-potable use groundwater). In an environmental context, however, this result is not of concern given that tailings are proposed to be stored in a specialised TSF, and the aluminium itself is likely to be colloidal rather than dissolved and will eventually settle and be removed from solution.
- Under highly oxidising conditions, tailings leachates are likely to be circum-neutral, non-saline and contain low concentrations of fluoride, major ions, and metals/metalloids. These conditions are considered unlikely to occur.
- LEAF 1313 and 1314 tests were used to assess whether the composition of tailings leachates was likely to change under different pH conditions and as liquid:solid ratios change over time. Results indicate that exceedances of relevant environmental guidelines are only likely to occur under either extreme pH values (e.g. 2.2, 13.1) or under very low liquid:solid ratios which are well below ratios typically found within TSFs. Consequently, under pH conditions and liquid:solid ratios typically found within TSFs and the surrounding environment, the risk of the tailings sample producing environmentally hazardous leachates is considered to be very low.
- In terms of alternate means of disposal, the tailings sample would qualify for disposal in Class I landfill (DWER 2018) as concentrations of all elements were below threshold concentrations.
- NORM values within tailings will be well below relevant human health and transport guideline concentrations.

In summary, the composite tailings sample assessed is relatively benign in a geochemical context. There is little to no risk of the material producing acidic leachates, and despite being enriched in a number of elements, under environmentally realistic conditions, leachates are highly unlikely to exceed relevant environmental trigger values. Consequently, no specialised management measures are required for long term tailings management.

2.2.3 TSF Design

TSF1 will comprise a paddock facility consisting of a zoned, downstream constructed embankment designed to store a total of approximately 14.72 Mt of tailings at an average rate of approximately 1.0 to 1.6 Mtpa. The total footprint area (including the basin area) will be approximately 102 ha.

TSF1 will be initially developed as a single cell (Cell 1 Stage 1A) with a second cell (Cell 2 Stage 1B) developed when Cell 1 nears the Stage 1A capacity. The initial storage capacity for Stage 1A (Cell 1) and Stage 1B (Cell 2) will be approximately 24 months and 12 months of tailings respectively. This allows flexibility for construction timing of Stage 1B without having to commence the construction of Stage 1B within the first 12 months of operations. Thereafter, capacity will be increased via staged embankment construction (Knight Piesold, 2021).

The embankments will be constructed in stages, with the core zones being constructed by a specialist earthworks contractor and the structural embankment being constructed by the mining fleet as part of the mine waste operations from the open pits. It has been indicated that the majority of the TSF1 structural fill will be placed within the first two years of mining activities. The TSF embankment design is shown in Figure 3.

Table 8 provides details on the stages proposed for TSF1.

Table 8: TSF1 Embankment Details

Stage	Cell	Crest Level (m RL)	Raise Height (m)
1A	1	519.0	Varies
1B	2	520.0	Varies
2	1 & 2	523.0	3.4
3	1 & 2	526.9	3.9
4	1 & 2	530.9	4.0
5	1 & 2	535.0	4.1

The design incorporates a compacted HDPE liner subgrade, basin HDPE liner over the entire basin area and an underdrainage system. The underdrainage system and upstream toe drains at the embankments are included in the design to reduce seepage losses and increase the water recycle to the Process Plant. As the tailings are considered to have a high permeability, it is expected that the underdrainage system will be important in terms of water conservation and recovery.

Tailings will be discharged into the facility from the embankments by sub-aerial deposition methods, using banks of spigots at regular intervals to maintain the supernatant pond near the decant tower. The decant towers are located in the centre of each cell and will collect and pump reclaim supernatant and rainwater to the process plant via a decant return pipeline (pump and pipeline design by others) over the life of the facility. The active tailings beach will be regularly rotated around the facility to improve tailings density.

The TSF1 design criteria are summarised in Table 9.

