Decision Report

Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	W6413/2020/1
Applicant	Greenstone Resources (WA) Pty Ltd
ACN	100 341 599
File Number	DER2020/000245
Premises	King of the Hills Project LEONORA WA 6438 Part of Mining Tenement M37/457 As defined by the coordinates in Schedule 1 of the Works Approval
Date of Report	4 September 2020
Status of Report	Final

Table of Contents

1. Definitions of terms and acronyms

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

Table 1: Definitions

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CS Act	*Contaminated Sites Act 2003* (WA)
Decision Report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation As of 1 July 2017, the Department of Environment Regulation (DER), the Office of the Environmental Protection Authority (OEPA) and the Department of Water (DoW) amalgamated to form the Department of Water and Environmental Regulation (DWER). DWER was established under section 35 of the *Public Sector Management Act 1994* and is responsible for the administration of the *Environmental Protection Act 1986* along with other legislation.
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of, and during this Review
m^3	cubic metres
Minister	the Minister responsible for the EP Act and associated regulations
NEPM	National Environmental Protection Measure
Noise Regulations	*Environmental Protection (Noise) Regulations 1997* (WA)

Occupier	has the same meaning given to that term under the EP Act.
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Primary Activities	as defined in Schedule 2 of the Revised Licence
Risk Event	As described in *Guidance Statement: Risk Assessment*
UDR	*Environmental Protection (Unauthorised Discharges) Regulations 2004* (WA)
Works Approval Holder	Greenstone Resources (WA) Pty Ltd

2. Purpose and scope of assessment

Greenstone Resources (WA) Pty Limited (Applicant) has applied for a works approval to construct a wastewater treatment plant, an irrigation area and a putrescible landfill within mining tenement M37/457.

The application specifically requests approval for the construction of:

- a waste water treatment plant (WWTP) to accommodate the requirements of the 450 person accommodation village (camp);
- an irrigation area for the disposal of the treated wastewater; and
- a putrescible landfill.

2.1 Application details

Table 2 lists the documents submitted during the assessment process.

Table 2: Documents and information submitted during the assessment process

Document/information description	Date received
Application form including following supporting information; Cost of project 1. Attachment 1A – Proof of occupier status 2. Attachment 1B – ASIC Company Extract; 3. Attachment 1C – Authorisation to act as representative of the occupier 4. Attachment 3A – Commissioning plan 5. Attachment 3B – Overview of proposed activities 6. Attachment 6A & 6B – Emissions and Discharges 7. Attachment 7 – Siting 8. Attachment 9A – Fee calculation	11 June 2020
Email: Response from Rhona Wardman to request for further information (GPS coordinates).	17 July 2020
Email: Response from Rhona Wardman to request for further information (DoH approval).	30 July 2020
Email: Response from Rhona Wardman to request for further information (DWER- Native Vegetation Clearing Permit (NVCP).	4 August 2020

3. Background

The King of the Hills (KOTH) project is an existing mine site (Tarmoola) located approximately 28 km north-west of Leonora which is owned and operated by Greenstone Resources (WA) Pty Limited, a wholly owned subsidiary of Red 5 Limited (Red 5). The mine site was purchased under the Tarmoola project name from Saracens Metals Pty Ltd in October 2017, whilst the site was under care and maintenance.

The applicant proposes to expand the existing Tarmoola open pit and King of the Hills underground mine at KOTH. Environmental Licence is currently held (L8345/2009/2) for the operation of a crushing, screening plant and mine dewatering activities.

On 11 June 2020, the applicant submitted an application for a works approval under the EP

Act for a wastewater treatment plant, an irrigation area for the disposal of treated wastewater and putrescible landfill to service the accommodation village within mining tenement M37/457.

The application details that the associated expansion works will be carried out in stages, as shown in Table 3 below.

Table 3: Development stages

Stage	Infrastructure
Stage 1	Construction, commissioning and operation of a WWTP to service the proposed 450-person construction and operations accommodation village.
	Construction and operation of a putrescible landfill to service the accommodation village.
Stage 2	Cutback of the existing open pit mine with changes to existing waste rock dumps (WRD). Continuation of underground mining.
	Completion of tailing storage facility (TSF 5) (partially constructed).
	Construction of an on-site gold processing facility and mining infrastructure area.
	Open pit mining of satellite deposits to the north west (Centuri and Cerebus-Eclipse) and south (Rainbow) (pits, WRD and haul roads).
Stage 3	Power supply infrastructure corridor. Both a powerline (electricity) and a gas pipeline with associated on-site generation infrastructure are being considered.

The applicant is seeking approval for the proposed Stage 1 works only. Subsequent applications will be made for Stage 2 and 3 as development progresses.

The Delegated Officer also recommends that any future works outside the scope of this assessment will require further works approval application to be submitted to DWER.

This decision report therefore assesses emissions and discharges associated with stage 1 works and the associated activities when the WWTP and the landfill is in operation.

Following the completion of the works the applicant proposes to apply to amend licence L8345/2009/2 to approve activities relating to category 54 and category 89.

Proposed activities under this Works Approval include:

- Construction and commissioning of a package Sequencing Batch Reactor wastewater treatment plant (WWTP) to service the proposed 450 person construction and accommodation village (Category 54).
- Construction of a 5,000 tonnes per year putrescible landfill to service the accommodation village (Category 89).

Table 4 lists the prescribed premises categories that have been applied for.

Table 4: Prescribed Premises Categories in the Existing Licence

Classification of Premises	Description	*Approved Premises production or design capacity or throughput*
Category 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.	146.25 m^3 per day
Category 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	Less than 5000 tonnes per year

	Officer, as amended from time to time) is accepted for burial.	

4. Overview of Premises

4.1 Operational aspects

The operational aspects as outlined within the works approval application supporting document are detailed below:

Category 54 – Sewage facility

A WWTP will be constructed to treat wastewater from the ablutions and other facilities at the accommodation village. Effluent will be collected and pumped from the Accommodation Village and operational crib rooms and ablutions blocks to the WWTP. The WWTP will be located adjacent to the Accommodation Village as shown on Figure 1 below. Wastewater will be treated using a Tristar designed sequencing batch reactor (SBR450EP) with an average daily capacity of 146.25 m^3/day with a capacity to treat up to 30.5 m^3/hr peak flow. Treated effluent will be discharged via an above ground sprinkler arrangement spray field. The WWTP and sprayfield layout is provided in Figure 1 below.

Wastewater will be treated to a Class C standard that is suitable for reuse in low risk category applications or for discharge to the environment. The WWTP will be a self-contained system. At the peak, the village will cater for up to 450 people, giving a total output of approximately 112 kL per day at a daily usage of approximately 250 L/day.

The SBR system operates in a 5-step mode; filling of the reactor basin, the reaction phase, the settling phase, the decant phase and the idle phase. The reaction phase will be a combination of anoxic and aerobic phases to achieve high levels of BOD and nitrogen removal and also includes a sludge dewatering system. The WWTP comprises:

- 2 x containerised SBR units.
- 2 x 50 kL Balance tanks.
- 1 x 32 kL Irrigation tank.
- 1 x 32 kL Sludge tank.
- Transfer and circulation pumps.
- Sodium hypochlorate dosing unit.
- Sludge dewatering system.

The balance tanks will be fitted with low level and high level alarms to commence and cease pumping and a ‘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 WWTP.

An appropriately sized fence will be erected around the boundary of the WWTP and spray field 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 at all times.

The WWTP will be constructed, operated and maintained in accordance with the ‘Operations and Maintenance Manual’ for the plant and DWER Works Approval once granted and an Environmental Licence and Local Government Health Regulations and permitting requirements as issued by the Shire of Leonora.

