Government of Western Australia
Department of Water and Environmental Regulation

Decision Report

Application for Works Approval

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

Works Approval Number	W6895/2024/1
Applicant	Shire of Broome
File number	DER2023/000671
Premises	Broome Regional Resource Recovery Park Legal description - Lot 550 on Deposited Plan 421448
Date of report	04/07/2024
Decision	Works approval granted

Abbie Crawford

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Abbie Crawford
Manager, Waste Industries

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

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1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the premises. As a result of this assessment, works approval W6895/2024/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

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

2.2 Application summary

On 10 October 2023, the Shire of Broome (the applicant / works approval holder) submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

The Shire of Broome's current waste management facility at Buckleys Road (L6912/1997/11) is nearing the end of its lifespan. To continue to provide waste management services to the community, the Shire proposes to build a new facility. The Broome Regional Resource Recovery Park (RRRP) will be a fully integrated, best practice waste management facility to provide a range of recovery and waste disposal services for the Shire's domestic and commercial communities.

The key infrastructure components at the RRRP include a Community Recycling Centre (CRC), a Liquid Waste Facility (LWF) and a Class III Putrescible Landfill. This application relates to Stage 2 of the works comprising of the construction of the Class III Putrescible Landfill (Cells 1 and 2 only), associated infrastructure and an asbestos monocell. Stage 1 of the works, the construction and operation of the CRC and LWF, are authorised under W6738/2022/1.

The key infrastructure elements of this application include:

- Class III putrescible landfill (Cells 1 and 2);
- Leachate management system;
- Landfill gas management system; and
- An asbestos monocell.

All other supporting infrastructure associated with the Broome RRRP including the surface water management system, levee, weighbridge, washdown bay, fire management system, perimeter fence and groundwater monitoring network has already been assessed and authorised under W6738/2022/1.

The premises is located approximately 6 km north-east of Broome as shown in Figure 1.

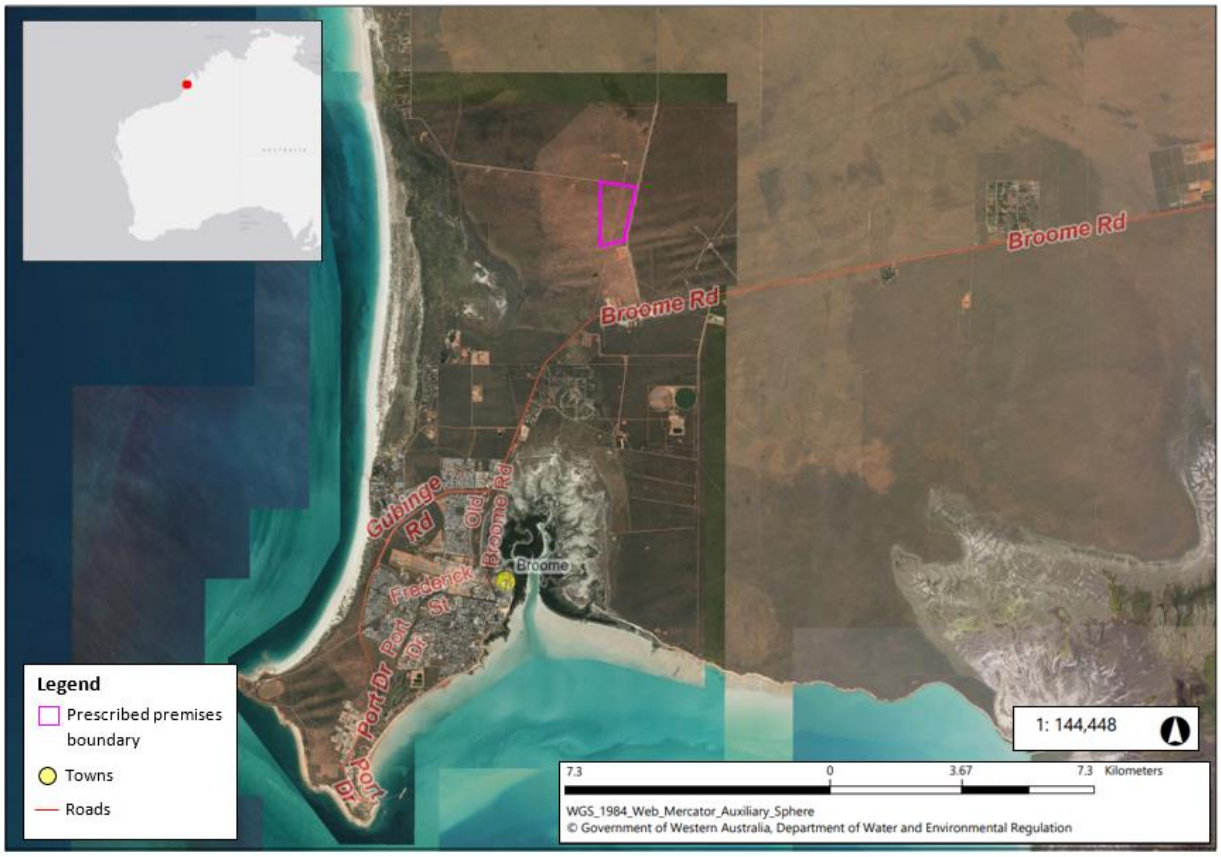


Figure 1: Regional location

Table 1 lists the prescribed premises categories that have been applied for as part of this works approval application.

Table 1: Prescribed premises categories

Classification of premises	Description	Approved premises production or design capacity throughput
Category 63	**Class I inert landfill site**: premises (other than clean fill premises) on which waste of a type permitted for disposal for this category of prescribed premises, in accordance with the *Landfill Waste Classification and Waste Definitions 1996*, is accepted for burial.	5,000 tonnes per year
Category 64	**Class III putrescible landfill site**: premises (other than clean fill premises) on which waste of a type permitted for disposal for this category of prescribed premises, in accordance with the *Landfill Waste Classification and Waste Definitions 1996*, is accepted for burial.	35,000 tonnes per year

The infrastructure and equipment relating to the premises category and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are outlined in works approval W6895/2024/1.

2.2.1 Exclusions

Time limited operations have not been granted for the operation of high-risk engineered critical containment infrastructure (landfill Cells 1 and 2 and the Leachate Evaporation Pond) in accordance with the department's regulatory framework. Operation of medium and high risk engineered critical contaminant infrastructure is halted until the licence assessment is complete and a decision to grant or refuse is made.

Operational risks from critical containment infrastructure have been considered, but not risk assessed in full as part of this works approval. Operational risks will be assessed in full as part of the licence assessment.

To avoid regulatory duplication, general site management requirements including conditions relating to site security, feral animal and weed management, signage, speed limits and operational hours have not been included as part of the works approval. General site management requirements are regulated under the works approval for Stage 1 (W6738/2022/1) and will be captured under the future licence.

2.3 Legislative context

2.3.1 Part IV of the EP Act

The project was referred under Part IV of the EP Act to the Environmental Protection Authority (EPA) on 20 October 2023. On 24 January 2024 the EPA determined that the proposal would not be assessed under Part IV of the EP Act as it is likely the environmental effects of the proposal are not so significant as to warrant formal assessment. The EPA noted that potential impacts are being managed under Part V of the EP Act.

2.3.2 Part V Division 2 of the EP Act

The applicant applied for a clearing permit under Part V Division 2 of the EP Act. Clearing permit CPS 9542/1 was granted on 2 August 2023 for the clearing of 79.85 ha of native vegetation.

2.3.3 Rights in Water and Irrigation Act 1914

The Shire of Broome holds groundwater licence GWL167287(3) for the abstraction of 100,000 kL/year across both the Buckley's Road and Broome RRRP facilities. The approval allows for the taking of water for dust suppression for earthworks and construction purposes.

2.3.4 Planning approvals

The establishment of the Broome RRRP is considered a public work and is subject to a Public Work Exemption under the *Planning and Development Act 2005* (PD Act). The PD Act gives exempt bodies the power to undertake a public work or take land for the purposes of a public work without obtaining development approval from the responsible authority under the relevant planning scheme subject to certain conditions. The Shire has discussed the Public Works Exemption with its Town Planning department which did not foresee any issues with the proposal having regard for the Town Planning Scheme as well as the amenity of the area.

3. Location and siting

3.1 Siting context

The premises is in the Kimberley region of Western Australia, approximately 6 km north-east of the Town of Broome. The Kimberley bioregion is diverse and includes arid desert areas, gorges, sandy beaches, escarpments, rainforests, waterfalls, fast open plains, river valleys and cave systems. The region is characterised by distinct wet and dry seasons.

Within the region, there are over 100 Aboriginal communities of various population sizes, speaking over 40 different dialects. A third of the region's population is Aboriginal or Torres Strait Islander people.

Mining, agriculture, tourism, and construction are the main contributors to the region's economy. The resources sector is dominated by diamond, gem and precious stone mining.

3.2 Environmental siting

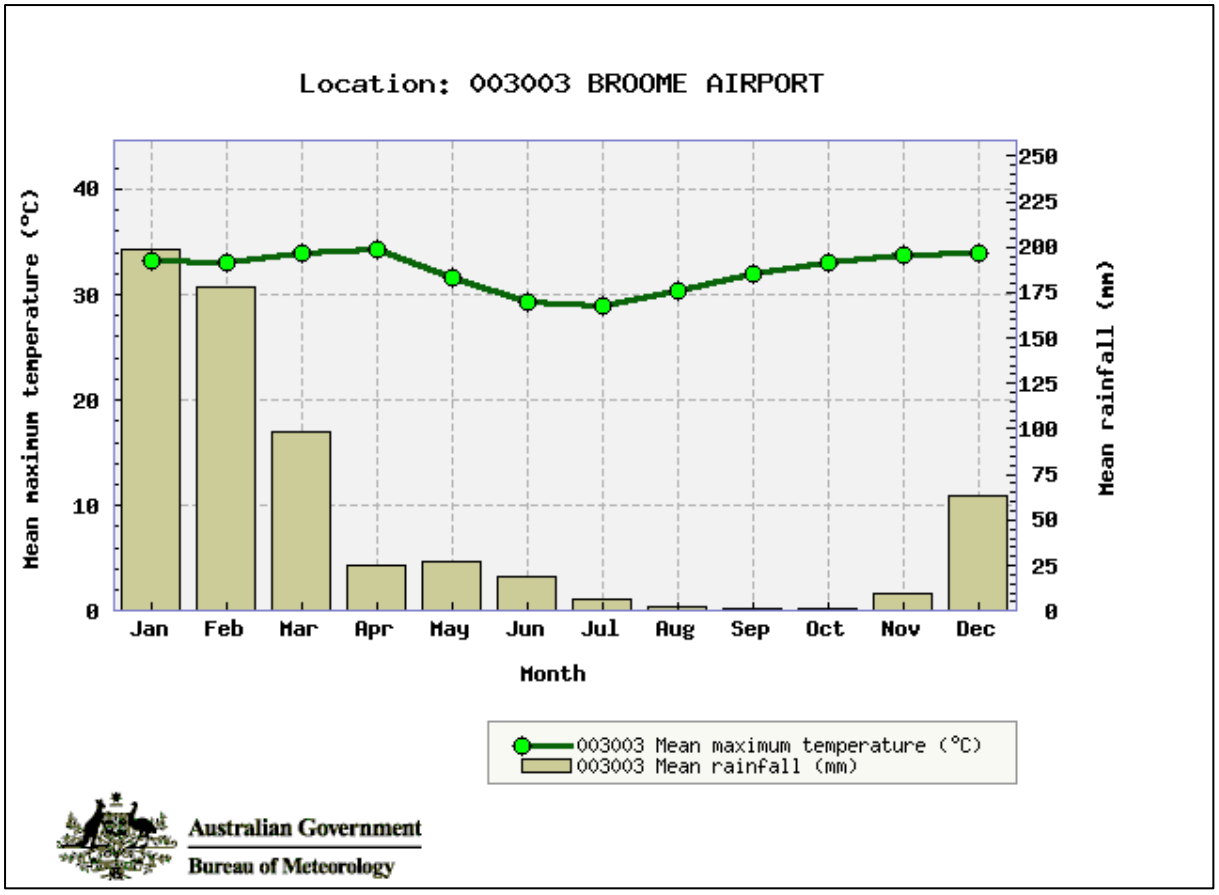
3.2.1 Climate and rainfall

Broome is considered to have a hot semi-arid climate as per the Köppen climate classification. There is a distinct 'wet' season from November to April and a 'dry' season for the remainder of the year. Rainfall during the wet season is variable as it is associated with thunderstorms, tropical lows and cyclones. These wet season weather systems generate approximately three-quarters of the average annual rainfall.