Table 9: TSF1 Design Criteria

Design Parameter	
Storm Events	**Design Application**
Average climatic conditions maximum operating volumes plus the 1:10 year ARI wet season and 1:100 yr 72 hr storm	TSF stormwater storage capacity
Water Management	
Supernatant pond	Minimum operating pond (target pond size) of 20,000 m^3
Operations	
Capacity - Final Initial capacity - Stage 1	~ 14.72 Mt of dry tails over ~12 years ~ 1.85 Mt of dry tails (24 months)
Deposition Rate (tailings)	~ 1.0 to 1.6 Mtpa
Production hours/year	8,000 (91 % availability)
Slurry Characteristics	• 55% solids by weight • Slurry settled density = 1.0 - 1.35 t/m^3 • Permeability of 8 x 10^{-6} m/s • Nominal bench slope 1V in 100H • Minimum raw water allowance to Process Plant 10%
Fluid Management	• Basin underdrainage system reports (via gravity) into a collection sump and pumped to supernatant pond or direct to the Process Plant • Decant tower removal of supernatant solution via pipeline to the plant. Decant towers located at the centre of the facility. Decant towers raised to design pond elevations • Collect surface water (runoff) via decant
Construction	• Upstream cut-off trench and toe drain • Zoned embankment comprising HDPE liner subgrade and structural fill zones • 10 m crest width
Materials	• Remove unsuitable foundation soils from entire footprint for use as embankment fill (if suitable) • HDPE liner subgrade material (Zone A) sourced from borrow areas • Transition material (Zone B) filter between Zone A and Zone C1 • Structural fill (Zones C1, C2 and C3) from mine waste. • Filter sand and gravel (Zone F1 and Zone F2) imported from off site • Erosion protection (Zone E) and coarse rockfill (Zone G) sourced from site mining operations
Tailings Basin	
Basin Liner	Composite liner over entire TSF1 basin area, comprising compacted soils as HDPE subgrade overlain by a 1.5 mm smooth HDPE geomembrane liner. Where in-situ materials are unsuitable for subgrade a 200 mm thick layer of imported fine grained material will be placed as the HDPE subgrade The upstream embankment faces will comprise of a 1.5 m zone of fine-grained material (Zone A) suitable for HDPE liner placement
Tailings Underdrainage System	Embankment toe drains and basin collector drains, with water collected from the tailings mass and discharged to a collection sump, then pumped to the supernatant pond or process plant

2.2.4 TSF Hazard Rating

The hazard rating and consequence category for TSF1 has been assessed in accordance with the Department of Mines, Industry Regulation and Safety (DMIRS) Code of Practice "*Tailings Storage Facilities in Western Australia*" and the ANCOLD Guidelines. The hazard rating is derived by considering the potential impacts in terms of safety, environmental and economic factors as well as with respect to the embankment maximum height.

For the dam break scenarios assessed the following implications may apply:

- The release of solids due to a dam breach has the potential to impact significant areas of the mine and a creek downstream of the breached facility, in which mine personnel are likely to be present.
- An environmental release should have limited impact on personnel, although may affect existing native flora and fauna within the zone of inundation, depending on the scale of the release.
- To mitigate the risks due to embankment failure, additional buttressing of TSF1 at the northwest embankment could be incorporated into the design, to reduce risks to the area downstream of the TSF. The buttressing could be developed in conjunction with the development of the TSF and mine waste placement.

The results of the dam breach and consequence category assessment define the design criteria to be used for design of the tailings storage facilities. TSF1 is assessed as 'High' Category 1 in accordance with the DMIRS guidelines. TSF1 is assessed with a dam failure consequence category of 'High A' and an environmental spill consequence category of 'Very Low' in accordance with the ANCOLD guidelines.

2.2.5 TSF Seepage Control

To reduce seepage losses in the TSF basin area, increase water return to the plant and increase the settled densities of deposited tailings, a number of seepage control and underdrainage collection features have been integrated into the design. The seepage control and underdrainage collection systems will consist of the following components:

- Embankment cut-off trenches.
- Basin foundation.
- Primary High-density polyethylene (HDPE) liner on the basin floor and embankments.
- Basin underdrainage collection systems comprising collector drains, with gravity flow to the underdrainage sump.
- Embankment upstream toe drains, with gravity flow to the underdrainage sump.
- Underdrainage collection sump.
- Access causeways constructed of mine waste material.
- Concrete underdrainage tower.

2.2.6 TSF Water Return and Pipelines

The TSF1 design is such that tailings will be discharged from the embankment. Decant towers will be located in the centre of each cell and the abstraction systems will be used throughout the operation. The decant tower will be raised as required with each embankment lift and will consist of the following components:

- Access causeway constructed of mine waste material founded on a compacted fine grained soil protection layer (to protect the HDPE liner).
- Slotted concrete decant towers consisting of a slotted concrete pipe surrounded by clean waste rock (Zone G).
- Submersible pump with float control switches mounted on a lifting hoist.

