Environmental Assessment and Management Plan

Coolgardie Wastewater Treatment Plant – Improvement Works

Shire of Coolgardie
Mother of the Goldfields

Prepared for Shire of Coolgardie

April 2024

Project Number: TW24012

DOCUMENT CONTROL

Version	Description	Date	Author	Reviewer	Approver
0.1	Internal Review	4/04/2024	[redacted]		
1.0	Draft Release for Client Review	19/04/2024			
2.0	First Approved Release	24/04/2024			

Approval for Release

Name	Position	File Reference
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1 Introduction

The Shire of Coolgardie (the Shire) is located within Western Australia's Goldfields region, situated approximately 560km east of Perth. The Shire currently owns and operates the Coolgardie Wastewater Treatment Plant (the Site), with Licence No. L8359/2009/2 under Section 57 of the Environmental Protection Regulations 1987.

The Shire intends to improve Site operations with the addition of a new septic tank farm for optimising effluent treatment and the refurbishment of the Site's effluent pond system with a better practice lining system. The Shire is therefore seeking a corresponding Work Approval from the Department of Water and Environmental Regulation (DWER) to undertake these improvement works.

1.1 Purpose and Scope

This Environmental Assessment and Management Plan (EAMP) has been developed to support the application for a Works Approval required for the re-development of the Site (the Project). The objectives of this EAMP are to:

- Describe the current environmental and social values on and surrounding the Site;
- Describe in detail the proposed development, including design, operations and associated benefits;
- Identify any potential impacts to environmental and social aspects associated with the Project;
- Develop environmental engineering and management measures to ensure that all potential impacts are managed to appropriate standards; and
- Understand the residual risks following the proposed management measures.

To achieve these objectives, the EAMP includes the following sections:

- Site Information;
- Infrastructure Design and Operational Aspects;
- Potential Environmental Impacts and Management;
- Residual Risk Assessment; and
- Conclusion.

2 Site Information

The following sections provide an overview of the key aspects of the Site, including its location, surrounding land uses, the DWER Licence, and environmental and social attributes.

2.1 Site Location and Information

The Site is located approximately 0.5 kilometres (km) west of the town of Coolgardie, Western Australia (WA). The Site encompasses approximately 3 hectares (ha) and is located on Bayley Street Coolgardie, across several lots, including:

- Lot 2133 on Plan 184160 Crown Reserve 37045;
- Lot 2140 on Plan 91726 crown Reserve 37045;
- Lot 53 on Plan 91726 Crown Reserve 37045;
- Lot 31 on Plan 91280 Crown Reserve 31983; and
- Lot 2123 on Plan 91095 Crown Reserve 34285.

The Site locality is shown in Figure 1, located in Appendix B. The Site's cadastre information is outlined in Figure 2.

2.2 Site Layout

The Site currently consists of five (No. 5) rectangular shaped ponds. The pond system is a dual treatment train arrangement with a facultative primary pond followed by an aerated facultative secondary pond in each train (Pond A1 & A2, Pond B1 & B2). The final pond (Pond C) functions as a balancing storage for the treated effluent prior to being pumped to the designated irrigation areas.

Treated effluent is transferred via a submersible pump from Pond C to the recycled water network tanks, located next to each designated irrigation area. The effluent is dosed with chlorine prior to entering the tanks and from the tanks, the effluent is then used for irrigation in the designated areas as outlined in the Site Licence. The Oval is located 100m east from the Site and has an irrigation area of approximately 1.5ha. The Coolgardie Park is located in the centre of Coolgardie, approximately 800m east of the Site, and has an irrigation area of approximately 0.8ha.

The two existing primary ponds (Pond A1 and Pond B1) were constructed in 1984 and extended for the addition of the two secondary ponds (Pond A2 and Pond B2) and the balancing storage pond (Pond C) in 1993. The Shire has been operating the treatment trains as a duty / standby configuration, with designated Train B (southern ponds) being offline, or on standby, since June 2021.

The Site layout is shown in Figure 3 provide in Appendix B.

2.3 Site Licencing

The Shire currently holds Licence L8359/2009/2 for the Site as a Category 54 – sewage facility Prescribed Premises under Part V of the *Environmental Protection Regulations 1987* (as amended). The Shire will submit a licence amendment application following the improvement works to include the additional infrastructure (i.e. septic tank farm) and upgraded pond system. The Site boundary will need to be extended to encompass the new septic tank farm.

2.4 Zoning and Surrounding Land Use

The Site is owned and managed by the Shire. The Site is currently situated across multiple zones, including public purposes, public open space and railways.

The land surrounding the Site includes areas of native vegetation as well as residential villages and land cleared for industrial and recreational activities. The surrounding zoning and land uses are as follows:

- Bushland is located to the north of the Site, which is zoned as 'Public open space' and 'No zone';
- Land to the east is zoned as 'Public open space' and 'Residential';
- Land south of the Site is zoned as 'Public open space' and 'No zone'; and
- Bushland is located to the west of the Site, comprising of multiple zones including 'Public open space', 'Railways', 'No zone' and 'Rural residential'.