The Bureau of Meteorology (BoM) data for the Broome Airport weather station (Station No. 003003) shows that the area in the vicinity of the premises has an average annual rainfall of 628.9 mm (based on data from 1939 to 2024), with the majority of the rainfall received between December and March. Rainfall averages are dominated by seasonal cyclones which affect the region between November to April.

The average annual maximum temperature is 32.3°C and the average minimum temperature is 21.3°C. The monthly mean rainfall and maximum temperature is shown on Figure 2.

Future climate projections for the Kimberley predict that the mean annual temperature is set to increase by 0.6-1.3°C compared to current conditions by 2030 and by 1.3-5.1°C by 2090. Changes in rainfall will be small compared to the current natural variability, and there is generally low confidence in projected rainfall changes. While the median rainfall will decline by 8-18% in the comparatively dry winter and spring months, unchanged or slightly increased summer rainfall means the annual rainfall changes will be 1% or less by 2090 compared to current conditions. The mean maximum one day rainfall will increase by 15-20% in 2090 compared to current conditions.

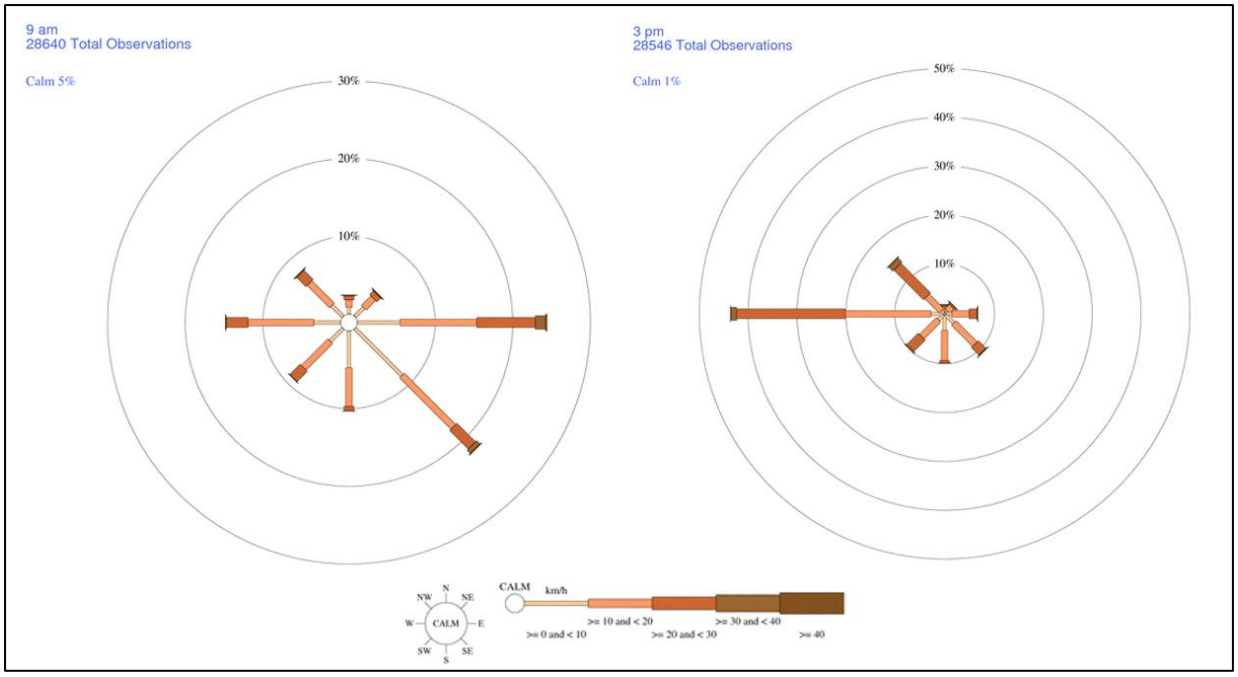


Source: BoM (Station No. 003003)

Figure 2: Rainfall and maximum temperature Broome Airport (1939-2024)

3.2.2 Wind direction and strength

Based on the climate data for the Broome Airport station (1939-2024), the prevailing wind is easterly to south-easterly in the morning to westerly in the afternoon. This is depicted in the wind roses show in Figure 3.



Source: BoM (Station No. 003003)

Figure 3: Wind direction and strength at Broome Airport at 9am (left) and 3pm (right)

3.2.3 Topography

A topographic survey was undertaken by RM Surveys at the premises on the 28 October 2019 using a combination of traditional global positioning system (GPS) survey and aerial capture. During this survey, it was observed that the elevation ranged from 20.5m AHD to 38.5m AHD at the premises. The topography of the premises is shown in Figure 4.

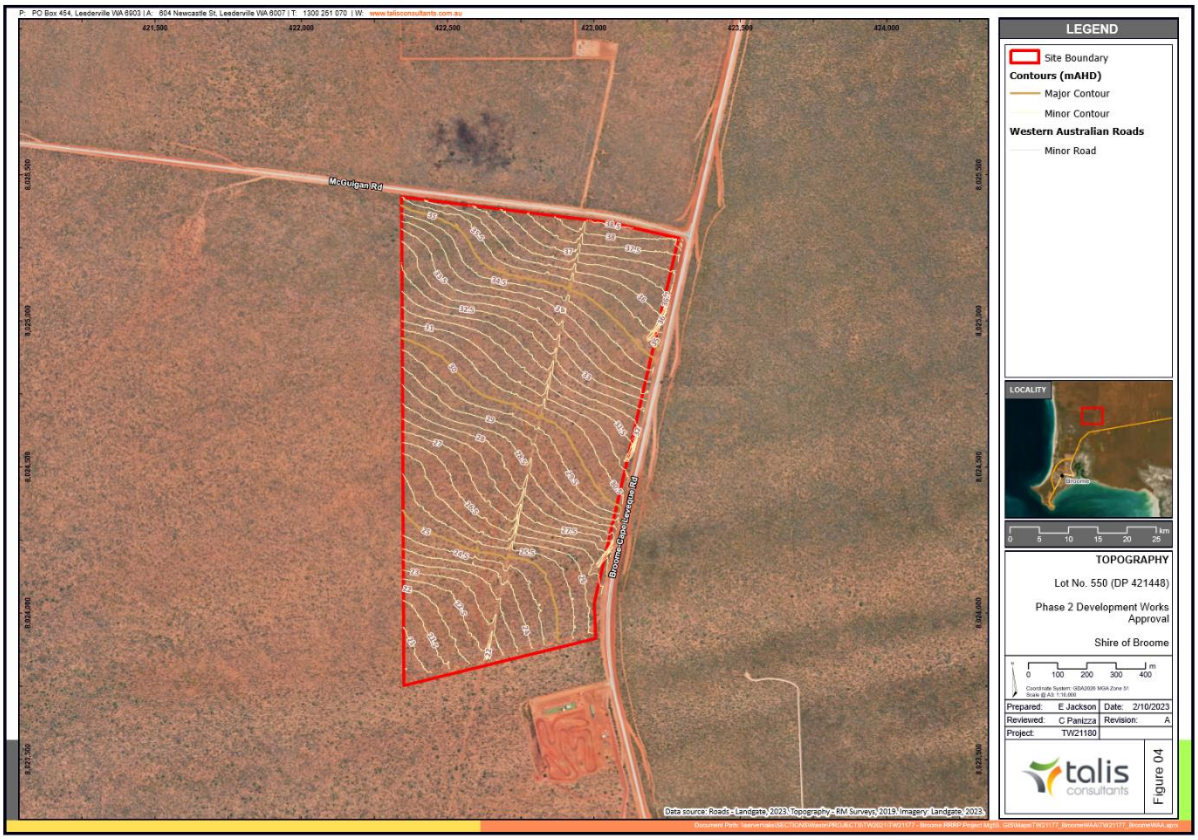


Figure 4: Topography of the premises

3.2.4 Regional geology

The premises lies within the Canning Basin. The Canning Basin is the largest sedimentary basin in WA. Superficial sands and pindan soils of Quaternary age unconformably overlie the Broome Sandstone of Cretaceous age. The Broome Sandstone comprises fine- to coarse grained sandstone with minor beds of pebble conglomerate, grey siltstone and claystone. The Broome Sandstone outcrops over the entire area and ranges in thickness from less than 5 m to about 300 m.

The Broome Sandstone conformably overlies the Jarlemai Siltstone of Late Jurassic age, which in turn, overlies the Alexander Formation (a fine- to coarse-grained sandstone with interbedded siltstone and shale), and subsequently the Wallal Sandstone of early to late Jurassic age (also a fine- to coarse-grained sandstone).

These sediments overlie an eroded, folded sequence of sediments of Permian age. Together, they form the northern margin of the Canning Basin and lie within what is known as the Fitzroy Trough (DoW, 2012).

3.2.5 Soils

Talis Consultants undertook an intrusive soil investigation across the premises in November 2020. Based on the findings of the soil investigation, the generalised soil profile was recorded to be:

- Silty clayey SAND - pale red sand, fine to medium grained, subangular with trace gravel probably of aeolian origin to between 10-15 m bgl (Pindan Plain Soil); overlying
- SANDSTONE - pale yellow to white, very fine to medium grained, variably cemented, bedded to weakly bedded sandstone probably of shallow marine or tidal origin

(Broome Sandstone).

3.2.6 Vegetation

Vegetation within and surrounding the premises boundary is *Corymbia greeniana* low open woodland with *Acacia eriopoda* and *Bauhinia cunninghamii* tall open shrubland, over *Triodia schinzii* and *Triodia caelestialis* low sparse hummock grassland and *Chrysopogon pallidus* and *Sorghum plumosum* low sparse tussock grassland.

3.2.7 Hydrology

There are no permanent water bodies on the premises. The nearest surface water bodies are Buckley's Plain (land subject to inundation) approximately 3 km to the west south-west and Dampier Creek, approximately 4.2 km to the south. Further to the west is the Indian Ocean, which is approximately 5.5 km from the premises.

The land drains only after intense rainfall exceeds the infiltration capacity of sandy soils whereby water follows topography and is discharged through poorly defined broad drainage paths to the coastal plain mudflats and then ultimately to the Indian Ocean or through Roebuck Bay.

3.2.8 Hydrogeology

The Broome Sandstone aquifer is the main aquifer at Broome and provides the water supply for the town. It forms a large, unconfined aquifer system and contains a substantial groundwater resource. The Broome Sandstone aquifer is recharged by throughflow and rainfall (DoW, 2012). Groundwater tends to flow to the west, discharging over a saline interface near the Indian Ocean. Where groundwater is shallow, the Broome Sandstone aquifer supports groundwater-dependent ecosystems.

The groundwater levels in the Broome Sandstone aquifer are strongly correlated to infrequent consecutive high rainfall years. These events raise the water levels in the aquifer and offset the drawdown impacts for a number of years (DoW, 2016).