A bunded pipeline corridor will be constructed to contain both the tailings delivery pipeline and decant return pipeline between the TSF and Process Plant, to limit discharges to the environment.

2.2.7 TSF Surface Water Management and Sediment Control

TSF1 is designed to operate without the need for a spillway. A minimum Total Freeboard (water) of 500 mm shall be maintained on the facility after a storm event together with a minimum Operational Freeboard (solids) of 300 mm, as outlined in the DMIRS Code of Practice.

Surface water management mainly comprises management of run-off reporting to the downstream toe of the TSF1 embankments to prevent ponding and/or erosion.

There are no inflows from external catchments to TSF1 due to the paddock style arrangements, therefore precipitation onto each facility will be contained within the appropriate freeboard allowances.

Prevention of erosion of the TSF1 embankment toe by surface flows during rainfall events will be achieved using suitable engineered fill material. Where coarse run-of-mine waste is used as structural fill zone construction material, it is anticipated that this material will provide adequate erosion protection. Should finer material be used for structural fill zone, then an additional layer of erosion protection material will be placed at the embankment toe.

TSF1 has two catchments of about 191 ha in total area reporting to the eastern toe that will require diversion to the north to prevent ponding against the embankment. Diversion will be achieved through construction of two diversion channels and associate bunds. Diversion channel have been designed by Knight Piesold to convey a 1% AEP event. Outflow from the channels will be directed to two sediment control dams. Sediment Control Dam design information is provided in Table 10.

Table 10: Sediment Control Dam Design Information

SCD No.	Embankment Height	Storage Volume (m^3)	Minimum Particle Size Removed (mm)
SCD 01	0.6	2,100	0.022
SCD 02	1.0	9,600	0.006

The location of surface water management infrastructure is shown in Figure 7 of Attachment 2 to this application. Design drawings for TSF1 surface water diversion and Sediment control infrastructure are provided in Figure 4. Additional design information is contained in the Knight Piesold TSF Detailed Design Report (Section 9 of Appendix 1).

2.2.8 Paste Plant

Two Paste Plants will be constructed to provide material for underground fill. As the primary grind in the process plant is too coarse for efficient paste fill, a tails treatment facility will be included prior to the separable remote paste fill facility located above the underground stoping facilities. Construction will be staged with the first paste plant planned to be constructed at Project commencement and the second paste plant planned to be constructed as the Project ramps up from 2.5 to 4.0 Mtpa ore throughput.

The paste plants will consist of a surge tank, a vacuum belt filter (with associated equipment) for dewatering, a pug mixer and cement storage silos. Treated tailings will feed the vacuum filter and the moist cake will discharge into the pug mixer. A controlled mass flow of cement will be added together with water to achieve the target density and structural strength. The cemented paste will then be discharged to the target location in the underground workings either by gravity if appropriate or by positive displacement pumps where required.

Both plants will have capacity to produce 194 tph. Paste reticulation will be via two parallel systems with the closest stopes being filled by gravity. Paste will be pumped on surface to boreholes located above the shallow, farther away stopes.

Layout of the paste plants is provided in Figure 5 and Figure 6.

2.3 ELECTRIC POWER GENERATION FACILITY (CATEGORY 52)

2.3.1 Key Characteristics

Key characteristics for the electric power generation facility are presented in Table 11.

Table 11: Key Characteristics for the Electric Power Generation Facility

Electricity Supply	• Off-grid 21 MW gas power plant • Four wind turbines generating 18 MW • 13.81 MW solar farm • 9.8 MW battery system
Facility Type	Standalone Hybrid Gas Fired Power Station, supplemented with solar, wind and battery energy solar system
Quantity	12 reciprocating gas engine generators (mixture of Jenbacher J624, Cummins HSK78 and Caterpillar CAT3520H)
Output	Overhead power lines will distribute 11/22 kV power
Generation Capacity	21 MW
Load	16.5 MW *
Fuel Consumption	Power Station will consume 1,221 TJ/annum running at 16.5 MW

The Project will use one of Australia's largest hybrid renewable energy microgrids comprising a (LNG) gas-fired powerhouse integrated with a 60% renewables (solar / wind) microgrid. Power infrastructure will be provided by a third party under a build own and operate style contract.