Category 54 – Spray irrigation area

The spray field will be utilised for the irrigation of effluent wastewater during commissioning with testing undertaken to prove the WWTP is producing water to the Low Risk (Class C) standard in accordance with the '*Guidelines for the Non-Potable Uses of Recycled Water in Western Australia*' (DOH 2011).

The WWTP site and irrigation area was selected in accordance with the Department of Water (DoW) *'Water Quality Protection Note (WQPN 22) Irrigation with Nutrient Rich Wastewater'*. The land is not permanently or seasonally inundated or waterlogged, needs no artificial drainage or requires natural watercourses to be diverted. There are no Sensitive Water Resources within 500 m of the WWTP facility. The location of the facility is not within a Public Drinking Water Source Area, a wetland with defined conservation value, Environmental Protection Policy Lakes, Waterways Management Areas or other wetland.

A review of the soils at the KOTH Project (loams and clays) indicates that the maximum allowable nitrogen (N) and phosphorus (P) loads are 480 kg/ha/year and 120 kg/ha/year, respectively. Therefore the required irrigation area is 3.56 ha based on specified throughput and nutrient loadings as shown in Table 5 below. However a maximum irrigation area of 3.8 ha has been included in the proposal to allow for rotation of active spray areas and contingency.

Table 5: Effluent specifications and spray field sizing

Item	Units	Value
Nitrogen load		
Daily flow rate	m^3/ day	146.25
TN in effluent	mg/L	30
Total TN allowed per ha (soil category D)	kg TN/ha/year	480
Irrigation area required	ha	3.34
Phosphorous load		
Daily Flow rate	m^3/ day	146.25
TP in effluent	mg/L	8
Total TP allowed per ha (soil category C)	kg P/ha/year	120
Irrigation area required	ha	3.56

Category 54 – Commissioning

The commissioning process for the WWTP will have the following phases:

- Pre-commissioning- comprising static checks on un-powered equipment to confirm that the infrastructure has been built according to specification. Operators of the WWTP will be trained in testing and maintenance procedures to ensure the plant is operated in accordance with the manufacturer's specifications. This phase is to be conducted without the addition of chemicals, water or wastewater.

- Wet commissioning- comprising test operation of equipment and facilities with water; and
- Waste water commissioning- comprising test operation of equipment and facilities with chemicals and waste water and will comprise the following:
    - Material feeds to the WWTP will be gradually increased until they reach the steady-state design volumes;
    - Treated effluent will be collected in a storage tank and recycled to the WWTP as required to meet effluent irrigation quality specifications;
    - Treated effluent water quality will be established according to a sampling and validation program. Treated effluent will not be disposed of unless the measured parameters comply with the Class C wastewater quality as shown in Table 6 below.

Table 6: Effluent quality

Discharge point	Parameter	Limit
Discharge point to the sprayfied	pH	6.5 - 8.5[1]
	Biochemical Oxygen Demand	<20 mg/L[1]
	Total suspended solid	<30 mg/L[1]
	Total Nitrogen	<30 mg/L[2]
	Total Phosphorus	<8 mg/L[2]
	Total Chlorine	0.2 - 2.0 mg/L[1]
	E. coli	<1000 cfu/100ml[1]

Note 1: Guidelines for Non-potable uses of recycled Water in Western Australia 2011, Department of Health

Note 2: WQPN 22 Risk Category C

Category 89 – Landfill

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 proposed landfill design is a moving trench which incorporates a maximum open excavation of 30 m long by 4 m wide and up to 4 m deep. Prior to trench excavation works, topsoil will be removed and stockpiled. Excavated overburden material will be placed around the edge of the landfill to create a safety bund of 1 m minimum height or half the height of the largest wheel for the vehicles using this facility. Excavated 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 accessing the tip head down a vehicle accessible ramp. Depositing of the waste as far back as possible with regular pushing up and compaction of the waste to get maximum capacity from the trench excavation. At least once a week the waste will be compacted by excavator or loader with a layer of overburden soil to reduce odours and pest species. 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. When the completed trenches backfilled surface has settled,

topsoil will be placed over the backfilled overburden to begin rehabilitation. The vehicle access ramp into the 10 m wide trench will be offer egress for both humans and fauna to enter and exit the excavation safely.

Throughput of the landfill facility is estimated to be approximately 243 tonnes of putrescible waste per year based on a calculation of 540 kg of waste produced by each individual per year (450 personnel) accommodated at the Accommodation Village in a year. This is equivalent to 243 tonnes of putrescible waste per year. Industrial/inert waste will be expected to be in the order of 2,000 t/year.

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 (in particular feral animals) from accessing waste material. An entrance/exit gate will be incorporated into the fence; however the gates will be kept closed at all times (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. Any 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*. The landfill facility will be constructed and managed in accordance with DWER Works Approval and Environmental Licence conditions.