Seven groundwater monitoring bores were installed in October 2020 as part of site investigations undertaken at the premises. Monitoring well locations are shown on Figure 5. All monitoring bores were installed within the unconfined Broome Sandstone aquifer. Four additional groundwater monitoring bores will be installed around the perimeter of the premises as part of the construction of Stage 1 as detailed in W6738/2022/1.

Groundwater at the premises ranges from approximately 16 m to 32 m below ground level (mBGL). Groundwater flows to the south-west, toward the Indian Ocean. Hydraulic testing determined a groundwater seepage velocity beneath the premises as approximately 21 m/year. Modeled travel times for a potential contaminant plume were 72 years at the closest downgradient production bore, and greater than 100 years for Buckley's Plain (144 years) and the closest single downgradient residential receptor (177 years).

Baseline data from groundwater monitoring indicates that groundwater is fresh with salinity ranging from 128 mg/L to 990 mg/L. A saltwater wedge exists beneath the overlying fresh groundwater which has been assessed by the Water Corporation to be over 150 mBGL. Slightly elevated concentrations of metals (calcium, copper, nickel and zinc) were reported during baseline monitoring, indicative of regional groundwater quality.

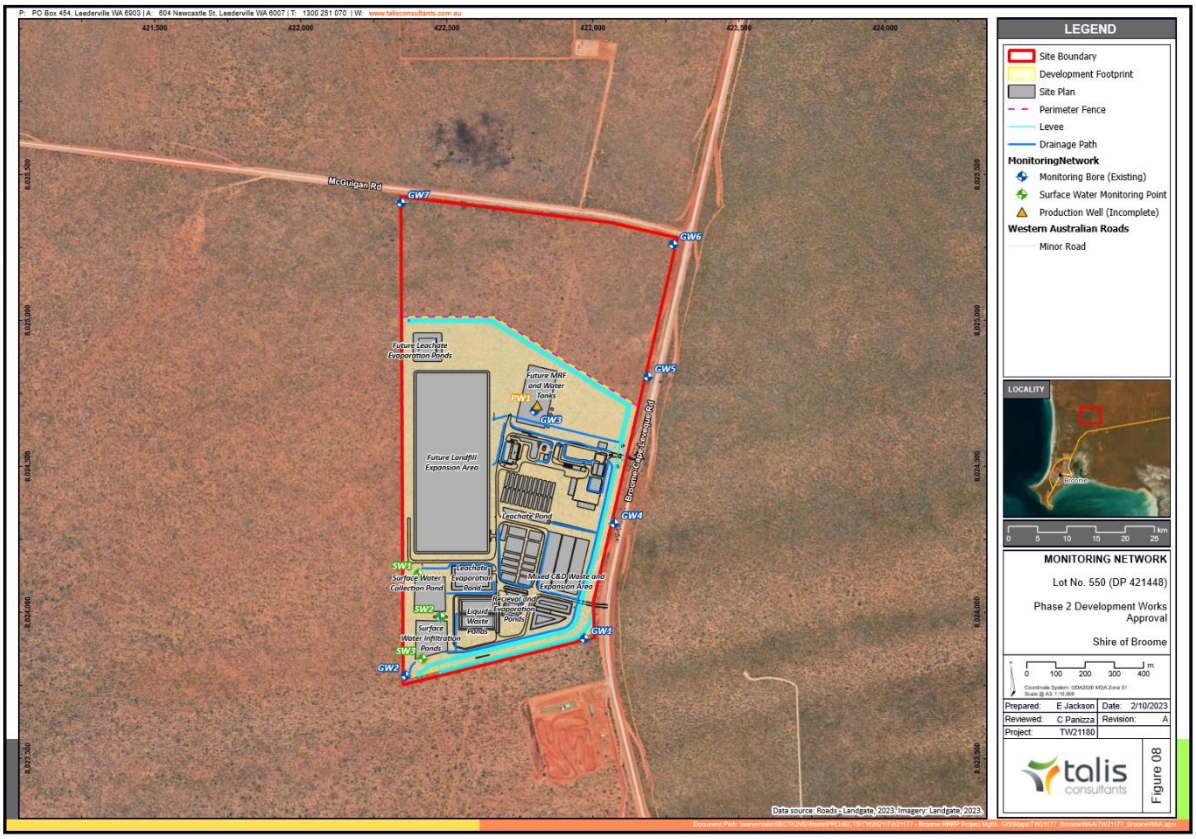


Figure 5: Groundwater monitoring bores (Oct 2020)

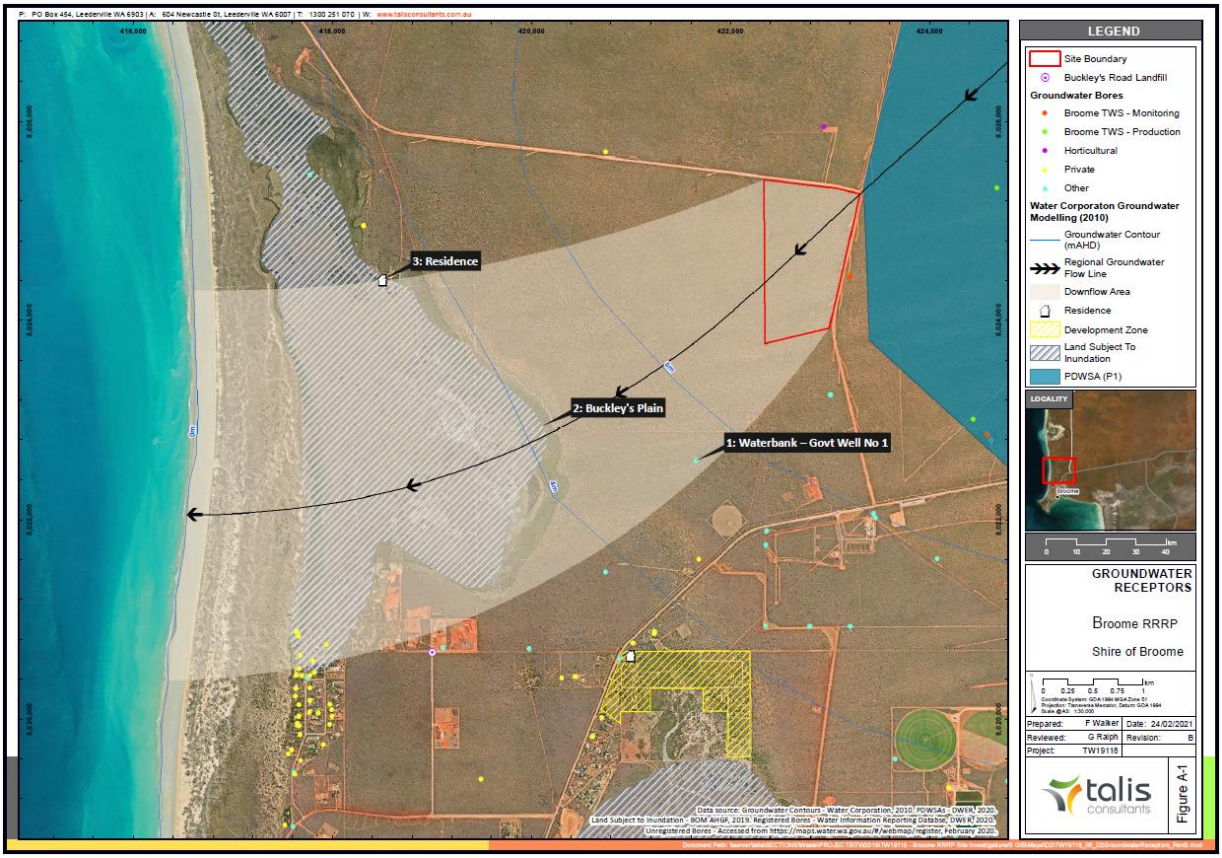


Figure 6: Groundwater flow and receptors

3.3 Residential and sensitive receptors

The distances to residential and sensitive receptors are detailed in Table 2 and shown in Figure 7.

Table 2: Human receptors and distance from premises boundary

Human receptors	Distance from activity or prescribed premises
Residential Premises	Approximately 3.5 km south of premises Approximately 3 km south-west of premises Approximately 3.7 km west of premises
Residential Premises (Goolarabooloo Community / Coconut Wells)	Approximately 5.3 km north-west of premises
Broome Motocross Club	Approximately 150 m south of premises
Mamabulanjin Aboriginal Corporation Nursery	Directly adjacent on the northern boundary of the premises
Industrial premises	Approximately 1.2 km south of premises
Beneficial groundwater users	Residential premises approximately 3.5 km south of the premises Residential premises approximately 3 km south-west of premises Residential premises approximately 3.7 km west of premises Broome Motocross club approximately 150 m south of premises Industrial premises 1.2 km south of premises

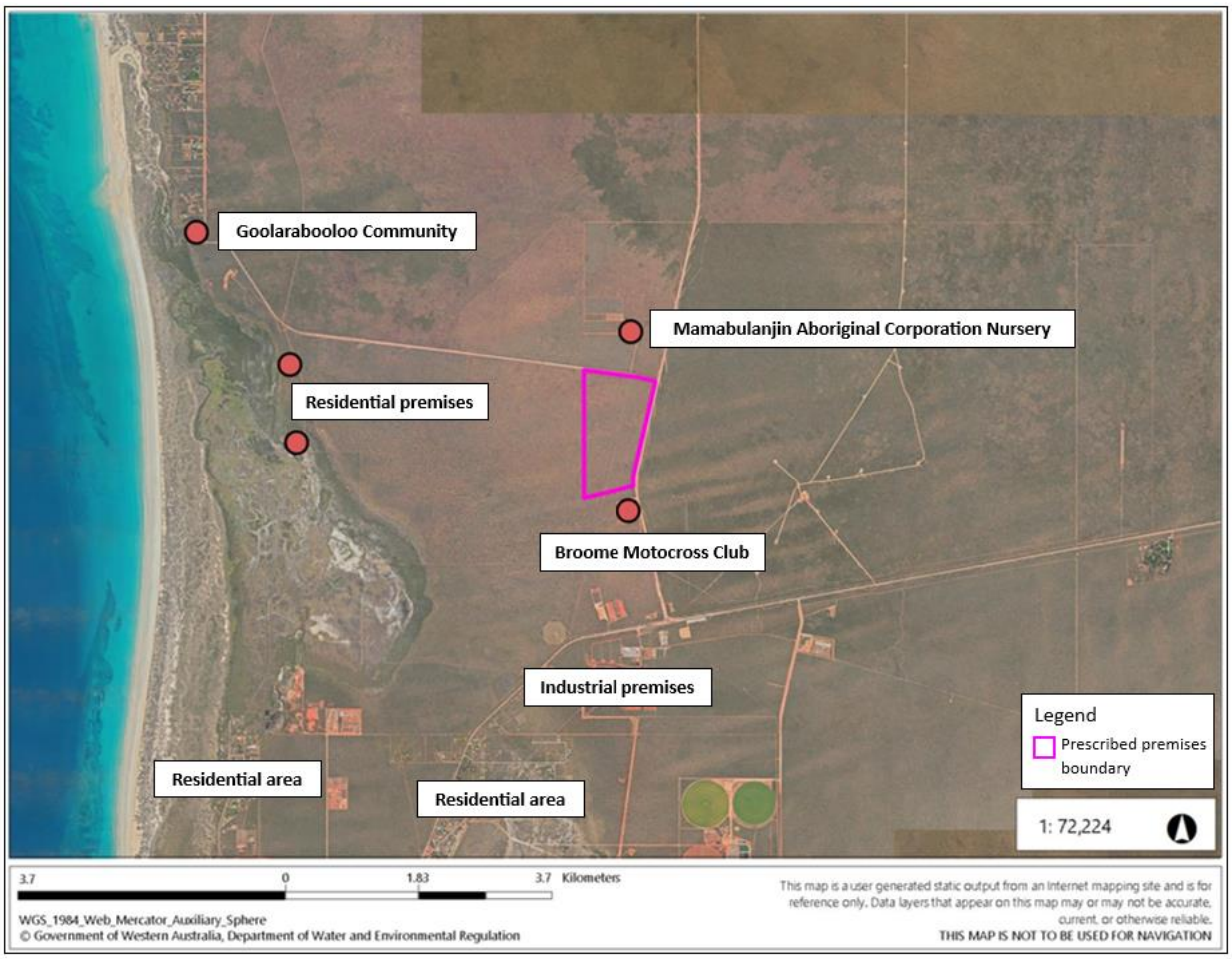


Figure 7: Residential and sensitive receptors in relation to the prescribed premises

3.4 Specified ecosystems and ecological receptors

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 description of specified ecosystems and distances from the premises are discussed in Table 3 and shown in Figure 3.