The microgrid will comprise four key components managed by an advanced control system; four wind turbines generating up to 18 MW, a 13.81 MW solar farm, a 15 MWh battery system and an off-grid 21 MW gas engine power plant.

Power would be supplied to site transformers and substations within the processing plant. High voltage 11 kV power lines will be installed to step down transformers at each operational area. A high voltage (HV) switchyard will be constructed adjacent to the process plant. The switchyard will be integrated with 11 kV incomer feeder supplies from the wind turbines, solar farm and storage battery. Distribution transformers will be fully sealed and installed in a concrete bund. The transformers will be secured with wire fences and lockable gates or concrete blast walls in sensitive areas.

The LNG fuel will be delivered from Mt Magnet in triple trailer trucks to a dedicated third party owned, and operated storage and regasification facility located adjacent to the powerhouse with 5 x LNG storage tanks, each having capacity 350 kL. The storage tanks are estimated to provide a total of 8-10 days' storage for power generation.

2.3.2 Power Hall Building

The gas generators will be housed in a purpose-built building fabricated with steel beams/purlins and clad with colorbond steel. The elevation of the building pad will be sufficient to prevent ingress of water with site drainage design to consider protection of bunds and sumps a priority, with the general level of concrete foundations 100 mm above ground level to prevent any flood water that may be present from entering the building/bund/culvert area. Acoustic air inlet louvres will be utilised to minimise noise transfer from power generation activities.

The building and genset foundations will be constructed of concrete with the building floor area drained to a 600 mm wide culvert running the full length of the building. The building has been designed to ensure hydrocarbon spills and contaminated water is contained within the building area and directed through to a spill containment pit.

Gas generator exhaust will be directed to individual stacks withing the prescribed premises boundary, emissions point coordinates appear on Figure 3 of Attachment 2 and are provided in Table 12.

Table 12: Power Station Exhaust Stack Coordinates

Centrepoint Number	Northing (m)	Easting (m)
CP1	6957758.437	257780.707
CP2	6957768.437	257780.734
CP3	6957778.437	257780.761
CP4	6957788.437	257780.787
CP5	6957798.437	257780.814
CP6	6957808.437	257780.841
CP7	6957818.437	257780.868
CP8	6957828.437	257780.895
CP9	6957758.441	257793.072
CP10	6957768.441	257793.099
CP11	6957778.441	257793.126
CP12	6957788.441	257793.153

2.4 WASTEWATER TREATMENT PLANT (CATEGORY 54)

The Project will use two wastewater treatment plants (WWTP):

- The primary WWTP will be located north of Jones Creek near the Accommodation Village. It will use containerised Moving Bed Bio Reactor (MBBR) technology to process up to 170 kL per day (based on 510 persons, 300 l/pp/day + miscellaneous production) in a containerised treatment plant with external process and storage tanks. The treatment plant installed initially has been sized for the planned camp upgrade to 510 persons after Year 4 of operation.
- A secondary smaller WWTP will be located near to the Process Plant. It will use containerised MBBR technology to process approximately 60 kL per day (based on 598 persons, 70 l/pp/day + miscellaneous production) in a containerised treatment plant with external process and storage tanks. The treatment plant has been sized for peak construction manning.

The MBBR is a continuous system, with a constant inflow and outflow. The sewage is fed to the MBBR which consists of an anoxic tank and two aerobic tanks. The biologically treated sewage overflows to the clarifier where excess biomass settles and is circulated to the sludge tank. The treated water exits through the overflow of the clarifier and is collected in the chlorine contact tank after being disinfected with Sodium Hypochlorite. The disinfected product is filtered by means of sand-filtration prior to release. The MBBR reactor is filled with plastic biofilm carriers.

The balance tanks will be fitted with low level and high level alarms to commence and cease pumping and a 'high high level' alarm which activates a visual and sound alarm for abnormally high levels in the tank for immediate action. A small amount of chemicals will be stored in a bunded area for operation of the WWTPs. A general process flow diagram for the MBBR treatment process is provided in Figure 7. The WWTP layouts are provided in Figure 8 and Figure 9.

Key characteristics for the Wastewater Treatment Plants are presented in Table 13.