The surrounding land zoning and uses are shown in Figure 4.

2.5 Industry Separation Distances and Sensitive Receptors

The WA Environmental Protection Authority's (EPA's) *Guidance Statement No. 3 – Separation Distances between Industrial and Sensitive Land Uses 2005* (Guidance Statement 3) contains the recommended minimum separation distances between industrial activities, including waste management facilities and sensitive land uses.

Sensitive land uses are defined as those that are sensitive to industrial emissions and include residential developments, schools, hospitals, shopping centres and other public areas and buildings. The recommended minimum separation distances between sensitive land uses and the Site's activities is shown in Table 2-1.

Table 2-1: EPA Recommended Separation Distances from the Proposed Industry Activities

Category	Industry	Impacts					Recommended Separation Distance (m)
		Gaseous	Noise	Dust	Odour	Risk	
54	Sewage Facility				✓	✓	Case by case

The closest residential property is approximately 220m northeast from the Site's wastewater ponds. Kurrajong Village and Ford Bayley Village are located approximately 270m and 243m, respectively, to the south.

The sensitive receptors and their distances from the Site are shown in Figure 5. The potential impacts of odour as well as the elevated levels of off-site risk to the community from the proposed waste management activities will be managed to appropriate best practice standards and are discussed further within Section 5.

2.6 Environmental Attributes

The following sections provide details on the key environmental attributes of the Site, including climate, topography, geology, flora and fauna.

2.6.1 Climate

The Site is located within a region that experiences an arid, non-seasonal to semi-arid Mediterranean climate according to the Bureau of Meteorology (BOM). Therefore, the local climate is defined by low rainfall year round, hot summers and temperate winters. The average monthly rainfall, mean maximum and mean minimum temperatures from 1893 to 2023 recorded at Coolgardie (BOM Station Number: 012018) are provided in Table 2-2. Pan evaporation is not recorded at this station, and this data has been sourced from SILO, which is a database of Australian climate data from 1889 to the present that is hosted by the Queensland Department of Environment and Science (DES). SILO constructs datasets from observational data obtained from BOM, using mathematical interpolation techniques to infill gaps in time series and construct spatial grids.

Table 2-2: Monthly Climate Statistics Summary from 1893 – 2023

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Rainfall (mm)	23	28	25	22	28	29	24	24	14	16	16	17	266
Mean Evaporation (mm)*	352	278	243	158	102	73	78	107	158	233	279	340	2,401
Mean Max Temp (°C)	33	32	29	25	20	17	16	18	22	25	29	32	25
Mean Min Temp (°C)	17	17	15	12	9	7	5	6	8	10	13	16	11

**Note: Data is collated from 1970 to 2023*

The annual average rainfall recorded at Coolgardie is 266mm, with the minimum and maximum monthly values ranging from 14mm and 29mm, respectively. The average annual potential evaporation rate is approximately 2,401mm, which is more than nine times the average annual rainfall and occurs at higher rates during the warmer, drier months of the year.

Diagram 4-1 indicates that winds are predominantly easterly in the morning (9am), remaining predominantly easterly in the afternoons (3pm) from December to April and westerly from May to November.