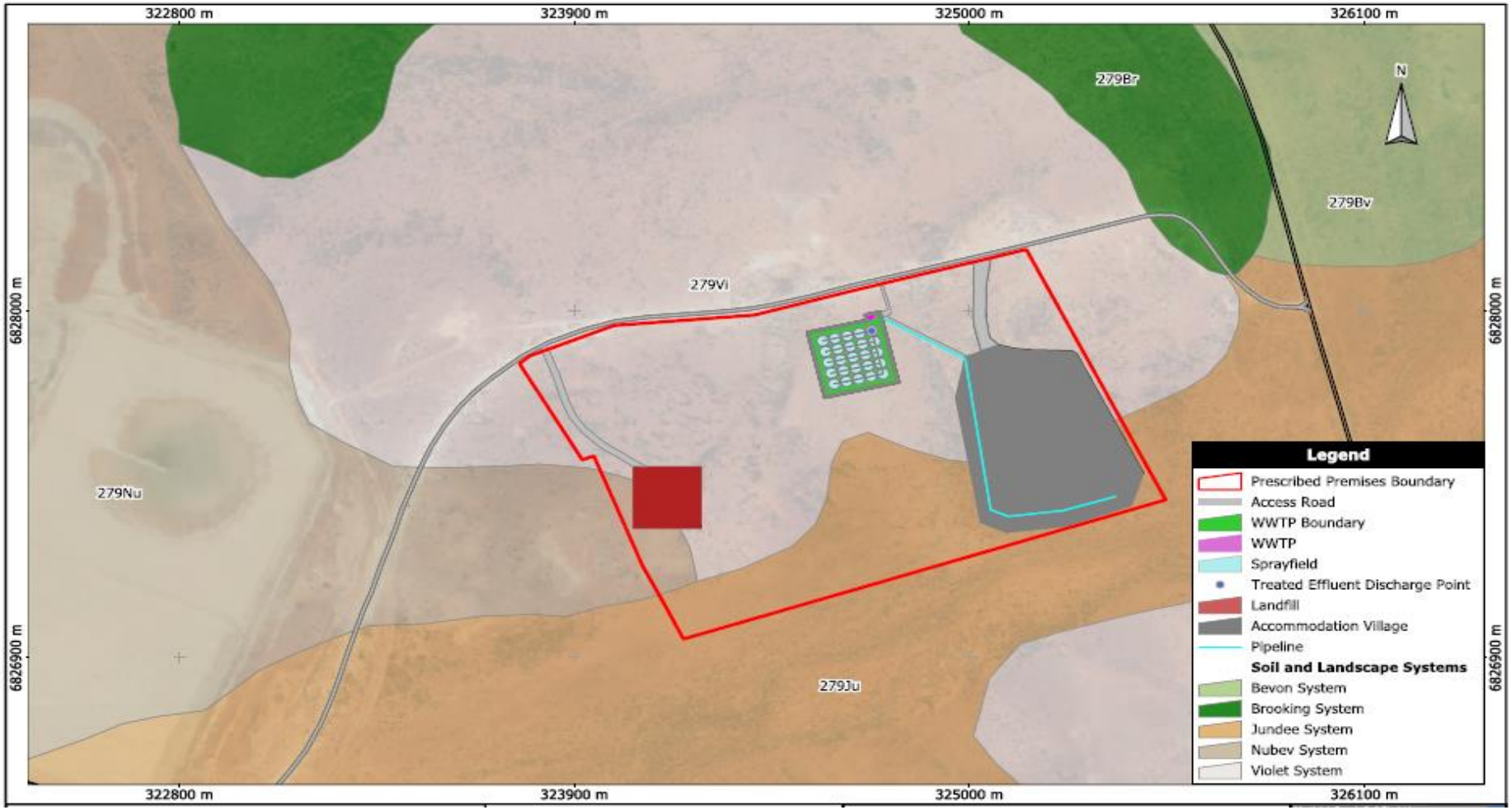

Figure 1: Site layout

4.2 Infrastructure

The WWTP and landfill facility infrastructure, as it relates to Category 54, and 89 activities, is detailed in Table 7 and with reference to the Site layout Plan (figure 1).

Table 7 lists infrastructure associated with each prescribed premises category.

Table 7: WWTP and landfill facility Category 54 and 89 infrastructure

	Infrastructure	**Site Plan Reference**
	Prescribed Activity Category 54	
A containerized five (5) stage WWTP to accept sewage and grey water from the on-site accommodation village. After treatment the chlorinated effluent water will be discharged to a fenced 3.6 ha irrigation area.		
1	A sequencing batch reactor WWTP comprising of: • transfer and circulation pump, • Inlet screen unit • two containerised SBR units, • two, 50kL balance tank, • sodium hypochlorate dosing unit, • 32 kL irrigation tank, • 32 kL sludge thickening tank, • and associated high density polyethylene pipelines	Figure 1 : WWTP and sprayfield
2	3.6 ha irrigation field during stage 1 phase, (to be expanded to 4 ha following the completion of stage 3 phase) comprising of : • A fenced spray field (steel wire fencing) • HDPE pipelines with welded joints • Safety/warning signage • Irrigation field inclusive of a spray drift buffer • Individual branch line flush valves	
	Prescribed Activity Category 89	
A class II landfill to accept up to 243 tonnes of putrescible waste and approximately 2000 tonnes of inert waste type 1, inert waste type 2.		
1	• Moving trench landfill, 30 m length x 4 m in width, 4 m in depth. • Earthen bunds and fencing constructed around the boundary of the landfill as they are progressively constructed and operated. • Landfill trench with sufficient cover material located within the footprint of the landfill.	Figure 1: Landfill

5. Legislative context

Table 8 summarises approvals relevant to the assessment.

Table 8: Relevant approvals and tenure

Legislation	Number	Subsidiary	Approval
Mining Act 1978	*87634*	*Tarmoola Gold Mine/ king of the Hills/ Greenstone Resources (WA) Pty Ltd*	*Mining proposal and Mine closure Plan for Stage 1 works has been approved by DMIRS*
Environment Protection Act 1986 Part V (DWER)	*8938/1*	*Tarmoola Gold Mine/ king of the Hills/ Greenstone Resources (WA) Pty Ltd*	*Permit Holder authorised to clear native vegetation subject to conditions of the permit*
Rights in Water and Irrigation Act 1914	*GWL 63771(3)*	*Tarmoola Gold Mine/ king of the Hills/ Greenstone Resources (WA) Pty Ltd*	*Licence to take water for dust suppression for earthworks and construction purposes, exploratory drilling, mining camp purposes.*
Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974	*Approval No: 112.20*	*Tarmoola Gold Mine/ king of the Hills/ Greenstone Resources (WA) Pty Ltd*	*Approval from the Department of Health to construct or install an apparatus for the treatment of sewage- 146.25kL Sequence Batch Reactor (SBR) WWTP to 47000m^2 fenced surface irrigation.*
Health (Miscellaneous Provisions) Act 1911 *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974*	*Approval No: 02/20*	*Tarmoola Gold Mine/ king of the Hills/ Greenstone Resources (WA) Pty Ltd*	*Local Govt approval (Shire of Leonora) to construct and install apparatus – 1 x Tristar SBR (sequencing batch reactor) system and 1 x 47,000m^2 surface irrigation*

5.1 Contaminated sites

Mining Tenement M37/457 is not listed on DWER's contaminated sites database.

5.2 Other relevant approvals

5.2.1 Planning approvals / Development approvals

The Shire of Leonora granted an approval to commence development for the works on 12 June 2020.

5.3 Part V of the EP Act

5.3.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

The guidance statements which inform this assessment are:

- *Guidance Statement: Regulatory Principles (July 2015)*
- *Guidance Statement: Setting Conditions (October 2015)*

- *Guidance Statement: Land Use Planning (February 2017)*
- *Guidance Statement: Licence Duration (August 2016)*
- *Guidance Statement: Publication of Annual Audit Compliance Reports (May 2016)*
- *Guidance Statement: Decision Making (February 2017)*
- *Guidance Statement: Risk Assessments (February 2017)*
- *Guidance Statement: Environmental Siting (November 2016)*

5.3.2 Works approval and licence history

Table 9 summarises the works approval and licence history for the premises.

Table 9: Works approval and licence history

Instrument	Issued	Nature and extent of works approval, licence or amendment
L8345/2009/1	04/05/2009	New licence application
L8345/2009/2	04/05/2013	Licence re-issue
L8345/2009/2	7/04/2016	Licence transfer and conversion to new format
L8345/2009/2	19/01/2017	Licence amendment to correct discharge points and include Category 12 as prescribed activity.
W6413/2020/1	03/09/2020	Works approval to construct a WWTP, spray field and landfill facility

5.3.3 Clearing

Clearing permit (purpose permit number 8938/1) has been issued to Greenstone Resources (WA) Pty Ltd for the purpose of mineral production and associated activities on 30 July 2020. The applicant is authorised to clear native vegetation subject to the conditions of the permit. The duration of the permit is from 22 August 2020 to 31 October 2021.

6. Consultation

The works approval application was advertised in the West Australian on 3 August 2020 for a comment period ending on 24 August 2020.

A letter of referral was sent to the Department of Mines, Industry Regulation and Safety (DMIRS), Department of Health and Shire of Leonora on 29 July 2020.

DWER received the following comment from DMIRS on 4 August 2020:

- This works approval application is consistent with the recently approved mining proposal “King of the Hills Project Stage 1: Early Works Version 2” (Reg ID: 87634) from Greenstone Resources (WA) Pty Ltd and has no further comments in relations to, or objections to the granting of the Works Approval.

7. Location and siting

7.1 Siting context

The KOTH project is located approximately 630km north east of Perth and 28 km north of Leonora town site, Western Australia. The proposed WWTP and the irrigation field will be within mining tenement M37/457.

7.2 Residential and sensitive receptors

The distances to residential and sensitive receptors are detailed in Table 10.

Table 10: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Residential Premises	*The closest residence is a pastoral residence approximately 5 km south of the project area*
Township of Leonora	*28 km to the south of the project area*

7.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are shown in Table 11. Table 11 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem.