Table 13: Key Characteristics for the Wastewater Treatment Plants

Sewage source	Domestic sewage
Plant capacity	Plant 1 = 170 kL per day Plant 2 = 60 kL per day
Plant design	Modularised WWTP Sequence Batch Reactor (SBR)
Peak influent flow	Plant 1 = 7.0 – 8.5 m^3/h Plant 2 = 3.0 m^3/h
Litres/person allowance	Plant 1 = 300 l/person for 510 people Plant 2 = 70 l/person for 598 people
Effluent quality	Department of Health (DOH) 'Low Risk' (Class C equivalent)

Wastewater will be treated to Class C standards which is suitable for reuse in low risk category applications or for discharge to the environment. The WWTP water quality specification is outlined Table 14. Treated effluent from the plant will be pumped to the Process Plant tails hopper where it will ultimately be disposed of within the TSF. WWTP solids/activated sludge will be processed offsite by a third party.

Table 14: WWTP Water Quality Specification

Parameter	Unit	Influent	Discharge
Hydraulics	KL/d	120	120
BOD	mg/L	150 – 350	<20
TSS	mg/L	150 – 350	<30
Total N	mg/L	50 – 70	<30
Total P	mg/L	10 – 30	<8
E.coli	Cfu/100 mL	–	<10
pH		6.5 – 8.5	6.5 – 8.5

The WWTPs will be constructed, operated and maintained in accordance with the 'Operations and Maintenance Manual' for the plant; DWER Works Approval, once granted; an Environmental Licence and local government health regulations and permitting requirements as issued by the Shire of Leonora.

An appropriately sized fence will be erected around the boundary of the WWTP to ensure an effective safety barrier to prevent humans and animals from easily accessing the area. The size and type of fencing will be dependent on the type(s) of animals trying to access the areas for e.g. kangaroos; cattle etc. all require different fencing methods. An appropriately signposted entrance/exit gate will be incorporated into the fence and gates will be kept closed.

During the early part of construction, domestic wastewater will be collected in tanks and processed offsite by a third party.

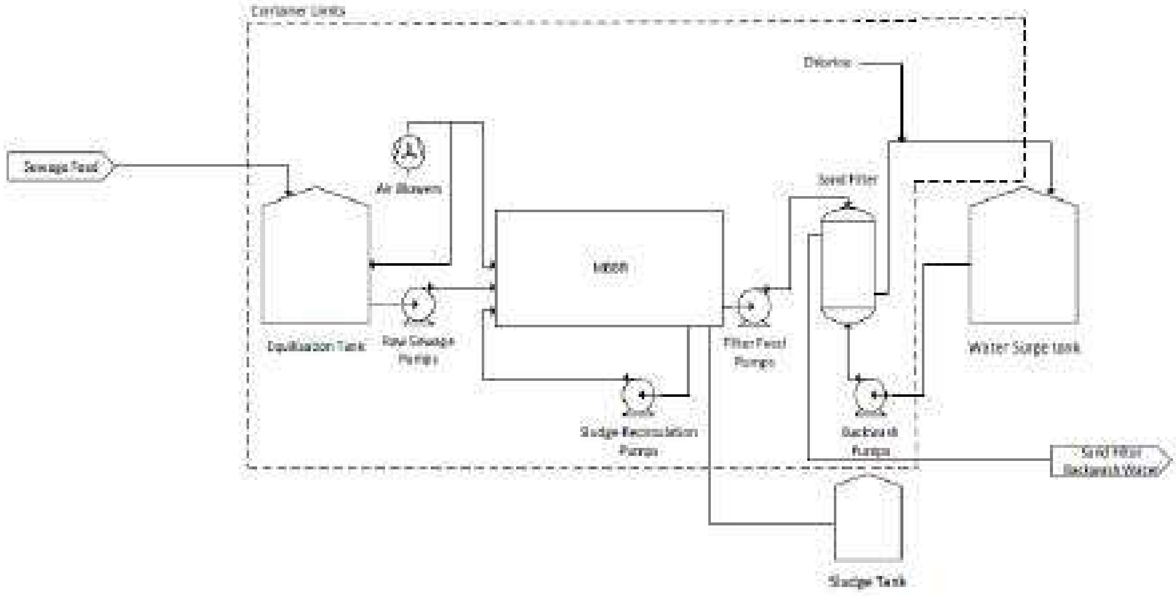

Figure 7: Wastewater Treatment Plant General Process Flow Diagram

2.5 LANDFILL (CATEGORY 89)

Key characteristics of the landfill are presented in Table 15.