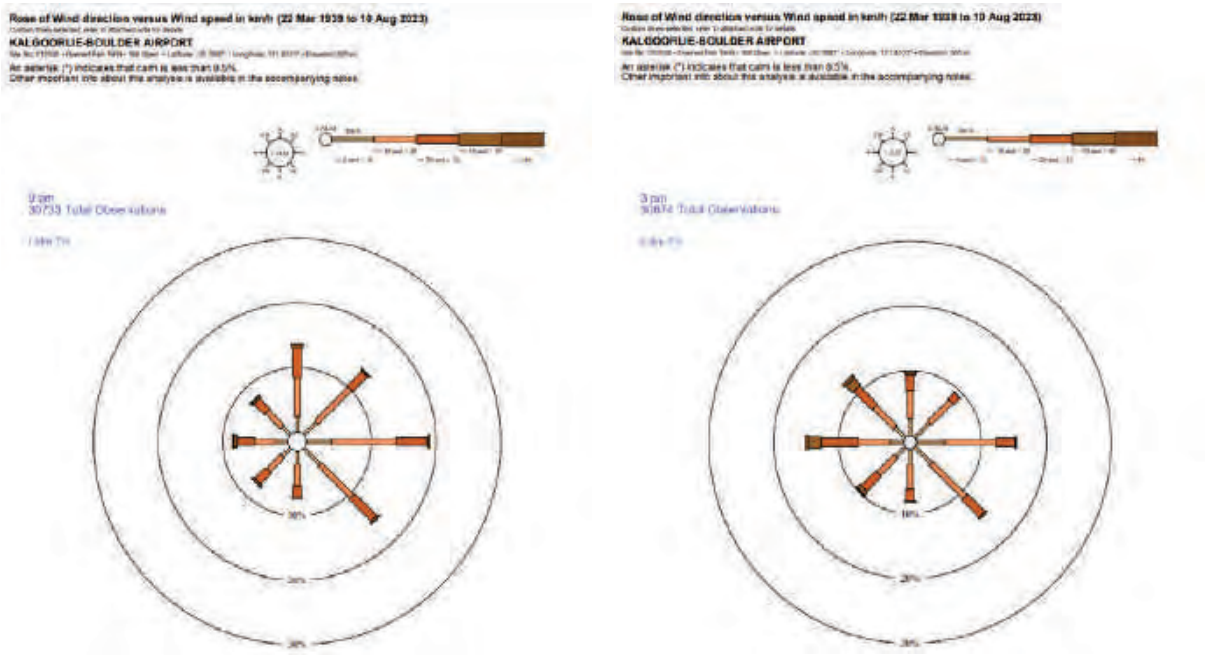

Diagram 4-1: 9am (left) and 3pm (right) Wind Rose for Kalgoorlie-Boulder Airport

2.6.2 Geology

Based on the published regional geology (1:100,000 Geological Survey of Western Australia map of Kalgoorlie), the Site is located within an area of Colluvium, described as comprising gravel, sand, and loam as sheetwash and talus. Figure 6 in Appendix B shows the surface geology at the Site.

The 1:500,000 state interpreted bedrock geology (sheet DMIRS-016) indicates the Site to be underlain by monzogranite, minor granodiorite, and tonalite, metamorphosed, of the Calooli Monzogranite unit.

Previous geotechnical investigations conducted by Wester Geotechnical in 2021 suggested that the Site geology comprises silty clay with gravel.

2.6.3 Flora and Fauna

To understand the ecological attributes of the Site and the surrounding area, a desktop assessment was undertaken utilising the Department of Biodiversity, Conservation and Attractions (DBCA) database. There are not any threatened flora or fauna species recorded at the Site; however, there are two recordings of a Priority 1 flora species approximately 1km south of the Site, as shown in Figure 7, provided in Appendix B. Given the nature, scale and distance of the proposed works, the likelihood of any impact to the Priority 1 flora species is considered to be negligible.

3 Infrastructure Design

The following section outlines the Shire's current and proposed future Wastewater Treatment Plant (WWTP) infrastructure.

3.1 Current Design

The sewage generated within the Shire enters the WWTP utilising gravity via a network of underground pipework.

The WWTP features a system with a dual pond treatment train configuration. This system includes a primary facultative pond leading to a secondary facultative pond. The ponds are equipped with two aerator propellers that aim to reduce odour and improve aerobic digestion.

The treatment trains operate on a duty/standby basis, with Train B (the southern ponds) designated as standby. Train B is activated for sludge removal from Train A. After the initial two ponds, the effluent proceeds to Pond C, regardless of whether it originates from Train A or B. The final pond acts as a balancing reservoir, managing the flow between the treated effluent and the demands of pumped irrigation. Table 3-1 outlines the characteristics of each pond including capacity and inlet/outlet level.

Table 3-1 Ponds Characteristics

Pond	Top of Bank	Outlet Pipe Invert Level (IL)	Pipe Diameter	Top Water Level (TWL)	Floor Level (FL)	Depth	Volume (m^3)
Pond A1	416.00	415.10	180 PE	415.3	413.9	1.40	6,170
Pond A2	415.80	415.1	180 PE	415.2	413.74	1.50	4,180
Pond B1	416.00	415.2	100 PVC/ 180PE	415.3	413.80	1.49	7,500
Pond B2	415.80	415.1	315 PE	415.2	413.7	1.51	4,350
Pond C	416.00	415.0	315 PE	415.2	412.1	3.11	20,475

The treated effluent is transferred from Pond C to the WWTP's recycled water network tanks, located at the Oval and at the Shire's Coolgardie Park in town, via a submersible pump. The effluent is dosed with chlorine prior to entering these tanks. Each tank's entrance is fitted with an actuated control valve to ensure that only one tank is filled at any given time.

The effluent is then used for irrigation in the designated areas as outlined in the Site Licence. The Oval is located 100m east from the Site and has an irrigation area of approximately 1.5ha. The Coolgardie Park is located in the centre of Coolgardie, approximately 800m east of the Site, and has an irrigation area of approximately 0.8ha.

3.2 Proposed Infrastructure Improvements

The key new infrastructure improvements for the Shire's WWTP will include:

- Bulk earthworks refurbishments for Ponds A1, B1, A2 and B2 at the Site;

- New lining system with a HDPE geomembrane overlaying a geotextile for Ponds A1, B1, A2 and B2 at the Site; and
- Installation of a new septic tank farm, consisting of six (No. 6) 31,000 litre (L) tanks with a total capacity of 186,000L.