The table has also been modified to align with the *Guidance Statement: Environmental Siting.*

Table 11: Environmental values

Specified ecosystems	Distance from the Premises
Sullivan Creek	*approximately 2 km to the west of the project area*
Not within any environmental sensitive areas	*Over 80 kms away*
Tributaries	*130 m SE - proposed area not at risk of flooding as modelled by GHD (2020) discharges unlikely to seep or flow into tributaries.*
Biological component	**Distance from the Premises**
Threatened and/or priority flora- Stenathemum patens (P1)	*The nearest sensitive Priority Flora species located approximately 3.4 km NW - proposed area not at risk of flooding, discharges unlikely to seep or flow 3.4 km to priority flora location*

7.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 12.

Table 12: Groundwater and water sources

Groundwater and water sources	Distance from Premises	Environmental value

Priority 1 Leonora Water Reserve	*located over 4 km to the south of the Prescribed Premises boundary*	*Drinking water reserve*
Groundwater	*Depth to groundwater encountered at approximately 7m – 12m.* *The closest bores to the proposed location of the WWTP and landfill are GW bores 76 and 78 which are adjacent to the historic tailings storage facility (TSF) 4.*	*Ground water in the area can range from prtable in the recharge areas to hypersaline in the discharge areas. Bores near the existing Tarmoola Pit have previously intercepted saline to hypersaline groundwater. During the 2014 – 2015 monitoring, the average electric conductivity (EC) reading of water from the production bores ranged from 2.7 – 5.4 mS/cm and pH was between 7.8 and 7.9.*

7.5 Soil type

Table 13 details soil types and characteristics relevant to the assessment.

Table 13: Soil and sub-soil characteristics

Groundwater and water sources	Soil Type	Environmental Value
Soil type classification	*Soils of the project area include red sandy earths, red deep sands, red shallow loams and red loamy earths with some red-brown hardpan shallow loams, salt lake soils and red shallow sandy duplexes.*	*Soils are typical of the Goldfields region; topsoils (upper 0 to 50 cm of the soil profile) are non-saline, with deeper subsoils below 1 m typically characterised by higher salinity and sodicity.*

7.6 Meteorology

7.6.1 Wind direction and strength

The prevailing wind direction at the Leonora BOM Site (number 012046) is from the east, especially in the morning. Winds are between 0 and 10km/hr for approximately 20% of the time and greater than 10 km/hr for the remaining time in the morning. Wind direction in the morning afternoon is predominantly from the east, however wind direction in the afternoon can be from the west and slightly stronger from this direction. The 9am and 3pm wind rose for the Leonora Meteorological Site (number 012046) are shown in figure 2 and figure 3 respectively.

9 am wind rose

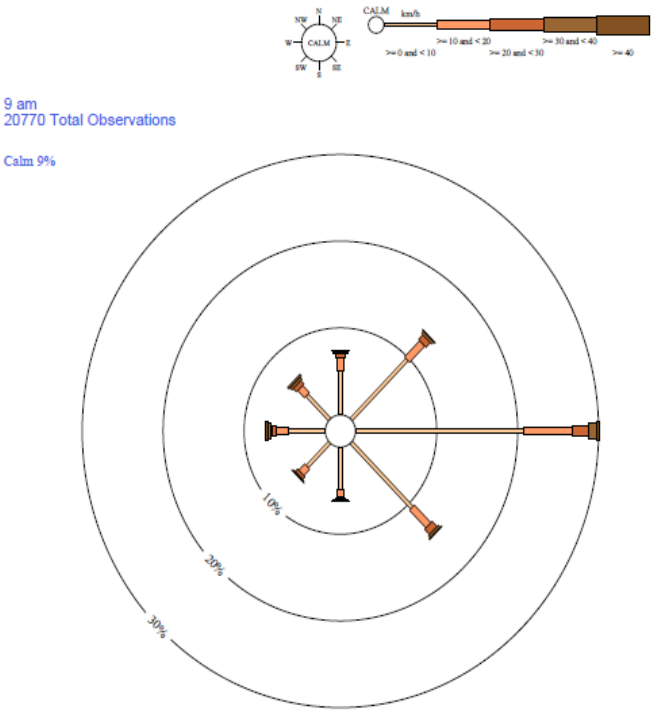

Figure 2: Leonora weather station 9 am average wind speed and direction showing bias to easterly, north easterly and south easterly wind

3 pm wind rose

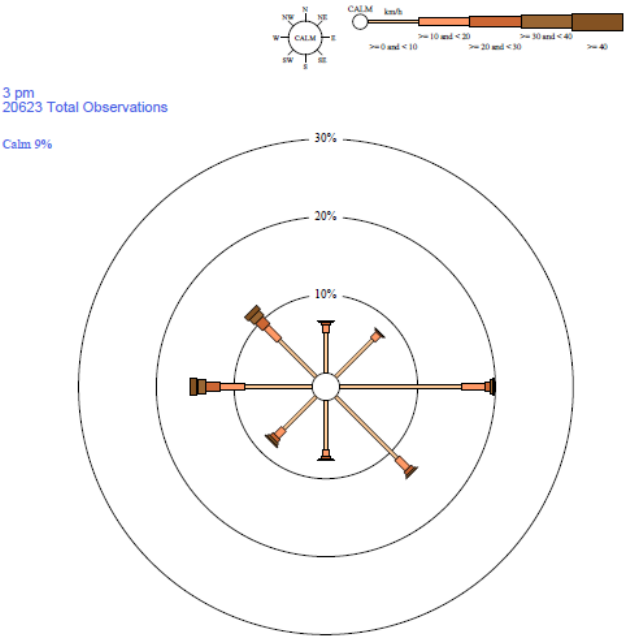

Figure 3: Leonora weather station 3 pm average wind speed and direction showing bias to easterly wind and sometimes stronger westerly wind

7.6.2 Rainfall and temperature

Climate in the KOTH project region is arid. Mean annual rainfall is approximately 236.4 mm, with annual rainfall recorded at the closest meteorological station (Leonora) ranging from 57.8 mm to 552.2 mm (BOM 2020). Rainfall is influenced by decaying tropical cyclones which originate off the north west coast in summer, and anticyclonic systems in winter. The area generally has low rainfall and high evaporation rate, with evaporation greatly exceeding rainfall. The annual average pan evaporation rate for the Leonora region is 2.8 m. The hottest month is January with an average maximum temperature of 37°C; however, temperatures above 40.0°C occur frequently when the hot and dry, north to north-easterly winds prevail. Winters tend to be cool and July is the coldest month with average maximum and minimum temperatures of 18.4°C and 6.1°C, respectively.