Table 15: Key Characteristics of the Landfill

Landfill	
Classification	Class II
Capacity	2,270t/year (270 t/year putrescible waste and 2,000 t/year inert waste)
Footprint	5 ha
Cell size	30 m long by 4 m wide and up to 4 m deep
Fire break	At least 3 m in width around the boundary of the site
Coverage frequency	Weekly and at closure

The proposed Class II (Category 89) landfill site will be constructed and operated according to the *Environmental Protection (Rural Landfill) Regulations 2002*. Domestic (putrescible and non-putrescible), non-recyclable waste produced at the Accommodation Village will be disposed of into this landfill facility. Recyclable materials such as metals, rubber, plastic, paper, glass, and fabric products will be segregated from other waste.

The landfill design will be developed using a moving trench which incorporates a maximum open excavation of 30 m long by 4 m wide and up to 4 m deep. An egress ramp will be constructed at each end of the trench for personnel and fauna to enter and exit the excavation safely.

Throughput of the landfill facility is estimated to be approximately 270 tonnes of putrescible waste per year based on a calculation of 540 kg of waste produced by each individual per year (500 personnel) accommodated at the Accommodation Village in a year. The majority of waste is forecast to be during construction from the delivery of materials and generation of construction waste (i.e. building materials and packaging, pallets). Industrial/inert waste will be expected to be in the order of 2,000 t/year. Thus the total tonnage of combined putrescible and inert waste requiring disposal is therefore approximately 2,270 t/year.

Excavated overburden material will be placed around the edge of the landfill to create a safety bund half the height of the largest wheel for the vehicles using the landfill. Overburden material will also be used to cover waste on a weekly basis. The excavated overburden stored alongside the long edges of the excavation will also prevent water inflow. The empty trench will be filled with waste by tipping from above, utilising the active long edge. Once filled, a new trench is dug in front of the first trench and the resultant overburden is used to compact and backfill the previous trench.

An appropriately sized fence will be erected around the boundary of the landfill facility to ensure an effective barrier is in place to prevent fauna (particularly feral animals) from accessing waste material. An entrance/exit gate will be incorporated into the fence; however, the gates will be kept closed (other than when waste is being deposited). The boundary fence will also create a wind barrier for any waste material that may be blown out of the perimeter, thereby minimising the potential for littering of the surrounding environment. Waste that is blown outside of the landfill will be returned to the tipping area at least once every month in accordance with Regulation 8 of the *Environmental Protection (Rural Landfill) Regulations 2002*.

3. TIME LIMITED OPERATIONS

3.1 CONTEXT

Environmental commissioning (see Attachment 3A) is the process of commencing operation (engineering commissioning) of particular plant and/or equipment and ensuring that the outputs of the activity (i.e. discharges or emissions) meet the criteria or specification nominated in the relevant Works Approval documentation and follows the submission of an Environmental Compliance Report to confirm that the works have been constructed in accordance with the conditions of the Works Approval.

Following the completion of environmental commissioning and upon submission of the relevant documentation to DWER (as required), the Prescribed Premises would enter a phase called Time Limited Operations (TLO); which permits operations, post-environmental commissioning, to continue under the Works Approval prior to the grant of a Licence for the Prescribed Premises.

Conditions may be included in the Works Approval to regulate emissions and discharges that arise during the TLO phase. These conditions, if included, would be based on the design performance of the operations at the premises as assessed and conditioned in the Works Approval and as provided in the Works Approval application (see Section 2 of this Attachment and Attachment 6A).

3.2 TIME LIMITED OPERATIONS

Due to the integrated nature of the operations at the Project, Liontown proposes a TLO period of 180 days be granted for all Prescribed Premises categories nominated in Section 1.3.4, as described in Table 16.

Operations under Licence conditions would begin when the Licence is granted.

Table 16: Proposed Time Limited Operations for Prescribed Premises

Infrastructure	Time Limited Operation Period (days)
Process Plant	180
TSF1	180
Paste Plant 1 and 2	180
Electric power generation facility	180
WWTP's	180
Landfill	180

3.3 COMPLIANCE

Where the operation of the premises does not meet the design specifications as proposed in the Works Approval application, it is likely the premises will be unable to comply with TLO phase conditions. Under these circumstances Liontown would apply for an amendment to the Works Approval to allow for reassessment of emissions and discharges. Operations will need to cease in this period, but if the amendment is granted the TLO phase would recommence.

4. REFERENCES

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