The new septic tank farm will be located 50m to the east of the Site in a historically cleared area. The farm will be fully enclosed by a security fence and one gated access point. There will be a 3m wide access track around the outer edge of the farm.

The septic tanks are rotational moulded LLDPE with welded baffles to enhance residence time and sedimentation. Each septic tank measures 17m in length and has a capacity of 31,000 L. The tanks will be placed within excavated trenches and lined with cleaned compacted sand to provide a firm base for tank installation.

The septic tank farm is intended to enhance the residence time and facilitate the sedimentation of solids. Therefore, the sewage waste collected from within the Shire will first pass through the septic tank farm before being transferred to the Site's pond system. The sewage will enter the septic tank farm through a newly constructed discharge chamber. The septic tanks operate in parallel in sets of three, meaning the sewage will pass through three tanks before being transferred to the Site's pond system via a new 160 PE sewer pressure main. The septic tank farm will feature two new access chambers: one located at the entrance and another at the exit of the septic tanks.

The septic tank installation will be carried out as per manufactures recommendations which will be provided when the tanks are purchased. The commissioning and testing of the septic tank farm will be as per industry-standard septic tank and pipe work installation.

Ponds A1, B1, A2 and B2 will retain the same geometry and their respective capacities will remain the same following the refurbishment works. Following bulk earthworks, each pond will be lined with a 2mm thick HDPE geomembrane liner with an underlying geotextile that will act as a protection between the geomembrane and subgrade. The geosynthetic layers will be secured in an anchor trench around the perimeter of the pond. To manage surface water and mitigate any ingress into the pond system, the crest of each pond is designed to slope away from the pond perimeter to divert surface water run-off away from the pond.

All Drawings developed for these works are provided in Appendix A.

3.2.1 Capacity Assessment

The tank sizing was based on an average population of 800 with a daily water consumption of 180L/person/day, which equates to 144,000L, with an additional 30% contingency.

In 2021, Wise Water[1] conducted a water balance assessment, which considered the max inflow volume, rainfall, and pond evaporation losses. The water balance model indicated that balancing storage Pond C may discharge from the emergency overflow during an 8 month-period of the year; from September to April; however, with the addition of the septic tank farm, the incidents of emergency overflow from Pond C is considered to be minimal.

The layout of the proposed infrastructure improvements is shown in Figure 3 provided in Appendix B.

[1] Wise Water Infrastructure, Coolgardie Wastewater Treatment Plant Asset Condition Assessment, October 2021

3.2.2 Project Timeline

The estimated project timeline for the delivery of the proposed infrastructure improvements is shown in Table 3-2. These timeframes may vary due to approval assessment periods and contractor timetables. Construction works will be undertaken in three phases: redevelopment of Train B, redevelopment of Train A, and installation of the new septic tank farm.

It is anticipated that Train A will be operational during Train B redevelopment works. Train A redevelopment works will commence once Train B is fully operational. The septic tank farm will be constructed after Train A and Train B development works.

Table 3-2: Estimated Project Timeline

Stage	Duration	Operation
Redevelopment of Ponds B1 and B2 (inc. earthworks, connector pipework and lining)	Winter 2024 (3 months)	Train A & Pond C
Redevelopment of Ponds A1 and A2 (inc. earthworks, connector pipework and lining)	Spring 2024 (3 months)	Train B & Pond C
Installation of Septic Tanks	Summer 2045 (4 months)	Train A, Train B & Pond C

3.2.3 Construction Quality Assurance and Technical Specification

To ensure the materials and construction of the redeveloped WWTP meets the design criteria, a Construction Quality Assurance (CQA) plan and Technical Specifications have been prepared for the Project, which is anticipated to be constructed in the 24/25 financial year.

The CQA plan details the testing methods and quality assurance procedures to undertake the proposed works. There are two Technical Specifications for the project. One provides detail on the earthworks for the refurbished pond system, while the other provides detail on the supply and installation of the pond system's new geosynthetic composite lining system. The installation specification for the septic tank farm will be provided by the manufacturer at the time of purchase and will be of industry-standard.

Copies of the Technical Specifications and CQA Plan for the Project are provided in Appendix C.

3.2.4 Leak Detection Survey

A leak detection survey will be undertaken on the HDPE geomembrane layer, utilising either the arc testing method or water lance method, to identify any potential holes in the geomembrane. Any anomalies detected in the underlying geomembrane will be repaired by the Contractor as directed by the CQA consultant. Further details regarding the Leak Detection Survey are provided in the CQA Plan (available in Appendix C).

4 Operational Aspects

The proposed infrastructure improvement works are intended to enhance environmental outcomes and controls for the Site. The operational aspects following these works are discussed in the following sections.

4.1 Waste Acceptance

The Site is licensed to accept 1,000m^3/day of sewage waste. The Shire is not requesting an increase to this limit, however, the Shire submitted a licence amendment to the DWER on 20 March 2024 to request the following amendments:

- The addition of Category 61: Liquid Waste Facility to the Licence; and
- Permission to accept additional liquid waste types at the Site, specifically septage wastes (K210) sourced from the resource sector.