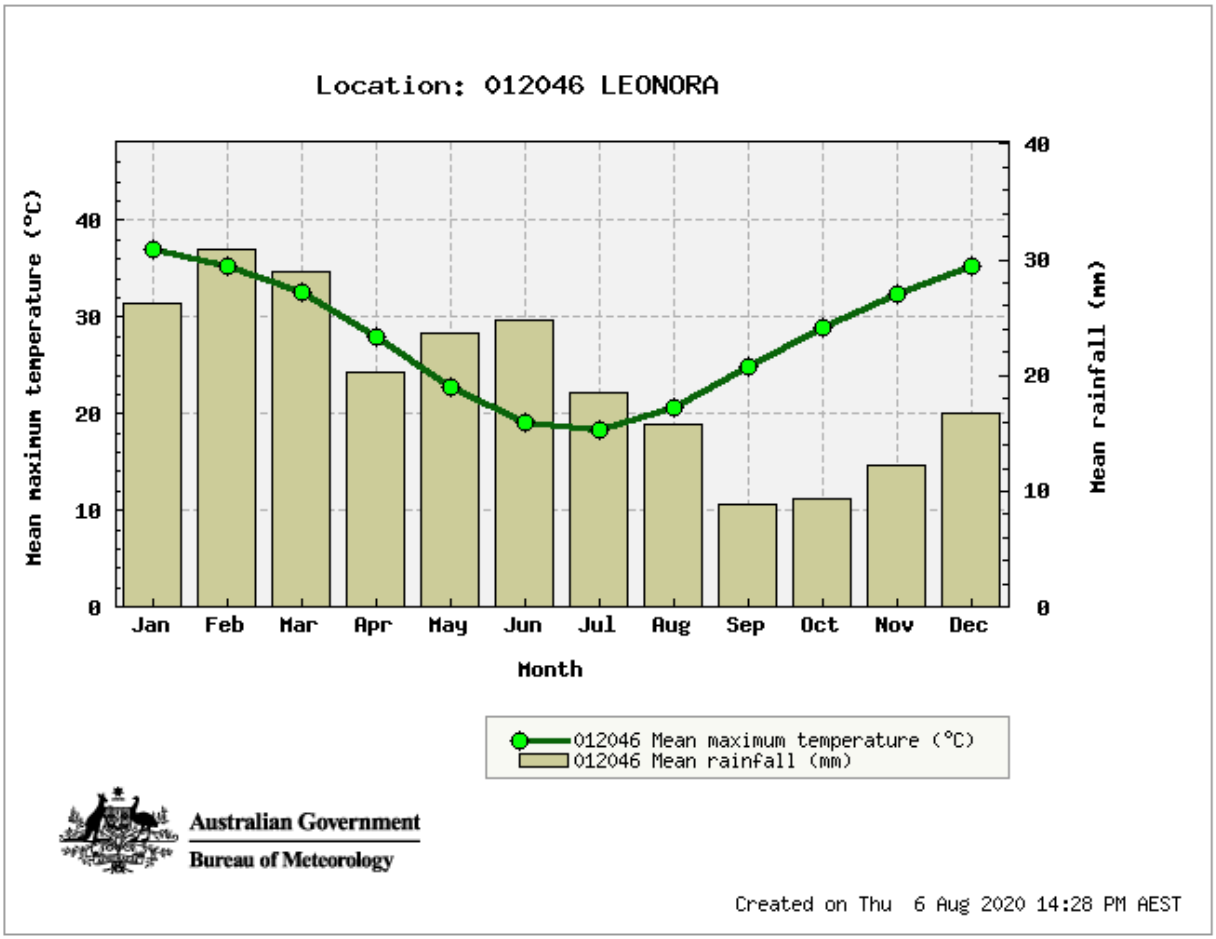

Figure 4: Mean maximum temperature and mean rainfall for Leonora weather station

8. Risk assessment

8.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DWER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

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. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 15.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Tables 14 and 15 below.

Table 14. Identification of emissions, pathway and receptors *during construction*

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**		
Construction, mobilisation and positioning of infrastructure - WWTP and Landfill	Vehicle movements on unsealed access roads	Noise	No residences or other sensitive receptors in proximity- The closest residence is a pastoral residence approximately 5 km south of the project area. Priority flora – approximately 3.4 km	Air / wind dispersion	None	No	No receptor present
		Dust			*Health/Amenity impacts Potential suppression of photosynthetic functions (priority flora) due to the emissions from the project area*	*No*	The Delegated Officer considers that the separation distance between the source and potential receptor is sufficient to prevent noise and dust impacts from occurring. The Delegated Officer also considers that minor amount of dust potentially generated will not cause vegetation impacts. There are also no Declared Rare Flora, Threatened Ecological Communities or Priority Ecological Communities within a 3 km radius of the Premises.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	Earthworks, Construction of WWTP and landfill	Noise	No residences or other sensitive receptors in proximity- The closest residence is a pastoral residence approximately 5 km south of the project area Priority flora – approximately 3.4 km	Air / wind dispersion	Health/Amenity impacts	No	No receptor present The Delegated Officer considers that the separation distance between the source and potential receptor is sufficient to prevent noise and dust impacts from occurring. The Delegated Officer also considers that minor amount of dust potentially generated will not cause vegetation impacts. There are also no Declared Rare Flora, Threatened Ecological Communities or Priority Ecological Communities within a 3 km radius of the Premises.
		Dust			Health/Amenity impacts, Potential suppression of photosynthetic functions (priority flora) due to the emissions from the project area	No	
		Stormwater from construction areas contaminated with sediment and/or hydrocarbons	Drainage lines Surrounding vegetation	Stormwater runoff Gravity flow overland	Soil contamination inhibiting vegetation growth and survival. Deterioration of groundwater quality and health impacts to fauna	No	Self-bunded fuel tanks used for fuel storage. Storage of dangerous goods in accordance with the Dangerous Good Safety Act 2004, and associated Regulations, administered by DMIRS. The general provisions of the EP Act and Environmental Protection (Unauthorised Discharges) Regulations 2004 apply.
	Storage and use of hydrocarbons and chemicals	Spills and breach of containment	Soil and vegetation adjacent to the area of spill or breach Groundwater, depending on volume discharged and depth to groundwater	Direct discharges to land	Soil contamination inhibiting vegetation growth and survival. Deterioration of groundwater quality and health impacts to fauna	No	Self-bunded fuel tanks used for fuel storage. Storage of dangerous goods in accordance with the Dangerous Good Safety Act 2004, and associated Regulations, administered by DMIRS. The general provisions of *the EP Act and Environmental Protection (Unauthorised Discharges) Regulations 2004* apply.

Table 15: Identification of emissions, pathway and receptors *during operation*

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**		
Category 89 Putrescible landfill site	Landfilling to active trench	Dust	No residences or other sensitive receptors in proximity- The closest residence is a pastoral residence approximately 5 km south of the project area Priority flora – approximately 3.4 km	Air/wind dispersion	Dust deposition on foliage reducing photosynthesis, inhibiting plant growth	No	The Delegated Officer considers the natural dust tolerance of vegetation species should prevent vegetation impacts. Dust emissions will be sporadic and localised, further reducing the likelihood of vegetation impacts.
		Noise	No residences or other sensitive receptors in proximity- The closest residence is a pastoral residence approximately 5 km south of the project area	Air/wind dispersion	None	No	The Delegated Officer considers that the separation distance between the source and potential residential receptor is sufficient to prevent noise impacts from occurring.
		Leachate	Adjacent vegetation	Leachate infiltrating through soil, migrating to groundwater	Groundwater contamination and contaminated soils impacting growth of vegetation	No	The Delegated Officer does not consider that a direct pathway exists given the landfill is situated within the WRD and the depth to groundwater is over 8m and that the applicant will ensure that the base of the landfill will be maintained at least 5 m from the groundwater. As per the requirements of *Water Quality Protection Note 111 'Landfill for disposal of putrescible materials'* (DoW 2009) which requires a minimum separation distance of 2 m for loamy soils, and 3 m for granular soils from the base of the landfill to groundwater. Therefore no further risk assessment is required.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
		Contaminated stormwater	Soil, Groundwater, Sullivan Creek (approximately 2km)	Stormwater containing sediment discharging to drainage lines	Soil contamination inhibiting vegetation growth and survival, and health impacts to fauna and increased sedimentation	No	Contaminated storm water runoff Bunds constructed and maintained around the trenches will prevent stormwater ingress into the landfill and minimise the generation of leachate. The general provisions of the EP Act and *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply.
		Odour	No residences or other sensitive receptors in proximity	Air / wind dispersion	None	No	No receptor present The landfill will be covered on a regular basis (at least monthly) in order to minimise odours.
		Gaseous emissions (from decomposition of putrescible waste)	No residences or other sensitive receptors in proximity	Air / wind dispersion	None	No	No receptor present
Waste Water Treatment Plants	Treatment of sewage	Odour	No residences or other sensitive receptors in proximity	Air / wind dispersion	None	No	No receptor present
	Sewage pipes and holding tanks	Rupture of pipes / overtopping of holding tanks /storage tank failure resulting in sewage discharge to land	Vegetation adjacent to discharge area	Direct discharge	Contaminated stormwater runoff with elevated nutrients can result in eutrophication of waterways and ecosystem disruption Soil contamination inhibiting vegetation growth and survival	Yes-Refer to section 8.4	Potential soil contamination from the release of untreated effluent.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	Storage of chemicals and hydrocarbons	Breach of containment causing chlorine discharge to land	Human receptors- minesite accommodation	Inhalation, Ingestion and dermal contact	Health	No	Self-bunded tanks used for fuel and chemical storage. Storage of dangerous goods in accordance with the Dangerous Good Safety Act 2004, and associated Regulations, administered by DMIRS. The general provisions of *the EP Act and Environmental Protection (Unauthorised Discharges) Regulations 2004* apply.
Re-use Scheme	Irrigation of treated effluent	Treated effluent discharged to spray field for irrigation containing elevated Nitrogen and Phosphorous	Terrestrial ecosystems	Direct discharge	Facilitated growth of weeds; Increase in nutrient levels in soil; Change in soil chemistry; Ponding in the irrigation area; and Impacts to surrounding vegetation.	Yes – Refer to section 8.5	Potential for ponding in the irrigation area and increase in nutrient levels in soil if effluent is not treated to recommended levels.