Table 3: Environmental Values

Specified ecosystems and ecological receptors	Distance from activity or prescribed premises
Flora and fauna	
Yawuru Birragun Conservation Park (CALM Act Reserve 52354) (jointly managed by the native title holders Nyamba Buru Yawuru and DBCA)	Directly adjacent on the western boundary of the premises.
Threatened and Priority Ecological Communities (TEC / PEC) Priority 1 Ecological Community – Relict dune system dominated by extensive stands of *Minyjurra Sersalisia sericea*	Situated within north-western corner of premises boundary.

Specified ecosystems and ecological receptors	Distance from activity or prescribed premises
Threatened and/or priority fauna	Recorded within 1km buffer of premises boundary: • Northern Coastal Free-tailed Bat *(Mormopterus (Ozimops) cobourgianus)* • Eastern Curlew (*Numenius madagascariensis*) • Greater Bilby *(Macrotis lagotis)* Recorded within 5km buffer of premises boundary: • Little Curlew (*Numenius minutus*) • Pacific Golden Plover (*Pluvialis fulva*) • Golden-backed-tree-rat (*Mesembiomys macrurus*) Not recorded, but high likelihood of occurrence: • Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus nudicluniatus)* • Oriental Pratincole *(Glareola maldivarum)*
Groundwater	
Underlying groundwater	Between 16 and 34 mbgl
Rights in Water and Irrigation Act 1914 (RIWI Act) Proclaimed Groundwater – Broome Groundwater Area	The premises is within the Broome Groundwater Area.
Public Drinking Water Source Area – Priority 1 – Broome Water Reserve	The Broome Water Reserve is approximately 100 m east of the premises boundary. The closest well head protection zone is located approximately 1.2 km east of the premises boundary.
Surface water bodies	
Buckley's Plains	Approximately 3 km west of premises boundary.
Roebuck Bay / Dampier Creek – Important Wetlands of Western Australia	Approximately 4.2 km south of the premises boundary.
Indian Ocean	Approximately 5.5 km west of the premises boundary.

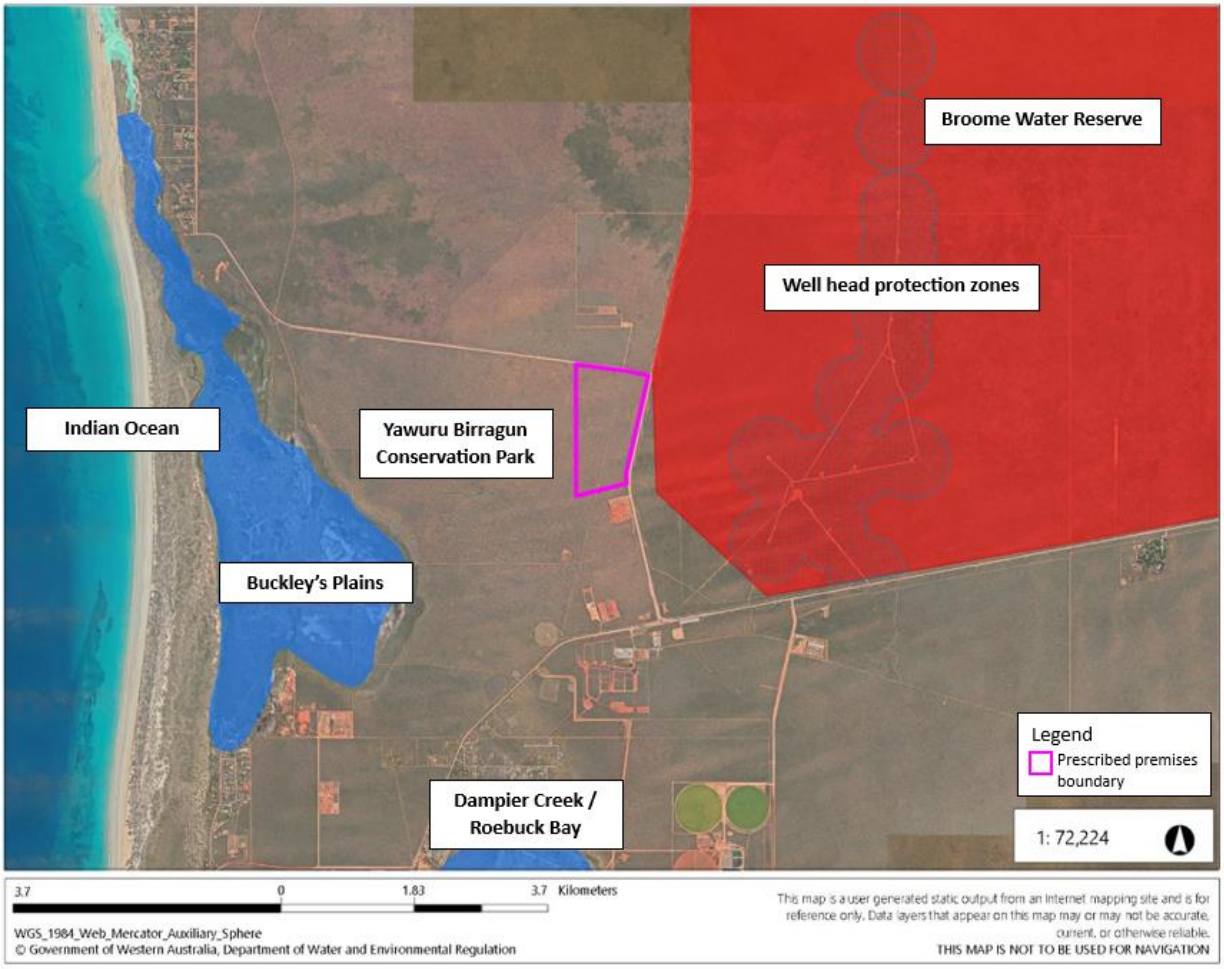


Figure 8: Ecological receptors in relation to the prescribed premises

3.5 Social and cultural values

3.5.1 Aboriginal heritage

The premises is located on Yawuru country. Aboriginal people have always lived in and around the Broome area, hence the region has very high cultural values. Yawuru country spans over 5300 km^2 of subtropical coastal regions and inland savannah country. It includes the town of Broome, Roebuck Plains Station and the Nagalugun Roebuck Bay Marine Park.

A heritage survey was conducted across the premises in late February and early March 2020 by Nyamba Buru Yawuru Pty Ltd and the Kimberley Land Council (KLC). The report's findings, as submitted as part of the application package, concluded that the survey team did not identify anything of cultural heritage.

The premises is adjacent to the Yawuru Birragun Conservation Park. Yawuru Birragun Conservation Park is jointly managed by the native title holders Nyamba Buru Yawuru and the Department of Biodiversity, Conservation and Attractions (DBCA). The conservation estate holds ongoing cultural values for the Yawuru people including for carrying out customary activities, to enjoy country, to use and gain respect for traditional ecological knowledge and the concepts of living cultural landscape.

Native Title does not exist over the premises.

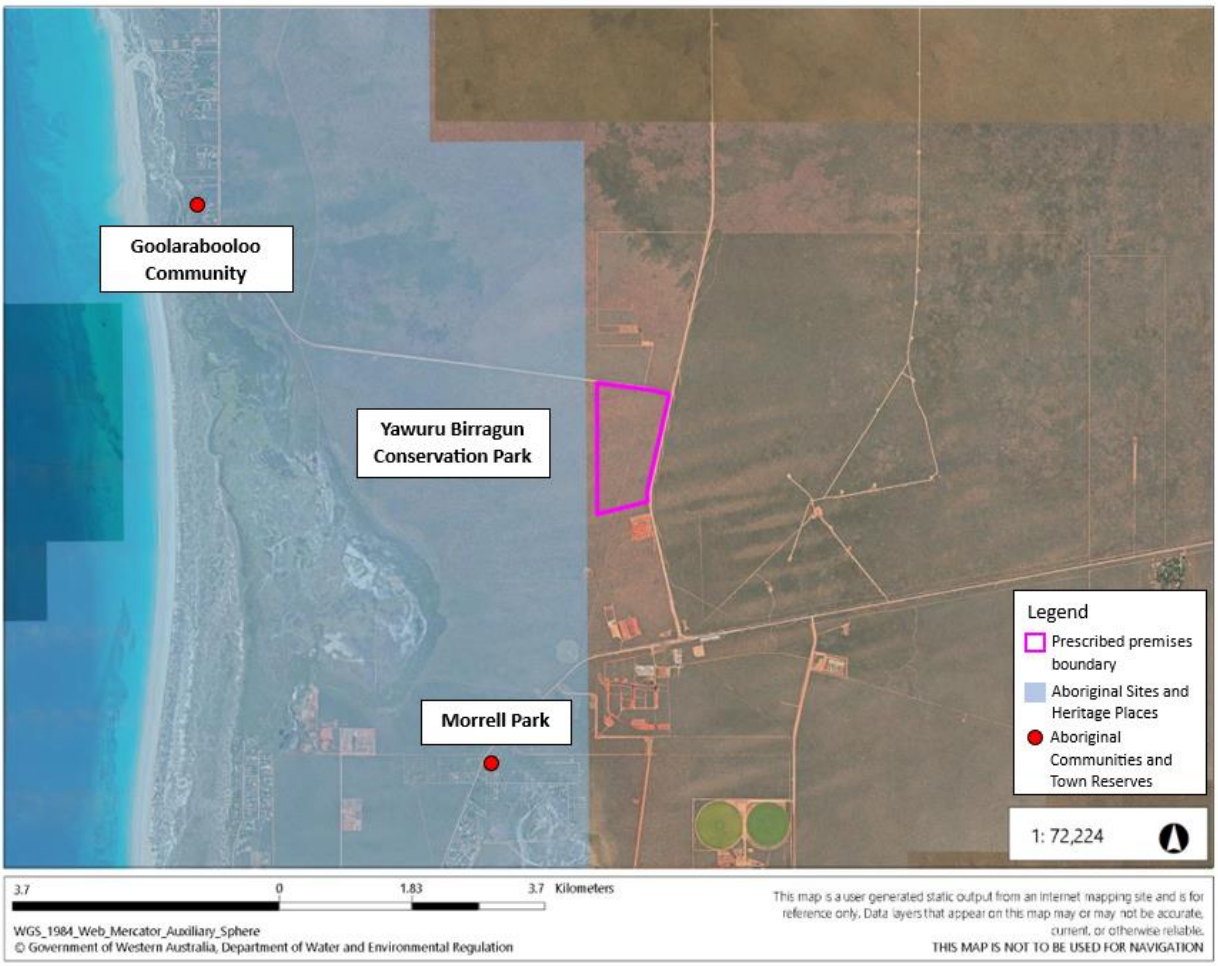


Figure 9: Significant Aboriginal sites

3.5.2 European heritage

No European heritage sites have been found to be located within the premises boundary.