The DWER is currently assessing this amendment request.

4.2 Sewage Treatment

Sewage from the Shire's sewer system will flow directly into the Site's new septic tank farm before transferring into the Site's refurbished pond system.

The farm will allow for the settlement of solids and a longer retention time, enhancing the performance of the Site's existing pond system. The solids within the septic tanks will be emptied periodically and as per manufacturer's recommendations. The removed material will be disposed of at appropriately licenced facility, which will be the Coolgardie Waste Facility.

The refurbished pond system will continue to encourage the growth of algae and bacteria that help eliminate dangerous substances in the wastewater. The facultative ponds are shallow and cover a wide area, optimizing conditions for bacteria oxidation and nutrient absorption. Their green surface, a result of algae presence, indicates active photosynthesis, which not only generates oxygen for Biochemical Oxygen Demand (BOD) reduction but also breaks down nutrients like ammonia, nitrogen, and phosphorus. The extended retention time in the septic tank farm and ponds, combined with UV radiation from sunlight, effectively destroys viruses and pathogenic bacteria, safeguarding public health. As an added measure, the treated effluent will continue to be dosed with chlorine before it enters the Shire's recycled water tanks, at which point, the treated effluent will be irrigated across the designated irrigation areas.

4.3 Equipment and Machinery

The design of the Site's pond system is considered passive, utilising gravity via HDPE pipework to convey liquids from between Ponds 1, 2 (Train A or B) and Pond C. However, in Pond C, there is a submersible pump positioned just below the water's surface that pumps treated effluent to recycled waste tanks located at Coolgardie Park and Oval. The operation of the pump is controlled via the Coolgardie Recycled Effluent System, which sends a signal to start and stop the pump according to predefined levels in the storage tanks.

Four floating aerators continuously operate in the operational pond train. Two wavemaker aerators are positioned in Pond 1 (A or B) and two in Pond 2 (A or B). The units are positioned by span cables

attached to anchors on the northern pond embankment and connect to manually operated winches on the southern embankment. The winches are mounted close to ground level on metal anchor posts and are used for aerator retrieval for maintenance operations.

4.4 Staffing

The Site is unmanned and is inspected/monitored on as needed basis. There is no anticipated change to staffing as a result of the improvement works.

4.5 Pond Maintenance and Monitoring

The Site will continue to be regularly inspected, maintained, and repaired when necessary. Desludging works for the Site's septic tank farm and pond system will be undertaken on a scheduled basis, by either onsite staff or by a third-party contractor, through the use of a long reach excavator or vacuum truck.

All monitoring and maintenance tasks are to be conducted in accordance with the Site Operations Manual for the WWTP[2] and the operations manual for the septic tanks. At a minimum, all infrastructure will be inspected on a monthly basis. Desludging of the septic tank system will be undertaken annually, while desludging of the pond system will be undertaken on an as-needed basis considering the majority of the solids will first settle in the septic tank system.

[2] Coolgardie Wastewater Treatment Plant, Operations & Maintenance Manual, Water Infrastructure Science & Engineering Pty Ltd, August 2019.

5 Potential Environmental Impacts and Management

The potential impacts associated with the Site are discussed in the following sections, namely:

- Stormwater & Liquid Waste;
- Odour;
- Dust;
- Noise;
- Fire;
- Traffic; and
- Security.

The following sections outline the key proposed environmental management measures to be implemented at the Site.

5.1 Stormwater & Liquid Waste

There is potential for stormwater to be contaminated when it comes into contact with the Site's pond system, or to generate additional waste and cause damage to infrastructure during heavy rainfall conditions. Additionally, leakage from the ponds, tanks or spillages can result in contamination of soils and groundwater at the Site.

The septic tanks are manufactured from moulded LLDPE and have access covers that will be sealed during regular operations.

The refurbished pond system at the Site will feature a low permeability lining system, consisting of a 2mm HDPE Geomembrane and an underlying geotextile, for the four ponds comprising Trains A and B. The bulk earthworks around the perimeter of each pond slopes away from the pond crest, preventing stormwater ingress. A Technical Specification and CQA Plan have been developed to ensure that the lining system is installed to best practices standards, mitigating environmental impacts.

The proposed stormwater management measures to be implemented for the Site include:

- The installation of a low permeability lining system for Ponds A1, A2, B1 and B2;
- The final levels around the Site's pond system ensure that stormwater run-off flows away from the perimeter of each pond;
- All stormwater engineering features will be inspected regularly, and maintenance works scheduled appropriately;
- Monitoring of meteorological conditions (i.e., storm events);
- Regular desludging of the septic tanks and ponds to minimise loss of capacity; and
- Train A and B can be used simultaneously if necessary.

The management measures outlined within this EAMP are considered suitable for managing the risk associated with stormwater at the Site to an acceptable level.