8.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 16 below.

Table 16: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 17 below.

Table 17: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	• **onsite impacts**: catastrophic • **offsite impacts local scale**: high level or above • **offsite impacts wider scale:** mid-level or above • Mid to long-term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • **Adverse health effects:** high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • **Local scale impacts:** permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	• **onsite impacts**: high level • **offsite impacts local scale**: mid-level • **offsite impacts wider scale**: low level • Short-term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• **Adverse health effects:** mid-level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • **Local scale impacts**: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	• **onsite impacts**: mid-level • **offsite impacts local scale**: low level • **offsite impacts wider scale**: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• **Adverse health effects:** low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • **Local scale impacts:** mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	• **onsite impacts**: low level • **offsite impacts local scale**: minimal • **offsite impacts wider scale**: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • **Local scale impacts:** low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	• **onsite impact**: minimal • Specific Consequence Criteria (for environment) met	• **Local scale**: minimal to amenity • Specific Consequence Criteria (for public health) met

^ Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting.*

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines.*
"onsite" means within the Prescribed Premises boundary.

8.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 18 below:

Table 18: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

8.4 Risk Assessment – Risk Event 1 - WWTP rupture of pipes, overtopping and storage tank failure during operation

8.4.1 Description of WWTP rupture of pipes, overtopping and storage tank failure during operations

Sewage from ablutions and other facilities at the accommodation villages will be treated through the containerised five (5) stage SBR, WWTP. If the WWTP has a breakdown of pumps, rupture of pipes, overtopping and/or tank failure, there is the potential for untreated, partially untreated or treated wastewater (depending on component of plant breakdown) to be released to the environment. Stormwater at the Premises also has the potential to become contaminated and can result in ecosystem disruption. During normal operations, treated wastewater will be discharged to the irrigation area.

8.4.2 Identification and general characterisation of emission

Wastewater may contain high levels of pathogens and nutrients; concentrations dependant on level of treatment reached when discharge occurs.

8.4.3 Description of potential adverse impact from the emission

Wastewater accidently discharged to the environment during the treatment process may cause localised soil contamination off-site impacts on vegetation.

8.4.4 Criteria for assessment

The Applicant has provided a commitment that the WWTP will comply with a Low Exposure

Risk Level (human contact) in accordance with *DoH, 2011* and Water Quality Protection Note (WQPN) 22(refer to Table 6 for the effluent specifications).

General provisions of the *EP Act* and the *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply as well.

8.4.5 Applicant/Licence Holder controls

This assessment has reviewed the controls set out in Table 19 below.

Table 19: Applicant's/Licence Holder's proposed controls for Risk Event 1 – Rapture of pipes, overtopping and storage tank failure

Site infrastructure	Description	Operation details	Reference
Controls for discharge			
WWTP	Rapture	All pipelines will be HDPE with welded joints; Pipelines will be inspected daily to identify leaks, spills or failures. Remote monitoring and control capabilities; and Standby pumps, during emergencies. Pipelines will be located within bunds to ensure that in the event of a spill or leak, effluent is captured and not released to the environment.	Figure 1
	Overtopping	Freeboard will be inspected daily; The WWTP will have contingency storage capacity for up to two days of normal flow if discharge is suspended while any problems are fixed. Remote monitoring and control capabilities; and Standby pumps, during emergencies.	Figure 1
	Storage tank failure	Remote monitoring and control capabilities; and Standby pumps, during emergencies.	Figure 1

8.4.6 Key findings

The Delegated Officer has reviewed the information regarding Rapture of pipes, overtopping and storage tank failure and has found:

1. *The WWTP will have contingency for storage capacity if discharge is suspended while any problems are fixed;*
2. *Pipelines will be located within bunds to ensure that in the event of a spill or leak, effluent is captured and not released to the environment; and*
3. *Untreated sewage should be appropriately contained with sumps located at low points along pipeline routes to capture and store spills and leaks.*

8.4.7 Consequence

Based on the applicant controls and distance to the nearest sensitive receptors and that the entire WWTP is built on hardstand ground, the impact of WWTP pipe rupture, overtopping and tank failure will result in low level on-site impacts. Therefore, the consequence is **minor**.

8.4.8 Likelihood of Risk Event

Based on the information detailed above and applicant controls to be put in place, an environmental impact from WWTP pipe ruptures, tank failure and the irrigation of treated wastewater will not occur in most circumstances. Therefore, the likelihood of the consequence is **unlikely**.

8.4.9 Overall rating of overtopping, storage tank failure and pipe rapture

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of discharges to land from the rapture of pipes, overtopping and storage tank failure is **medium**.

8.5 Risk Assessment – Risk Event 2 – Reuse of treated wastewater

8.5.1 Description of risk from reuse of treated wastewater

Effluent from the WWTP will be treated to a secondary level of treatment (Category C) in accordance with Water Quality Protection Note 22 (WQPN 22) and to comply with a Low Exposure Risk Level (level of human contact) in accordance with *DoH, 2011*, with effluent achieving the specifications detailed in Table 6.

The applicant is proposing an application rate of less than 30mg/L for nitrogen and less than 8 mg/L of phosphorus based on calculations from the “Water Quality Protection Note 22, July 2008, Risk Category C”.

There is a risk of improperly treated sewage effluent potentially affecting natural soil or drainage lines through pathogens or excessive nutrients.

8.5.2 Identification and general characterisation of emission

Often the discharge of improperly treated effluent from WWTPs results in the deposition of large amounts of organic matter and nutrients which have major detrimental effects on the health of these surrounding environments.

8.5.3 Description of potential adverse impact from the emission

If wastewater is discharged to the irrigation area prior to meeting emission standards, this could lead to the facilitated growth of weeds, increase in nutrient and pathogenic levels in soil within the irrigation area. Risk of exposure to pathogens is even greater should ponding occur within the irrigation area.