4. Landfill engineering and design

4.1 Class III putrescible landfill

Table 4 provides a summary of the landfill engineering as constructed.

Table 4: Landfill design

Landfill design aspect	Description
Total landfill footprint	Approximately 16.5 ha
Total landfill capacity	Approximately 2,145,386 m^3
Landfill liner design	Composite lining system overlain on a prepared subgrade comprising of: • Layer 1: 500 mm thick Engineered Attenuation Layer • Layer 2: Geosynthetic Clay Liner (GCL) • Layer 3: 2.0 mm High Density Polyethylene (HDPE)

Landfill design aspect	Description
	• Layer 4: Cushion/Protection Geotextile • Layer 5: 300 mm thick Leachate Collection System • Layer 6: Separation Geotextile
Groundwater separation distance	Minimum 3 m above highest recorded groundwater level at lowest point (bottom of leachate sump)
Cell lifespan	Each cell approximately 4-5 years
Side slopes	1V:3H
Basal gradient	≥3% to the primary collection pump and ≥1% to the extraction sump
Final slope profile	1V:5H and 1V:17H
Maximum height	Approximately 20 m above natural ground level
Containment infrastructure	Basal lining system, leachate collection system, gas management system, capping system and surface water management system

4.1.1 Landfill liner design

The Class III landfill comprises of a composite lining system overlain on a prepared subgrade. The lining system is illustrated in Figure 10 and described below.

- Layer 1: 500 mm Engineered Attenuation Layer. A moisture conditioned and compacted layer of fill sourced from on-site excavated stockpiles;
- Layer 2: Geosynthetic Clay Liner (GCL) – A low permeability GCL consisting of layer of bentonite needle punched between two layers of geotextile;
- Layer 3: 2.0 mm High Density Polyethylene (HDPE) – A 2.0 mm HDPE geomembrane acts as an artificial sealing liner to form the upper part of the primary lining system. The HDPE liner is welded together to form a solid artificial barrier to allow the direction of drains towards the leachate extraction point;
- Layer 4: Cushion/Protection Geotextile – The composite lining system is protected from the leachate collection system and overlying materials with a non-woven cushion/protection geotextile. The cushion/protection geotextile is specified to account for the grading of the gravel and long-term loading from waste disposal operations;
- Layer 5: Leachate Collection System – A 300 mm thick layer of permeable gravel with an associated network of perforated collection pipes acts as the leachate collection system. The collection system directs leachate to the extraction point and subsequent removal and treatment within the evaporation ponds; and
- Layer 6: Separation Geotextile – The separation geotextile provides a barrier between waste deposits and the leachate collection layer to mitigate biological clogging within the leachate aggregate layer.

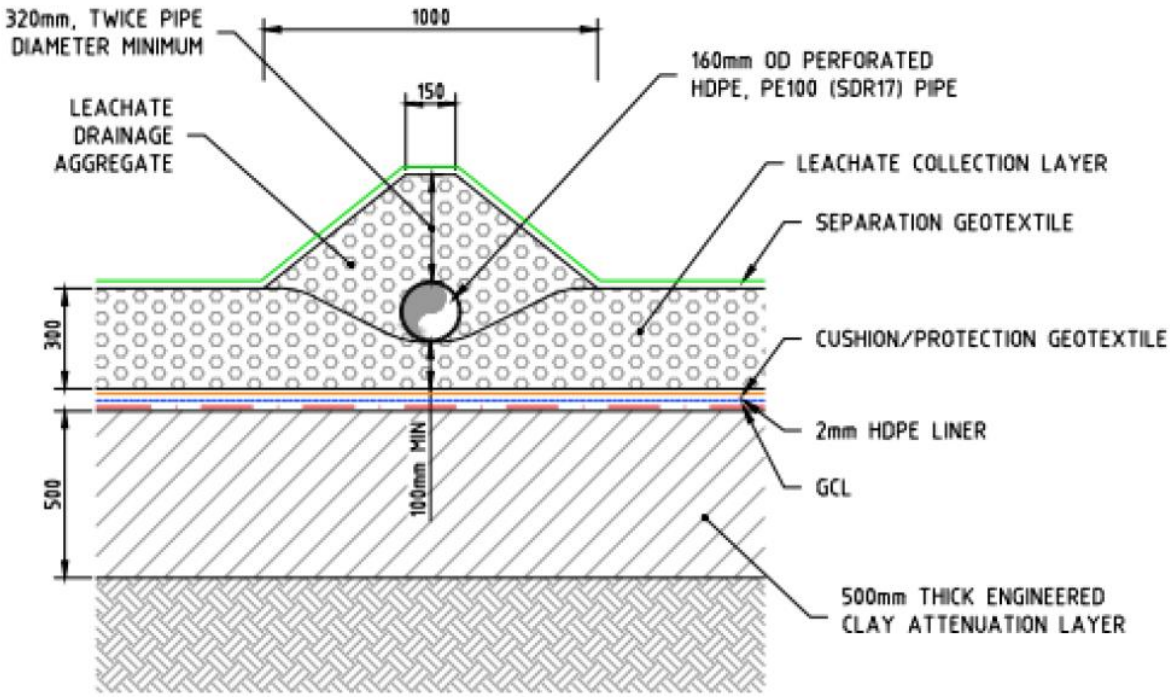


Figure 10: Basal lining system

4.1.2 Construction quality assurance

Construction Quality Assurance (CQA) activities will be required to be undertaken during construction of the lined landfill cells. These activities are undertaken by an independent, suitably qualified engineer that is not affiliated with contractors, suppliers or manufacturers. A CQA Plan has been prepared that outlines the CQA requirements including quality assurance procedures and testing methods for construction.

4.1.3 Landfill stability

The stability of the landfill has been modelled and assessed for different phases of the landfill lifecycle for both confined and unconfined conditions (where appropriate). The Broome RRRP Landfill Stability Risk Assessment (Talis, 2023) was prepared in general accordance with the UK Environment Agency's Environmental Permitting (England and Wales) Regulations Stability Risk Assessment template, and similar stability assessments of projects in Western Australia.

Methods used in the stability risk assessment include:

- Limit equilibrium stability analyses for the derivation of factors of safety for the side slope and outer embankment;
- Finite element method (FEM) analyses for the determination of geosynthetic tension within the basal liner system; and
- Closed-form analyses for the capping stability analysis.

The stability analysis program SLIDE2 9.026 from Rocscience was used to undertake the limit equilibrium using the Bishop simplified and Morgenstern-Price for circular and Spencer and Morgenstern-Price for non-circular forms of analysis. RS2, Version 11.017 (Rocscience) 2D finite element method (FEM) analysis software has been used for the geomembrane liner integrity assessment. Limit equilibrium modelling and a closed form 'veneer' analysis has been undertaken for the capping assessment. The closed form assessment has been undertaken utilising methods proposed by Jones and Dixon (1998) and Jones and Pine (2001), with the

equations processed in an Excel spreadsheet.

The scenarios assessed were considered to be the critical worst case (highest) slopes.

Data inputs for the model were based on hydrogeological and geotechnical investigations conducted at the premises, or, where no direct measurement of a particular property was available, reference was made to relevant studies from the same or similar materials. The material parameters adopted for the limit equilibrium analysis are shown below in Source: Table 3-3 (Talis, 2023)

Figure 11.

Material	Bulk Unit Weight γ (kN/m³)	Effective cohesion c′ (kPa)	Angle of Shearing Resistance Φ′ (°)	Undrained Shear Strength Su (kPa)	Typical Description
Engineered Attenuation Layer/Fill	19.5	1	33 (26.4)	>60	Re-compacted Silty Sand Fill
Sand	18.5	1	32 (25.6)	>60	Natural Silty Sand
Gravel	18	0	35		Drainage Gravel.
Protection Soils	18.5	1	32 (25.6)	>60	Natural Silty Sand
Sandstone	24	100 (80)	30 (24)		Fine grained weakly to moderately bedded sandstone
Waste	10	5	25		Municipal Solid Waste r_u of 0.1 to represent pore-water pressure in the waste mass as a function of the overburden stress.
Restoration Soils	18.5	1	32 (25.6)	>60	Natural Silty Sand

Source: Table 3-3 (Talis, 2023)

Figure 11: Material parameters adopted for stability assessment

The FEM analysis material parameters adopted are shown below in Source: Table 3-4 (Talis, 2023)

Figure 12.

Materials	Young's Modulus (kPa)	Poisson's Ratio (v)	Friction Angle (degrees)	Cohesion (kPa)	Density (kN/m3)
Pindan Sand	40,000[21]	0.3	32	1	18.5
Engineered Fill	50,000	0.3	38	0	19.5
Sandstone	6.9E+6[22]	0.3	30	100	24
Waste	500	0.3	25	5	10
Geomembrane	120,000	0.45	(Interface) 18	-	-

Source: Table 3-4 (Talis, 2023)

Figure 12: FEM Material Parameters

The closed form interface design parameters are shown below in Source: Table 3-5 (Talis, 2023)

Figure 13 noting the report highlights that site specific interface friction tests are recommended to be undertaken on the final selected geosynthetic products prior to incorporation into any capping and restoration works.

Interface	Peak		Post Peak	
	c' (kPa)	Φ′	c' (kPa)	Φ′
Restoration Soil/Geonet (Drainage Geocomposite)	0	22	0	18
Geonet/Textured LLDPE Geomembrane	3	11	3*	9.1
Geonet/Subgrade	0	22	0	18

1. *TR1 post peak cohesion reported as 9.2kPa. Cohesion reduced reflecting a degree of strain softening at the interface - reduced to 3kPa.

Source: Table 3-5 (Talis, 2023)

Figure 13: Closed form interface design parameters

Factors of safety have been established based on internationally accepted guidance in the UK Environment Agency document TRI2 and ANCOLD Guidelines on Tailings Dams as well as similar stability assessments of projects in WA and interstate. The following factors of safety for each model were adopted:

- For the limit state equilibrium analyses, a factor of safety of ≥1.5 was considered appropriate when using peak shear strength parameters under static loading. A factor of safety of ≥1.1 under earthquake loading for an operating base earthquake (OBE), and a factor of safety of ≥1.0 for a safety evaluation earthquake (SEE) / Maximum Credible Earthquake (MCE) was adopted.

- For the closed form interface analyses, construction plant and gas pressures, a factor of safety of 1.3 was considered appropriate when using conservative peak shear strength parameters, and a factor of safety greater than unity for reduced post peak shear strength parameters.
- The risk of failure of the lining system was assessed in terms of interface stability with acceptable tension induced in the lining system geosynthetics.
- For temporary waste slopes where the slopes will be buttressed with the filling operations in the adjacent cell over a short period of time, a factor of safety of ≥1.3 was considered appropriate when using peak shear strength parameters under static loading.

A summary of the results of the modelling are presented below:

- All factors of safety calculated during seismic conditions assessed are in excess of the minimum values for both peak and post peak scenarios, and therefore deemed acceptable.
- The short and long term stability of the unconfined side slope lining system has been analysed and acceptable factors of safety have been determined and deemed acceptable.
- The calculated factor of safety for temporary waste slopes all exceeded the adopted minimum factors of safety and are therefore considered acceptable. Temporary waste faces may be affected by the leachate head within the waste that could increase pore fluid pressure. A worst-case scenario waste mass pore pressure representing overburden stress was selected for the model. The hydraulic head of leachate over the landfill liner should be managed during landfill operation and closure through continuous extraction of leachate from the sumps.
- The FEM liner integrity analysis demonstrated that strains are significantly lower than the minimum allowable HDPE geomembrane strain values and are therefore considered acceptable.
- The capping profile assessed on the basis of a limit equilibrium analysis demonstrated that a satisfactory factor of safety will be achieved for the proposed capping and restoration slopes for both short-term and long-term conditions. Sensitivity analysis has indicated that on the maximum height 1V:5H pre-settlement slopes site specific interface shear testing is recommended to ensure that adequate factors of safety are maintained for 1:1000 AEP seismic loading scenarios.
- A closed form analysis for the capping assessment was undertaken and all factors of safety calculated exceeded the minimum values for both peak and post peak scenarios, and therefore deemed acceptable.
- Analysis for construction plant upon the capping system has shown, for the plant considered, that a factor of safety of 1.56 exists for plant working on the steepest capping slope of 1V:5H, during capping construction activities, which is considered acceptable.
- Analysis of gas pressures and proposed gas collection system has demonstrated that for the interfaces considered in the capping system, acceptable factors of safety are maintained.