5.2 Odour

There is the potential for odours to be generated during the regular operations of the Site due to the nature of liquid waste.

The generation of odour from the new septic tank farm would be minimal since the tanks are fully enclosed.

Four aerator propellors work in the ponds to improve the biological process and reduce odours. Pond sludge can also cause odours within a pond if desludging works are not regularly undertaken, and the periodic desludging activity is also likely to generate odour.

As discussed in Section 2.5, there is a sufficient buffer between the Site and the nearest sensitive receptor. There is no permanent site office; therefore, any odour exposure to site staff is limited. Any desludging operations will be limited to a brief period on a regular, scheduled basis and will not be undertaken during periods of high winds.

The key odour management measures to be implemented include:

- Consideration of meteorological conditions during material handling;
- Minimal disturbance of the ponds liquid surface during operation;
- Regular sludge removal from the septic tank farm and pond system;
- A complaints register will be maintained to ensure that the community can express their comments or concerns regarding the operations of the Site; and
- Odour levels across the Site will be monitored by staff and action taken if required.

The management measures outlined within this EAMP are considered suitable for managing the risk associated with odour at the Site to an acceptable level.

5.3 Dust

Clearing and construction activities at the Site have the potential to generate dust, with the possibility of impacts to nearby vegetation, reducing amenity and health impacts. The key activities that will generate dust include the removal of vegetation and topsoil during site clearing, earthworks during construction and the movement of vehicles and machinery throughout the Site.

Following the improvement works, operational activities at the Site have a low risk of generating dust since traffic is minimal and there are no other activities other than wastewater treatment being undertaken.

To manage potential impacts arising from dust, a number of factors were considered including separation distances, clearing, construction, and operational activities, waste types accepted and treatment processes. A summary of the key management measures to be implemented include:

- Vehicles to maintain a maximum speed of 20 km/hr unless otherwise signed;
- A water cart will be utilised on unsealed roads, stockpiles and other operations as deemed necessary during construction works; and
- All works will cease during periods of strong winds.

The management measures outlined within this EAMP are considered suitable for managing the risk associated with dust at the Site to an acceptable level.

5.4 Noise

Noise emissions will be generated from the proposed construction activities. The majority of these emissions will be generated from the operation of equipment onsite and from road and engine noise from vehicles entering and exiting the Site. During operations, noise generation for the Site, if any, will be minor, periodic, and restricted to daylight hours.

Regardless, to ensure that noise emissions are minimised, the following noise emission management measures will be implemented:

- All equipment and machinery will be maintained in good working condition; and
- Ensuring all vehicles accessing the Site use the designated access roadways;
- The operation of equipment and machinery will be restricted to operational hours only;
- If required, plant and equipment shall be fitted with appropriate acoustic treatment (i.e., silencers); and
- Vehicles will be restricted to a maximum speed of 20km/hr at the Site.

The management measures outlined within this EAMP are considered suitable for managing the risk associated with dust at the Site to an acceptable level.

5.5 Fire

The Site is surrounded by natural bushland and is therefore at risk of being impacted from bushfires originating off-site. Due to the nature of the waste treated at the Site, there is minimal potential risk of fire associated with Site operations.

To manage the potential impacts of natural bushfires and onsite fires, the following management measures are proposed:

- Establishing and maintaining fire breaks between the Site boundary and surrounding areas;
- Restrictions to smoking on Site;
- Regular maintenance of all equipment, plant, vehicles, and machinery;
- Regular pre-start checks to be undertaken on all vehicles and machinery;
- Fire suppression equipment to undergo regular testing; and
- Induction/training of staff in fire risks, mitigation, and response capability.

The management measures outlined within this EAMP are considered suitable for managing the risk associated with fire at the Site to an acceptable level.

5.6 Traffic

The proposed improvement works will result in temporary elevated traffic movements to and from the Site and on the surrounding road network. However, traffic at the Site will continue to be low during operation due to the passive nature of the treatment system.

Onsite traffic movements have the potential to generate noise, dust and create an occupational health and safety risk to staff. To manage this risk, the following measures will be implemented:

- Appropriate signage located throughout the Site and entrance/exit;
- Vehicles and machinery will move through the Site via established roads and tracks only;
- Employees and contractors shall wear high visibility and reflective clothing when working in areas where vehicle movement occurs;
- Vehicles will be restricted to a maximum speed of 20km/hr;
- All Site vehicles and machinery will undergo regular maintenance; and
- Induction/training to be provided.

The management measures outlined within this EAMP are considered suitable for managing the risk associated with traffic at the Site to an acceptable level.

5.7 Security

A breach of security may result in injury to persons or damage to infrastructure. To minimise potential security the following management measures will be implemented:

- Appropriate signage will be installed at the Site entrance;
- A perimeter fence is installed around the Site and will be monitored and maintained on a regular basis; and
- All access gates and buildings will be locked securely outside of operational hours.