8.5.4 Criteria for assessment

The following criteria have been used to evaluate the risk associated to reuse of treated wastewater:

- Department of Health's *Guidelines for the non-potable uses of recycled water in Western Australia*, low exposure risk for surface irrigation with some restricted access and application.
- Heavy metals in wastewater should not exceed the quality criteria for irrigation use given in the *Australian and New Zealand guidelines for fresh and marine water quality*.
- Australian water quality guidelines *(ANZECC and ARMCANZ 2000)* provide recommended trigger values for fresh and marine water.
- *Turf Guideline (2014).*
- *DER Guideline: Assessment and Management of Contaminated Sites (2014)* provides ecological and human health assessment levels for soil.
- *Water Quality Protection Note 22*

8.5.5 Applicant/Licence Holder controls

This assessment has reviewed the controls set out in Table 20 below.

Table 20: Applicant's/Licence Holder's proposed controls for Risk Event 2 – Irrigating improperly treated wastewater

Site infrastructure	Description	Operation details	Reference
Controls for discharge			
Irrigation area	Improperly treated effluent water	Pipelines will be inspected daily to identify leaks, spills or failures; Daily inspections of the irrigation area will be carried out to ensure system is functioning correctly and no ponding is present; Effluent discharge from the WWTP will be via sprinklers to maximise evaporation; Quarterly monitoring of the parameters as specified in Table 6 above will be carried out for the irrigation area; Effluent discharge from the WWTP will be managed to allow effluent to infiltrate or	*Figure 1*

Site infrastructure	Description	Operation details	Reference
		evaporate and prevent surface ponding or runoff from the irrigation area; Irrigation water will be tested for nutrient load; Irrigation water will be monitored online(alarm in place); and No irrigation will be carried out during rainy periods The Works Approval holder will be required to carry out weekly sampling of the effluent to irrigating the during commissioning period; The Applicant will be required to carry out monthly monitoring of the effluent prior to irrigating when the WWTP is in operation.	

8.5.6 Key findings

The Delegated Officer has reviewed the information regarding the risk from the re-use of improperly treated wastewater and has found that:

1. *The WWTP should have contingency for storage capacity if discharge is suspended while any problems are fixed.*
2. *Effluent discharge should be efficiently managed to allow effluent to infiltrate or evaporate and prevent surface ponding or runoff from the irrigation area;*
3. *Discharge may result in increased nutrient enrichment within the irrigation area;*
4. *Nutrient enrichment may cause native vegetation die off, exposing greater areas of soil to wind erosion;*
5. *Improperly treated wastewater may contain high levels of pathogens and nutrients; concentrations during commissioning of the WWTP/spray field and during time limited operations, therefore design and performance specifications, as well as requiring Environmental Commissioning Report and Environmental Compliance Report will be set as a requirement in the works approval.*
6. *Regulatory controls may be added to the licence to ensure there are no surface ponding or runoff from the irrigation area; and*

8.5.7 Consequence

Based on the information detailed above and that the wastewater will undergo treatment prior to discharge, the Delegated Officer has determined that the consequence from reuse of treated wastewater at the proposed irrigation area will be **minor**.

8.5.8 Likelihood of Risk Event

Based on the information detailed above, the Delegated Officer has determined that the likelihood of the risk event occurring due to reuse of improperly treated wastewater causing minor consequences is **unlikely** as the event will not occur in most circumstances.

8.5.9 Overall rating for the re-use of improperly treated wastewater

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of discharging improperly treated wastewater to land/spray field during operation is **medium**.

8.6 Summary of acceptability and treatment of Risk Events

A summary of the risk assessment and the acceptability or unacceptability of the risk events set out above, with the appropriate treatment and control, are set out in Table 21 below. Controls are described further in section 9.

Table 21: Risk assessment summary

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	**Source**	**Pathway/ Receptor (Impact)**			
1.	Discharge of treated/ untreated wastewater	WWTP rupture of pipes, storage tank failure/over topping and pump breakdown	Direct discharge to land potentially causing soil contamination Facilitated growth of weeds Increase in nutrients in soil	Refer to Applicant controls as detailed in section 8.4.5	Minor consequence Unlikely likelihood **Medium Risk**	Acceptable subject to regulatory controls
2.	Discharge to land from contaminated stormwater and material spills	Contaminated stormwater	Directed stormwater to nearby environment potentially causing impacts/ disruptions to the ecosystem.	Infrastructure and management controls as detailed in section 8.4.5.	Minor consequence Unlikely likelihood **Medium risk**	Acceptable subject to proponent controls conditioned / outcomes based controls
3.	Irrigation of treated wastewater -leaching of nutrients into the groundwater and contaminated runoff of nutrients Key nutrients include phosphorus and	Treated effluent water	Direct discharge	Infrastructure, application area and frequency Refer to Applicant controls as detailed in section 8.5.5	Minor consequence Unlikely likelihood **Medium Risk**	Acceptable.

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	**Source**	**Pathway/ Receptor (Impact)**			
	nitrogen in wastewater					

9. Regulatory controls

A summary of regulatory controls determined to be appropriate for the Risk Event is set out in Table 22. The risks are set out in the assessment in section 8 and the controls are detailed in this section. DWER will determine controls having regard to the adequacy of controls proposed by the *Applicant*. The conditions of the *Works Approval* will be set to give effect to the determined regulatory controls.

Table 22: Summary of regulatory controls to be applied

		Controls **(references are to sections below, setting out details of controls)**			
		9.1.1 -9.1.3 Infrastructure and equipment	**10.1.2 Operational requirement**	**10.1.3 Monitoring**	**10.1.4 Reports**
Risk Items (see risk analysis in section 8)	**1. WWTP rupture of pipes, storage tank failure and over topping**	●	●	●	●
	2.Contaminated stormwater runoff	●			
	3. Irrigation	●	●	●	●
	4. landfill	●	●	●	●

9.1 Works Approval controls

9.1.1 WWTP infrastructure and equipment

The following infrastructure and equipment should be constructed to manage discharge resulting from pipeline ruptures and tank failures.

Table 23: Infrastructure requirements to manage discharge

Infrastructure	**Requirements (Design and Construction)**
WWTP	**Containerized** five (5) stage tristar designed sequencing batch reactor (SBR450EP) with an average daily capacity of 146.25 m^3/day comprising of: ○ Inlet screen unit; ○ 2 x containerised SBR units; ○ 2 x 50 kL Balance tanks fitted with low level and high level alarms as well as malfunction alarms; ○ 1 x 32 kL Irrigation tank; ○ 1 x 32 kL Sludge tank; ○ Associated HDPE pipelines; ○ Tanks fitted with malfunction alarms; and ○ Remote monitoring and control capabilities;

	○ Pipelines to be located within bunds to ensure that in the event of a spill or leak, effluent is captured and not released to the environment; ○ Standby pumps, during emergencies. ○ Works approval holder will be required to submit a compliance report following the construction works and prior to the commissioning and time limited operations phase; and ○ Works approval holder will be required to submit a commissioning report prior to the time limited operations phase;

9.1.2 Landfill and WWTP infrastructure and equipment

The landfill and WWTP should be constructed as shown in table 24 below to manage discharge relating to contaminated stormwater.

Table 24: Infrastructure requirements to manage contaminated stormwater

Infrastructure	Requirements (Design and Construction)
Inert and putrescible landfill	Landfill located greater than 5 m above the groundwater table; Trenches to be 100 metres in width, 200 metres in length and 4 metres in depth; Earthen bunding and perimeter fencing constructed; and Sufficient cover material to be located within the footprint of the landfill. The Works approval holder will be required to submit a compliance report following the construction works and prior to the time limited operations phase;

9.1.3 Irrigation field infrastructure and equipment

The following infrastructure and equipment (Table 25) should be constructed to manage the spray field:

Table 25: Infrastructure requirements to manage contaminated stormwater

Infrastructure	Requirements (Design and Construction)
Spray field	3.6 ha irrigation area during stage 1 phase, expanded to 4 ha following the completion of stage 3 phase, comprising of : ○ A fenced spray field (steel wire fencing) ○ HDPE pipelines with welded joints ○ Irrigation field inclusive of a spray drift buffer ○ Individual branch line flush valves

9.1.4 Monitoring requirements

Works approval

The Works Approval Holder will be required to undertake monitoring (table 26) during commissioning to confirm that the treated effluent is meeting the required quality (table 27).