4.1.4 Leachate management

A leachate management system has been developed to control leachate generated in the landfill. Leachate is generated through waste decomposition in the landfill, liquids within the

deposited waste, surface water inflow, groundwater intrusion and the percolation of rainfall through waste. The landfill will incorporate the installation of an engineered lining system, including a leachate collection and extraction system.

The leachate collection system in each cell will comprise of a 300 mm thick layer of non-calcareous aggregate that will collect and guide the leachate towards a network of perforated HDPE pipes. A 225 mm primary collection pipe and a series of 160 mm secondary pipes spaced approximately 25 m apart will direct leachate downgradient towards a collection sump and extraction point located at the low points of each cell. The base of the cell is designed with a 3% slope to a 1% spine orientated diagonally across the cell base which will also direct leachate towards the leachate collection sump.

The leachate sump contains a primary 450 mm side riser pipe with a secondary one installed for contingency to assist in the removal of leachate from the cell. A submersible pneumatic pump, installed inside the primary 450 mm leachate extraction riser pipe of each cell, will extract leachate automatically when sufficient head is present over the pump's inlet. The pumps will use an air displacement method and are fitted with built-in level sensors which will trigger the controller to feed air from an air compressor into the submerged pump chamber to displace the leachate. The pump will be self-regulating and operate at a low flow rate (0-1L/s) to extract small quantities of leachate as soon as enough is present in the sump. A diagram of a typical leachate collection sump is shown in Figure 14.

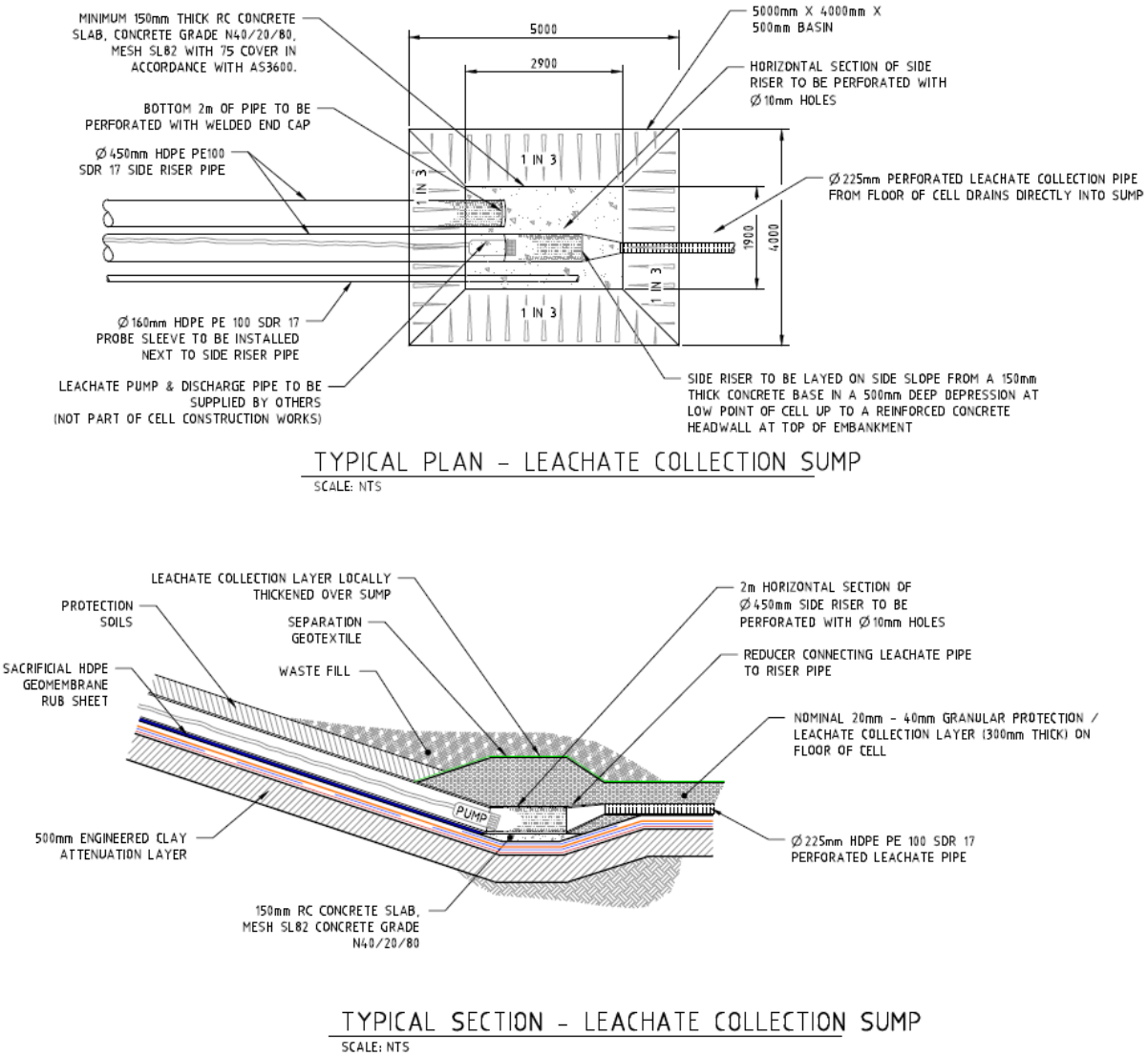


Figure 14: Typical leachate collection sump

The leachate will then be transferred via a solid HDPE pipe rising main to an evaporation pond located within the designated leachate management area south of the landfill. Leachate volumes will be monitored by 2" mag flow meters installed at each leachate well location and at the outlet to the leachate evaporation pond.

Initially, one evaporation pond will be constructed south of the landfill development footprint. This pond has been sized to accommodate the requirements of future landfill operations for Cells 1-8. Following the expansion into cells 9-16, the leachate management system is to be reviewed and provisions have been made for a second leachate pond to be built north of the landfill development footprint if landfill operations require.

To prevent leachate in the evaporation pond from infiltrating into groundwater, the pond will be prepared with a 500 mm engineered (compacted subgrade) and overlain with a 2.0 mm HDPE geomembrane as show in Figure 15.

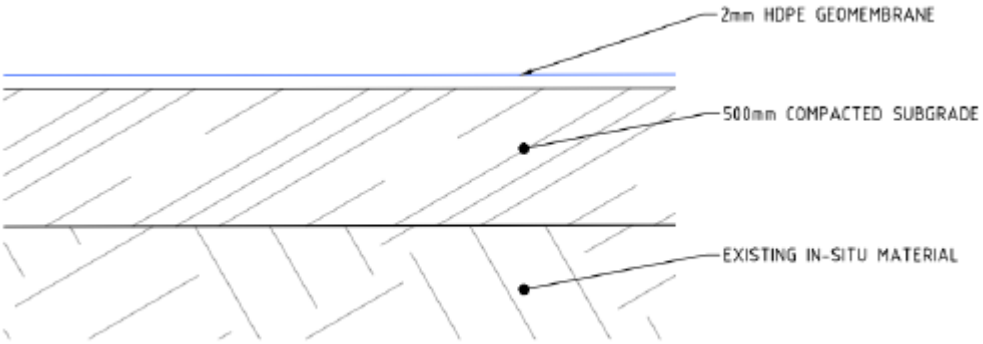


Figure 15: Leachate evaporation pond lining system

The evaporation ponds have been designed to be able to manage the maximum leachate volumes potentially generated and extracted from the landfill as well as any rainfall into the ponds during two consecutive wet years while maintaining a 0.5m freeboard. During particularly wet weather periods, leachate can be recirculated back through the landfill cells to provide additional storage. Recirculation has not been included as part of the assessment for the leachate management system.

High-Level sensors / float switches will be installed within each leachate evaporation pond to switch off the extraction pumps when the pond reaches operational freeboard. The signal from the float switch will override the signal from the submersible pumps to prevent accidental overfilling or overflowing of the pond.

The pond crest will be engineered to be a minimum of 0.5 m above the natural topographic ground level to prevent surface water runoff from the premises entering the ponds. The pond system will also be securely fenced and have safety netting installed on the interior face of the pond.

The pond will have a total volume of 21,031 m^3 and an operational volume of 16,035 m^3.

The leachate management system will only service leachate generated in the landfill (Cells 1 and 3 initially). All surface water that has not come into contact with Cells 1 or 2 will be directed to the Surface Water Management System. The Surface Water Management System was assessed as part of Stage 1 and is authorised under W6738/2022/1.

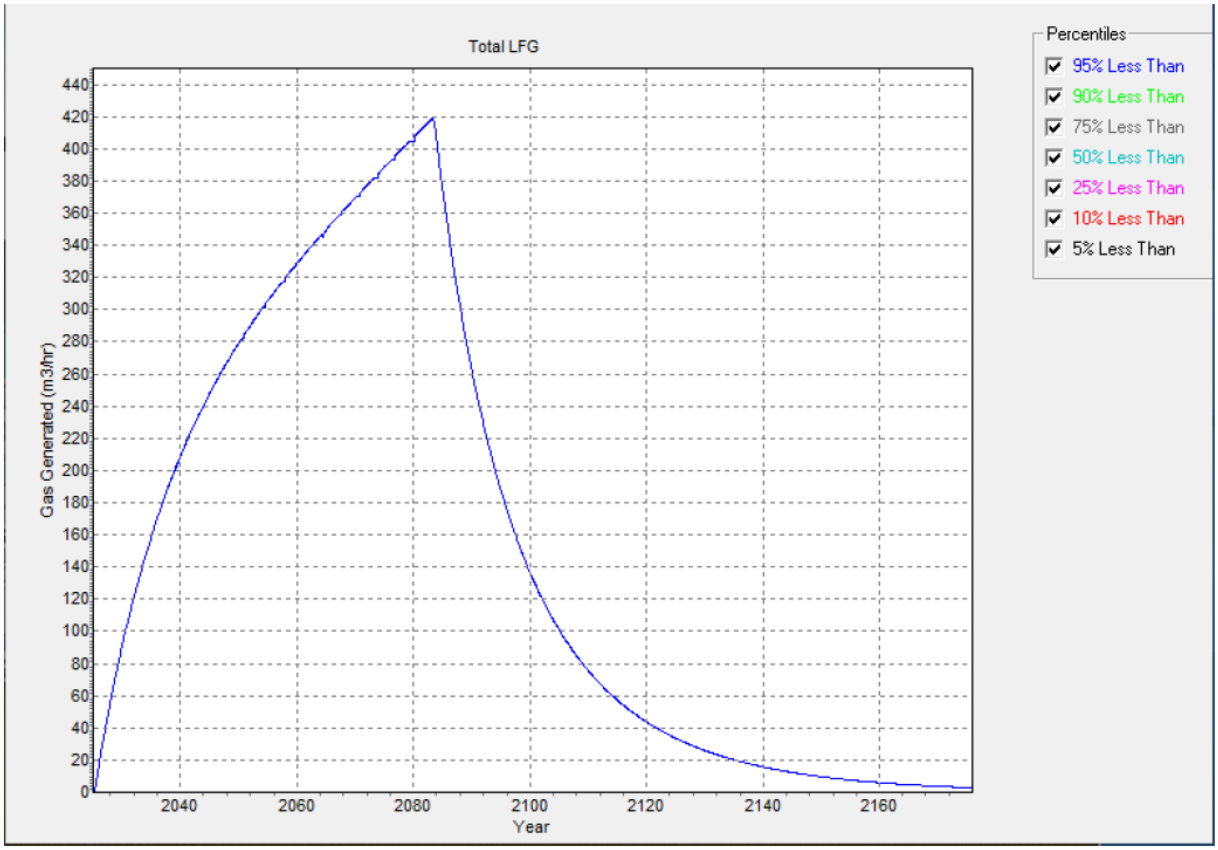
4.1.5 Landfill gas management

A Landfill Gas Management Plan (LFGMP) (Talis 2023a) was prepared and submitted as part of the application which details engineering information including assumptions, calculations and models implemented as part of the design work.