The management measures outlined within this EAMP are considered suitable for managing the risk associated with security at the Site to an acceptable level.

6 Residual Risk Assessment

Each of the potential risks was assessed as per the *DWER Guidance Statement: Risk Assessments - Part V, Division 3, Environmental Protection Act 1986* (February 2017) (Guidance Statement). The objective of the Residual Risk Assessment is to ensure the potential risks associated with the proposed activities are understood and managed appropriately to ensure that there is no unacceptable residual risk. The sources of hazards, pathways and receptors of hazards identified are outlined in the following subsections.

6.1 Sources of Hazards

For the purpose of this assessment, a source is defined as a primary risk with the potential to cause significant contamination or harm to the environment. With regards to the environment and public health, sources and its potential hazards which may arise from the various future activities have been identified and are shown in Table 6-1.

Table 6-1: List of Potential Hazards

Source	Description of Hazards
Stormwater & Liquid Waste	• Excessive stormwater not properly managed can lead to flooding and damage to infrastructure. • Leakage from the ponds can result in environmental harm.
Odour	• Odour from liquid wastes can cause amenity issues.
Dust	• Dust generated during clearing, construction and operational activities onsite may be inhaled by staff potentially resulting in health impacts and reduced visibility. • Excessive dust may impact surrounding vegetation and flora.
Noise	• High levels of occupational noise can impact personnel onsite. • Noise can cause reduced amenity for surrounding sensitive receptors.
Fire	• Potential for fires in equipment or in surrounding bushland.
Traffic	• Poor design of traffic flow and operations can lead to unpredictable traffic routes and create safety hazards for Site personnel.
Security	• Unauthorised personnel may access the Site resulting in a security breach of the Site facilities, plant and equipment.

6.2 Pathways for Hazards

For the purpose of this assessment, a pathway for a hazard is defined as the route by which potential contamination or harm can migrate. The key migration pathways for a waste management facility generally include the following:

- Air through which lightweight materials, such as dust, litter and odour can travel;
- Surface along which the sources of contamination or harm can travel or be present at (e.g. surface water runoff, litter, persons walking or working over the surface); and
- Sub-surface whereby the underlying soils, bedrock, aquifers and infrastructure permit infiltration of leachate, chemicals and other hazardous materials.

6.3 Receptors of Hazards

For the purpose of this assessment, a receptor is defined as the location where the impact of the contamination or harm is registered. The possible generic receptors of the contamination or harm cause by the identified hazards are summarised in Table 6-2.

Table 6-2: Generic Receptors that May be Impacted by Potential Contamination or Harm

Receptor	Description of the Receptor
Surrounding land users	• People who work or live beyond the boundary of the Site. Some of these are referred to as sensitive receptors.
Site Users	• Persons authorised to traverse across the site, including: o Customers using the Site; o Operational staff; o Contractors carrying out maintenance or monitoring; o Visitors inspecting the Site.
Site Infrastructure	• Buildings that are semi-permanently or permanently occupied and used for work or residential purposes. • Site management systems (i.e., stormwater).
Vegetation	• Offsite vegetation and flora species.
Fauna	• Fauna species whose habitat is within or surrounding the Site.
Groundwater	• Groundwater that exists beneath the Site either as a local perched system or as a regional aquifer from which a water supply may be extracted for industrial or potable purposes.

6.4 Risk Analysis and Management

As outlined previously, this Risk Assessment has been undertaken to identify and evaluate the potential environmental and health risks associated with the proposed activities and to determine the risk rating of the Site. The risk assessment methodology analyses potential 'Source-Pathway-Receptor' scenarios to determine what level of risk may exist following the development works.

Where there is no complete linkage between source, pathway and receptor, there is no definitive risk of an impact occurring. Where there is a potential linkage then a risk of an impact may arise. In the absence of detailed investigations to support the Risk Assessment a risk level can only be subjectively assessed, and potential risks flagged.

6.5 Risk Rating Matrix

To assess the various risks, the potential hazards identified in Table 6-2 were classified according to the DWER's Guidance Statement shown in Table 6-3.

Table 6-3: Risk Rating Matrix

		Consequence				
		Slight	Minor	Moderate	Major	Severe
Probability	Almost Certain	Medium	High	High	[illegible]	[illegible]
	Likely	Medium	Medium	High	High	[illegible]
	Possible	Low	Medium	Medium	High	[illegible]
	Unlikely	Low	Medium	Medium	Medium	High
	Rare	Low	Low	Medium	Medium	High

6.6 Risk Profile

Risk management measures refers to the key management strategies that will be adopted onsite to ensure that all hazards and potential risks identified are controlled to an appropriate level, and that strategies are in place to react to any potential incidents or accidents. In most cases these risk management measures decrease the probability and/or consequence of identified hazards and therefore lower the risk rating.