Table 26: Monitoring requirements

Monitoring point reference	Parameter	Units	Averaging period	Frequency
Final effluent to irrigation storage tank	*E.coli*	cfu/100ml	Spot sample	Monthly (NATA accredited analysis)
	Total Nitrogen	mg/L		
	Total Phosphorous			
	Biochemical Oxygen Demand			
	Total dissolved solids			
	Total suspended solids (as turbidity)			Monthly (in-field non-NATA accredited analysis permitted); and Monthly NATA accredited testing for verification purposes.
	pH[1]	pH units	N/A	Monthly (in-field non-NATA accredited analysis permitted)
	Volumetric flow rate	m^3/day	24 hours	Continuous

Note 1: In-field non-NATA accredited analysis permitted.

Table 27: Wastewater Irrigation Quality

Parameter	Value
pH	6.5 - 8.5[1]
Biochemical Oxygen Demand	<20 mg/L[1]
Total suspended solid	<30 mg/L[1]
Total Nitrogen	<40mg/L[2]
Total Phosphorus	<8 mg/L[2]
Total Chlorine	0.2 - 2.0 mg/L[1]
E. coli	<1000 cfu/100ml[1]

9.1.5 Monitoring reports

The Applicant has stated that construction is scheduled to commence following receipt of relevant approvals. Compliance reporting will be required for the landfill and WWTP. A suitably qualified person will be required to confirm that each item of infrastructure specified in the Works Approval has been constructed to the specified requirements.

Commissioning of the WWTP is authorized under the Issued Works Approval for a period of no longer than three (3) months following submission of the compliance report. Three (3) month commissioning timeframe has also been authorized for the WWTP under the Issued Works Approval.

Works approval holder will be required to submit a commissioning report prior to the time limited operations phase.

Following approved time limited operations, the Applicant will require an Issued Licence, prior to further operation of the landfill and WWTP.

9.2 Licence controls

It should be noted that these controls are not final and will be subject to compliance with conditions of the Works Approval and may change if additional information becomes available to further inform the risk assessment (as per *Guidance Statement: Risk Assessments*).

9.2.1 Operational requirements for the WWTP and irrigation area

The Licence will authorise irrigation of treated effluent water from the Premises to the spray field subject to compliance with Licence conditions, which will include infrastructure and equipment controls, waste acceptance, throughput restrictions, disposal requirements and treated wastewater limits for the WWTP.

Table 28: WWTP & Irrigation field operational requirement

Infrastructure	Management Controls
WWTP	Design capacity of 146.25 m^3/day The wastewater will be treated before being discharged to a dedicated spray field. The WWTP will meet the following emission standards: Biochemical Oxygen Demand <20 mg/L Total Suspended Solids <30 mg/L Total Nitrogen <30 mg/L Total Phosphorus < 8 mg/L pH 6.8-8.5 *E.coli* <1000 coliform forming units per 100 mL (cfu/100mL) Freeboard will be inspected daily; Pipelines to be located within bunds to ensure that in the event of a spill or leak, effluent is captured and not released to the environment.
Irrigation field	Stage 1 – Approximately 3.6 hectare to receive up to 146.25 m^3 per day of treated wastewater; HDPE pipelines with welded joints; and Fenced;

9.2.2 Operational requirements for the landfill

Table 29: WWTP & Irrigation field operational requirement

Infrastructure	Management Controls
Landfill	Design capacity of 5000 tonnes per annum Multiple trenches 100 m x 200 m in area, 4 m in depth Landfill will be covered on a fortnightly basis with inert material Regular inspections Bunding maintained around trench perimeter Windblown waste will be collected and put back in the landfill

9.2.3 Monitoring requirements for landfill

Waste acceptance criteria (including waste type, quantity limit and specifications), cover requirements and the monitoring of inputs will be applied to the Issued Licence for the landfill.

9.2.4 Monitoring requirements for the WWTP

Waste acceptance criteria (including waste type, quantity limit and specifications; monitoring of inputs and outputs (volume – continuous and monthly cumulative); and the quarterly monitoring of treated wastewater shall be applied to the Issued Licence for the WWTP.

9.2.5 Licence reporting

An Annual Environmental Report and Annual Audit Compliance Report will be required to be submitted as a condition of the Issued Licence.

10. Determination of Works Approval conditions

The conditions in the issued Works Approval in Attachment 1 have been determined in accordance with the *Guidance Statement: Setting Conditions*.

The issued works approval expires in 5 years from date of issue.

Table 30 provides a summary of the conditions to be applied to this works approval.

Table 30: Summary of conditions to be applied

Condition Ref	Grounds
Infrastructure and Equipment Condition 1	These conditions are valid, risk-based and contain appropriate controls.
Environmental commissioning 2, 3, 4, 5, 6 ,7, 8 and 9	This condition is valid, risk-based and consistent with the EP Act.
Time limited operation 8 and 9	These conditions are valid, risk-based and contain appropriate controls.
Monitoring during time limited operation 10 ,11,12, 13 and 15	This condition is valid, risk-based and consistent with the EP Act.
Environmental Compliance reporting 16,17,18,19	Environmental compliance is a valid, risk-based condition to ensure appropriate linkage between the licence and the EP Act.

Information 20, 21 and 22	These conditions are valid and are necessary administration and reporting requirements to ensure compliance.

DWER notes that it may review the appropriateness and adequacy of controls at any time and that, following a review, DWER may initiate amendments to the *works approvals* under the EP Act.

11. Applicant's comments

The Applicant was provided with the draft Decision Report and draft issued Works Approval on 1 September 2020. The Applicant advised on 2 September 2020 that they have no further comments on the draft Works Approval and waived the remaining consultation period.

12. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

Based on this assessment, it has been determined that the Issued Works Approval will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Stephen Checker

Digitally signed by Stephen Checker
Date: 2020.09.04 16:04:05 +08'00'

Steve Checker
MANAGER WASTE INDUSTRIES
Delegated Officer under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text ref	Availability
1.	Application form including following supporting information; Cost of project 1. Attachment 1A – Proof of occupier status 2. Attachment 1B – ASIC Company Extract; 3. Attachment 1C – Authorisation to act as representative of the occupier 4. Attachment 3A – Commissioning plan 5. Attachment 3B – Overview of proposed activities 6. Attachment 6A & 6B – Emissions and Discharges 7. Attachment 7 – Siting Attachment 9A – Fee calculation	W6413/2020/1	DWER records (A1902364)
2.	Email: Response from Rhona Wardman to request for further information (GPS coordinates).	W6413/2020/1	17 July 2020 DWER records (A1921651)
3.	Email: Response from Rhona Wardman to request for further information (DoH approval).	W6413/2020/1	30 July 2020 DWER records (A1921651)
4.	Email: Response from Rhona Wardman to request for further information (DWER-Native Vegetation Clearing Permit (NVCP).	W6413/2020/1	4 August 2020 DWER records (A1921651)
5.	DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth.	DER 2015a	accessed at www.dwer.wa.gov.au
6.	DER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth.	DER 2015b	
7.	DER, November 2016. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.	DER 2016b	
8.	DER, November 2016. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth.	DER 2016c	

Attachment 1: Issued Works Approval W6413/2020/1