The numerical modelling software GasSim was used to model landfill gas generation within the Class III landfill over the landfills operational and post-operational lifespan. GasSim estimates the quantity of LFG generated, including emissions, migration, dispersion, and possible impacts.

The results of the gas modelling indicate that bulk gas production will peak in 2083 at a rate of approximately 420 m^3/hr. This peak rate coincides with the final capping of the Class III landfill. The model estimates that gas generation rates at the end of 2029 will be approximately 100m^3/hr, increasing to 250 m^3/hr by 2045. The results of the modelling are presented in Source: Talis, 2023a

Figure 16.



Source: Talis, 2023a

Figure 16: Modelled landfill gas production

Due to the relatively low rate of landfill gas generation, the applicant is proposing to passively vent landfill gas until approximately 2044, where landfill gas generation will exceed 250 m^3/hr (following the capping of Cell 4), at which point an active extraction system should be operational. The active extraction system may be installed prior to this target year when landfill gas exceeds 100 m^3/hr, which is estimated to occur in 2029. The passive system will have the ability to be upgraded/converted into active extraction to ensure that there is no gas accumulation underneath the permanent capping system that is installed for the initial landfill cells.

A total of 26 landfill gas monitoring bores are proposed, which can be installed in stages as the landfill is progressively rehabilitated. The spacing of wells around the northern, eastern and southern edges of the landfill is every 150 m due to the lack of sensitive receptors and lowered associated risk. Spacing along the landfill's western edge was reduced to 50 m due to the location of the Site's Community Recycling Centre and in the vicinity of the proposed electrical conduit (located approximately 58 m from the western edge of the landfill), it was reduced even further to 20 m. The location of landfill gas monitoring wells are show in Figure 17.

A total of 46 vertical gas extraction wells will be installed in a symmetrical grid-like pattern at a spacing of 50 m as show in Figure 17. Gas extraction wells will be installed to 75% of the waste depth at a minimum depth of 10 m to ensure optimal gas extraction without causing leachate ingress into the system. The area around the wells will be backfilled with aggregate to protect them from the surrounding waste and allow gas to flow freely into the well. While gas production is below 100 m^3/hr, gas wells will be connected directly to an aspiromatic cowl for venting to the atmosphere.

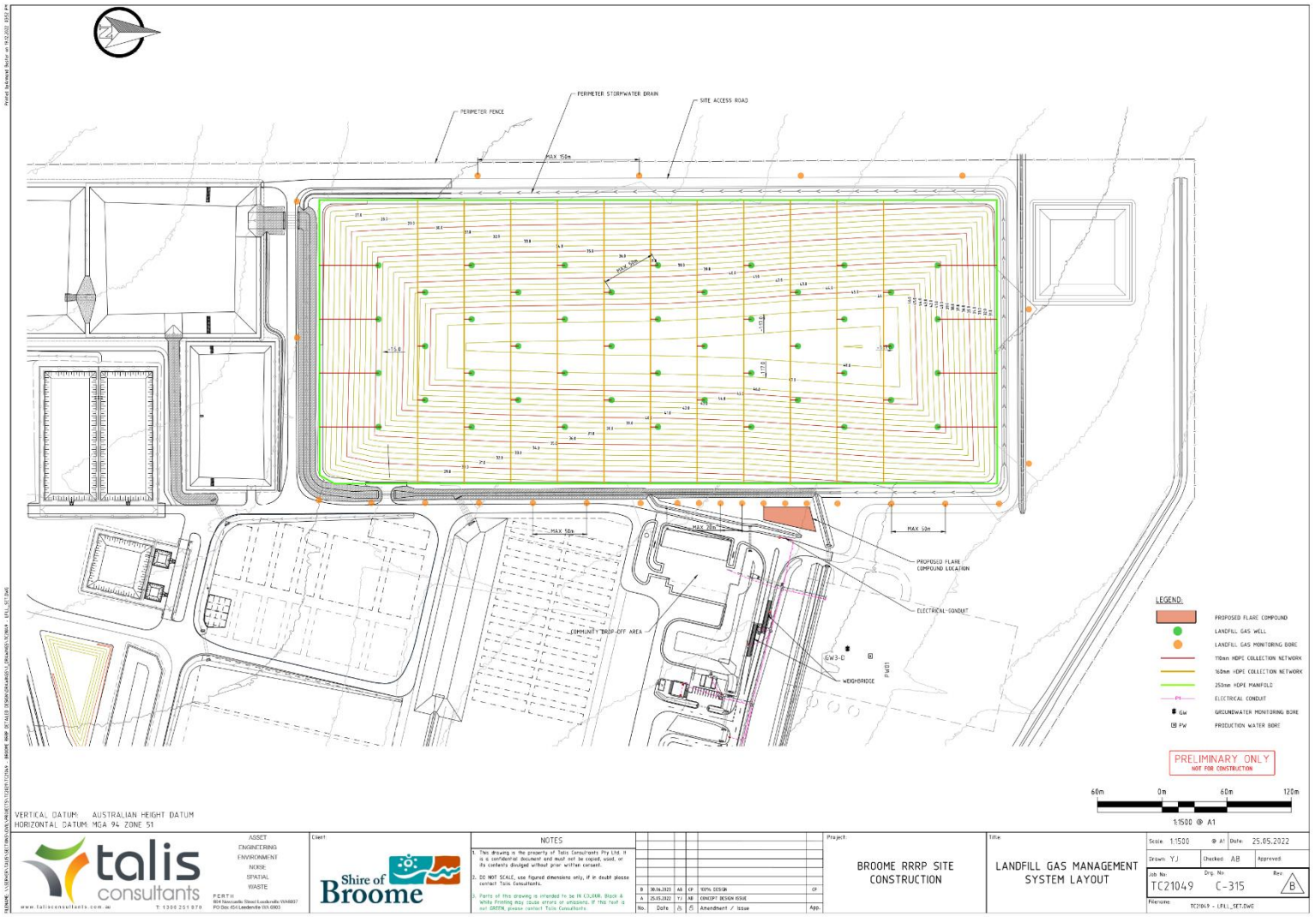


Figure 17: Landfill gas monitoring network

Works Approval: W6895/2024/1

4.1.6 Cell Closure

The applicant has provided a summary of the proposed capping and restoration of the landfill and proposes that the details are to be determined during the operational life of the facility based on data gained during the filling process on a variety of aspects including waste inputs, landfill gas generation as well as determination of preferred revegetation and post closure use.

The current design and proposal for the landfill capping and restoration which covers the waste materials on completion of each landfill cell would be as follows (in ascending order):

- 300 mm regulating layer;
- A gas geocomposite for the collection of landfill gas
- A linear low density polyethylene (LLDPE) geomembrane which will provide an engineered cap for the landfill;
- A geocomposite drainage layer to transmit any surface water that has filtered through the restoration soils towards the edge of the landfill;
- 1 m thick restoration soils layer consisting of site-won material; and
- 200 mm topsoil/growth medium layer.

A conservative approach for the restoration profile has been adopted by incorporating a reduced minimum gradient of 1V:17H.

4.2 Asbestos monocell

4.2.1 Landfill design

The excavation of the asbestos monocell will be conducted progressively as the need arises. The excavation will reach a maximum depth of 4 m, maintaining a 1:2.5 (V:H) batter slope until this depth is achieved. To prevent surface water from inundating the monocell and impacting operations, a 0.5 m surface water bund will be constructed around its perimeter to divert surface water via overland flow into the premises' surface water management system.

An access ramp with a 1:10 (V:H) slope will be progressively constructed to allow plant access to the monocell for waste deposition and operations.

No basal lining is proposed for the asbestos monocell.

4.2.2 Cell closure

To prevent the long-term exposure of asbestos wastes, a final cover system will be installed over the final fill profile. The proposed top of waste profile will have a maximum height of 26.3 m AHD, approximately 1 m above the surrounding ground level.

The final capping design comprises of the following layers in descending order ending at the waste profile:

- Vegetation layer – the upper surface of the restoration layer will comprise of mulch or rapidly germinating seed grass.
- Subsoil layer – the subsoil layer will have a thickness of 2,000 mm and will be constructed from materials won during the construction of the cell or from operations elsewhere on the premises.
- High Visibility Separation (HVS) Geotextile – The HVS geotextile is placed under the subsoil layer to provide visual warning in the event of erosion or accidental excavation. The HVS will be installed a minimum 0.5 m beyond the edge of the waste.

5. Operational overview

5.1 Class III putrescible landfill

5.1.1 Operational overview

The Broome RRRP will be open to commercial and residential entities for waste drop off and disposal.

At the entrance of the site, a gatehouse and viewing platform will be constructed at the weighbridge for load inspection and data gathering. CCTV will be installed at the gatehouse to monitor vehicle movements to and from the premises. A CCTV camera will also be installed on the viewing platform to assist with the inspection of waste loads seeking access to the premises. An infra-red camera will also be used to identify any ignited loads. All waste vehicles will be weighed on entry to, and exit from, the premises. The construction and operation of the gatehouse and weighbridge is already authorised under W6738/2022/1.

The operational house of the facility will be:

- Monday to Saturday 7:30 am to 3:30 pm;
- Sunday 8:00 am to 2:00 pm; and
- Closed Good Friday, Christmas Day, Boxing Day and New Year’s Day.

A map of the facility is presented below in Figure 18.