The current risk rating and revised probability and consequence for each identified hazard following the implementation of defined management measures are shown in Table 6-4.

ure	Surface	Excessive stormwater that is not properly managed can lead to flooding onsite resulting in damage.	Possible	Moderate	Medium	• The installation of a low permeability lining system for Ponds A1, A2, B1 and B2; • The final levels around the Site's pond system ensure that stormwater run-off flows away from the perimeter of each pond; • All stormwater engineering features will be inspected regularly, and maintenance works scheduled appropriately; • Monitoring of meteorological conditions (i.e., storm events); • Regular desludging of the septic tanks and ponds to minimise loss of capacity; and • Train A and B can be used simultaneously if necessary.	Rare	Minor
ter, on a	Surface	Stormwater that interacts with waste will result in further liquid waste generation causing contamination of the surrounding environment. Liquid waste can contaminate groundwater and impact native fauna and flora if released into the environment.	Possible	Moderate	Medium		Rare	Minor
rs	Air	Odour from liquid waste can cause amenity issues.	Likely	Minor	Medium	• Consideration of meteorological conditions during material handling; • Minimal disturbance of the ponds liquid surface during operation; • Regular sludge removal from the septic tank farm and pond system; • A complaints register will be maintained to ensure that the community can express their comments or concerns regarding the operations of the Site; and • Odour levels across the Site will be monitored by staff and action taken if required.	Unlikely	Slight
ing rs	Air		Likely	Minor	Medium		Unlikely	Slight
rs	Air	Visibility may be impaired, and inhalation of dust may occur during site activities.	Possible	Minor	Medium	• Vehicles to maintain a maximum speed of 20 km/hr unless otherwise signed; • A water cart will be utilised on unsealed roads, stockpiles and other operations as deemed necessary during construction works; and • All works will cease during periods of strong winds.	Unlikely	Slight
ing on	Air	Excessive dust may cause detrimental impacts to surrounding vegetation.	Possible	Slight	Low		Unlikely	Slight

rs	Air	Noise impacts from activities onsite.	Possible	Minor	Medium	maintained in good working condition; and • Ensuring all vehicles accessing the Site use the designated access roadways; • The operation of equipment and machinery will be restricted to operational hours only; • If required, plant and equipment shall be fitted with appropriate acoustic treatment (i.e., silencers); and • Vehicles will be restricted to a maximum speed of 20km/hr at the Site.	Possible	Slight
ing rs	Air	Noise impacts from activities onsite.	Unlikely	Minor	Medium		Rare	Slight
rs	Surface	Risk of fires onsite arising from faulty equipment/machinery, bushfires	Rare	Major	Medium	• Establishing and maintaining fire breaks between the Site boundary and surrounding areas; • Restrictions to smoking on Site; • Regular maintenance of all equipment, plant, vehicles, and machinery; • Regular pre-start checks to be undertaken on all vehicles and machinery; • Fire suppression equipment to undergo regular testing; and • Induction/training of staff in fire risks, mitigation, and response capability.	Rare	Minor
ure	Surface		Possible	Major	High		Rare	Minor
n/	Surface		Possible	Moderate	Medium		Rare	Minor
rs	Surface	Poor design of traffic flow and operations can lead to unpredictable traffic routes and create safety hazards for Site personnel.	Unlikely	Major	Medium	• Appropriate signage located throughout the Site and entrance/exit; • Vehicles and machinery will move through the Site via established roads and tracks only; • Employees and contractors shall wear high visibility and reflective clothing when working in areas where vehicle movement occurs; • Vehicles will be restricted to a maximum speed of 20km/hr; • All Site vehicles and machinery will undergo regular maintenance; and • Induction/training to be provided.	Rare	Minor
ure	Surface	Unauthorised personnel may access the Site resulting in a security breach of the Site facilities, plant, and	Unlikely	Minor	Medium	• Appropriate signage will be installed at the Site entrance; • A perimeter fence is installed around the Site and will be monitored and maintained on a regular basis; and	Rare	Minor

7 Conclusion

The Shire is seeking to obtain the required approvals to improve processes at its wastewater treatment plant. The continued operation of the Site's current liquid waste management activities is critical for the Shire and its community, and the improvements to the Site will provide a more efficient process, enhancing the performance of wastewater treatment and reducing wastewater filtration into the ground.

The key potential environmental impacts associated with the improvements of the wastewater treatment plant at the Site include stormwater & liquid waste, odour, dust, noise, fire, traffic, and security. Following an evaluation of the potential environmental impacts, a suite of engineering and operational management measures has been developed and will be implemented to manage the proposed activities at the Site, which are generally considered to be low-risk due to the low wastewater acceptance volumes and the Site's environmental context.

As shown within the EAMP, the overall low risk of the Site, combined with the proposed environmental management measures result in low residual risk ratings. Talis and the Shire believe that the construction and operation of the proposed infrastructure at the Site can be achieved while managing environmental impacts to acceptable levels.

APPENDIX A
Drawings

APPENDIX B
Figures

APPENDIX C

CQA Plan

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