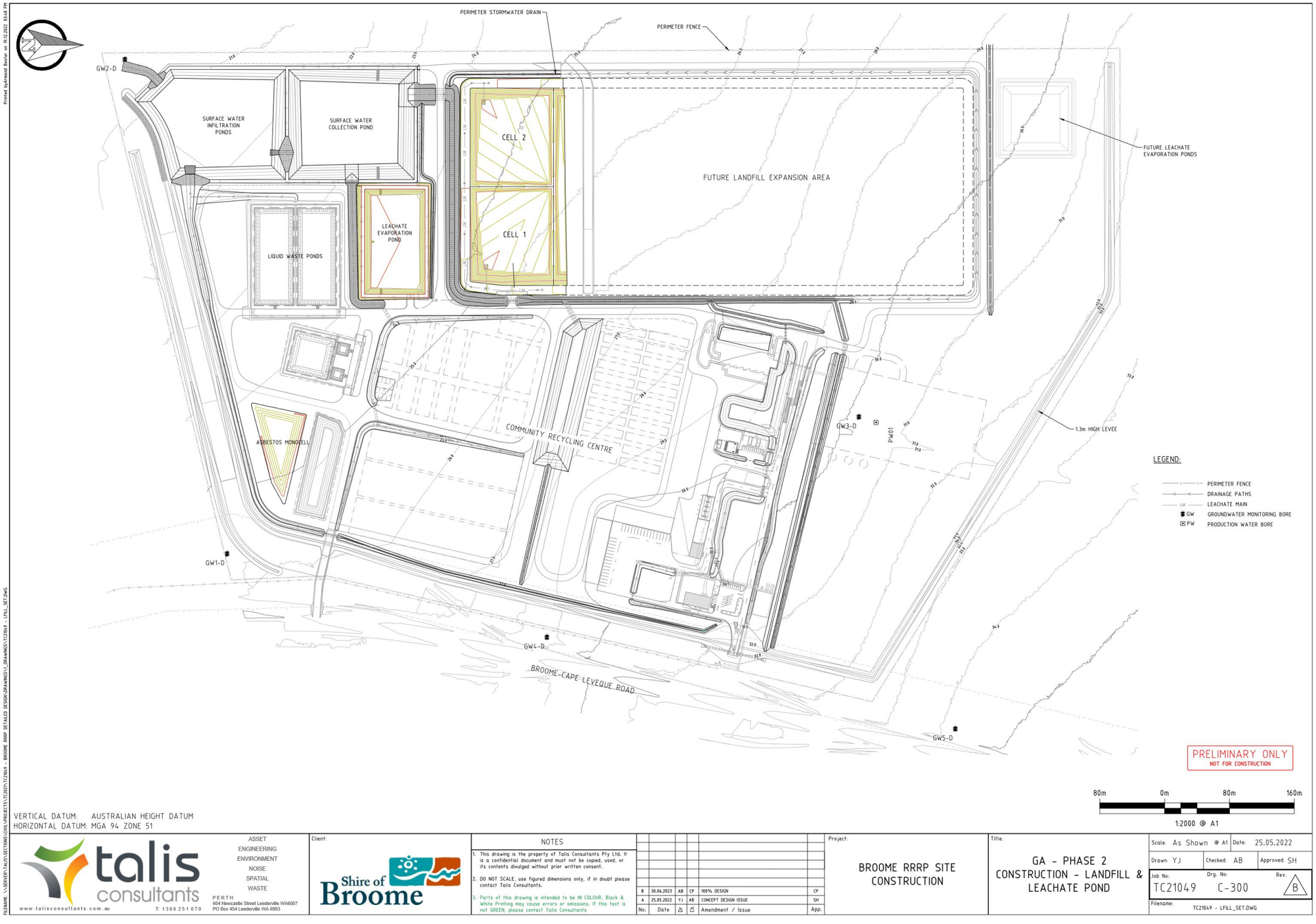


Figure 18: Premises layout

5.1.2 Waste acceptance

The following waste types will be accepted for disposal at the Class III landfill:

- Clean fill;
- Uncontaminated fill;
- Neutralised acid sulfate soil;
- Inert waste type 1;
- Inert waste type 2;
- Putrescible waste;
- Contaminated solid waste (meeting the criteria for a Class II or III landfill); and
- Special waste type 2.

Upon entering and once weighed, accepted loads will be directed to the relevant section of the RRRP for unloading or disposal in the active cell and tip face. The tip face will be clearly signed and the site operator will ensure the load is in the correct location for the materials' appropriate management.

In the event that non-conforming waste materials are discovered within a vehicle, these will be denied access. Alternatively, if a vehicle is supposedly carrying a clean stream, such as green waste or C&D but it is identified as being contaminated following inspection, this material will be directed to the landfill and charged the relevant disposal costs. If contamination is identified while unloading the materials, the generator will be ordered to reload the material and redirected to the landfill for disposal and the generator charged accordingly.

Commercial waste generators will be required to provide laboratory results to confirm that the waste materials comply with relevant Class III standards prior to disposal within the RRRP landfill.

5.1.3 Landfill management

The applicant has proposed to maintain the active tipping face to no more than 30 m by 30 m. No restriction of tipping face height was proposed. Compaction and daily cover of waste to be applied in general accordance with *788.3: Siting, design, operation and rehabilitation of landfills* (EPA Vic 2015; BEPM).

5.1.4 Leachate management

Leachate generated within the waste mass of the Class III landfill will enter the leachate collection system built into the engineered lining system. Leachate will be directed towards a collection sump and extraction point located at the low points of each cell. A submersible pneumatic pump located within a side riser pipe within the sump will extract leachate and transfer leachate to the leachate evaporation pond.

At this stage, the only leachate treatment system being proposed is via evaporation from the leachate evaporation pond, however, leachate recirculation, aeration and drip irrigation may be considered in the future, particularly during wet weather periods.

In addition, the applicant proposes regular monitoring and maintenance of the leachate management system. The integrity of each leachate pond and permanent surcharge, each leachate side riser and headwall and the conveyance pipe network shall be inspected weekly and following a heavy rainfall event.

5.1.5 Stormwater management

The surface water management system (SMWS) has been designed in consideration with the local climatic conditions. The SWMS has been designed for a 1-100 year, 72 hour storm event and comprises of a 1.3 m high levee embankment system, a collection system (swales and culverts), scour protection and surface water ponds. The SMWS was assessed as part of Stage 1 and construction and operation is authorised under W6738/2022/1.

The SWMS has been designed to divert clean stormwater away from the landfill. Stormwater that enters the waste mass will be captured and treated through the leachate management system.

5.1.6 Landfill gas management

As discussed in Section 4.1.5, due to relatively low generation levels of LFG, the applicant is proposing to passively vent landfill gas until approximately 2044 when landfill gas generation exceeds 250 m^3/hr (following the capping of Cell 4), at which point an active extraction system should be operational. The active extraction system may be installed prior to this target year when landfill gas exceeds 100 m^3/hr, which is estimated to occur in 2029.

A total of 46 vertical gas extraction wells will be installed in a symmetrical grid-like pattern across the landfill footprint. Initially, gas wells will be connected directly to an aspiromatic cowl for venting to the atmosphere.

During the period of passive venting, the applicant has proposed a landfill gas monitoring regime with landfill gas action levels. The proposed monitoring locations and frequency are shown in Figure 19.

Aspect	Monitoring Location	Monitoring Method	Monitoring Frequency
Landfill Gas	Landfill Gas Wells	Subsurface Monitoring	Monthly*
	Landfill Gas Monitoring Bores	Subsurface Monitoring	Monthly
	Capping Surface**	Visual Inspection	Monthly
		Surface Emissions Monitoring	When Required***
	Buildings and Conduits	Accumulation Monitoring	Annually
	Landfill Gas Flare	Flare Emissions Monitoring	Continuously

*While an active extraction system is in place and while the Site landfill remains operational
**Once the final cap has been established
***As established by the results of the visual inspection

Figure 19: Landfill gas monitoring program

Action levels for LFG monitoring are specified in Figure 20. Where LFG action levels are exceeded during monitoring, the applicant proposes to notify the department within 24 hours, unless the issue has been rectified beforehand. The remedial actions will be taken, followed by a further round on monitoring to confirm and demonstrate the effectiveness of remediation strategies. Remedial strategies include increased monitoring, installation of new infrastructure or repair / maintenance of existing infrastructure.

Aspect	Parameter	Action Level
Landfill surface final cap	Methane concentrations*	100 parts per million (ppm)
Within 50mm of penetrations through the final cap	Methane concentrations**	100 ppm
Landfill surface intermediate cover areas***	Methane concentrations*	200 ppm
Within 50mm penetrations through the intermediate cover	Methane concentrations**	1,000 ppm
Subsurface geology at the landfill boundary	Methane concentration	1% v/v Methane or 1.5% v/v Carbon Dioxide above background
Subsurface services on and adjacent to the landfill Site	Methane concentration in air	10,000ppm
Buildings and structures on and adjacent to the landfill Site	Methane concentrations	5,000 ppm
Landfill gas flares	Methane and Volatile Organic Compounds (VOCs)	98% destruction efficiency
Landfill Gas Extraction Well	Carbon Monoxide concentration	>1000ppm and >100ppm#

*Point of measurement is 50mm above the landfill surface.
**Point of measurement is 50mm from the point of discharge.
***Intermediate cover areas are those that do not have an engineered landfill cap and are not scheduled to receive waste during the next 3 months.

Figure 20: Landfill gas action levels

5.2 Asbestos monocell

5.2.1 Waste acceptance

To determine the estimated annual rate of asbestos waste which will be accepted at the premises, the applicant used asbestos waste acceptance data from the Shire's existing Buckley's Road facility (L6912/1997/11). The facility accepts an average of 412 tonnes per annual period of asbestos waste with a notable increase in the 2020 annual period (1,790 tonnes) due to the demolition of a large building. To ensure there is adequate capacity to meet the Shire's ongoing and future needs, the Shire has applied for a maximum acceptance capacity of 5,000 tonnes per annual period, 250% above the annual average throughput, however, estimates the actual throughput will be approximately 412 tonnes per annual period.

All asbestos loads will be inspected at the weighbridge by the weighbridge attendant to ensure materials are packaged in accordance with pre-acceptance wrapping requirements. If the load is accepted, it will be entered into an asbestos register. The weighbridge attendant will then inform the site operator of the asbestos load. Following confirmation / approval from the site operator, the weighbridge attendant is to direct the customer / driver to the dedicated asbestos deposition area.

Asbestos loads not appropriately wrapped or bagged will be rejected and recorded in a

rejected loads register.

An exclusion zone will be established during the unloading of asbestos at the asbestos monocell with only trained personnel permitted to be within the exclusion zone. All asbestos loads will be wet down with a fine mist prior to being unloaded using a front end loader or excavator. Loads will be dropped off as close as possible to the dedicated asbestos disposal area as possible to minimise handling of the material and potential for damage to packaging to occur. Asbestos will be offloaded at the foot of the excavation in such a manner as to avoid the generation of dust and the release of asbestos fibres.

The active tipping face will be maintained to be no more than 30 m wide and 2 m deep. A ramp with a 1:10 gradient will be used to access the tip face.

Filling operations will be carried out from south to north, with the slope of the top face maintained at a gradient not exceeding 1:2:5 to ensure a stable waste slope that can be navigated by plant if required.

All asbestos waste will be immediately covered with clean fill to a minimum depth of 300 mm as soon practicable after deposit. No compaction of asbestos is to occur, however, compaction of cover / fill material is accepted. After burial, the placed material should not be disturbed and no asbestos waste will be placed in within 300mm of the final fill profile.

For asbestos loads greater than 1 m^3, the GPS coordinate, type and quantity of asbestos disposed in the cell will be recorded.

5.2.2 Rehabilitation

To prevent long-term exposure of asbestos wastes, a final cover system will be installed over the final fill profile. The final fill profile will consist of a High Visibility Separation Geotextile (HVSG) to act as a visual indicator in the event that soils are accidentally disturbed or eroded, followed by a 2,000 mm thick subsoil layer followed by a vegetation layer comprising of mulch or rapidly germinating grass seed.

Following rehabilitation, visual inspections of the integrity of the capping layer will be conducted annually and following severe weather events for the first ten years until vegetation establishes. Following this, inspections should be conducted biennially for up to twenty years post-rehabilitation.

6. Risk assessment

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

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

6.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered in this decision report are detailed in Table 5 below. Table 5 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 5: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Vehicle movements on unsealed surfaces, earthworks, construction and installation of site infrastructure	Air / windborne pathway	• Vehicles to maintain a maximum speed of 10 km/hr; • All works will cease during periods of strong winds; and • A water cart will be used as necessary.
Noise			• All trucks and mobile equipment to be installed with broadband noise reverse alarms; • Vehicles to maintain a maximum speed of 10 km/hr; • Noise reducing workplace procedures will be adopted such as slow unloading of materials from the lowest height possible; and • All equipment and machinery will be maintained in good working condition.
Operation			
Category 63: Class I Inert Landfill			
Dust / asbestos fibres	Acceptance, handling and disposal of asbestos and asbestos containing material	Air / windborne pathway	• Asbestos and ACM will be disposed of in a dedicated asbestos monocell; • All asbestos loads will be inspected by the weighbridge attendant; • All asbestos waste must be appropriately package prior to acceptance; • Asbestos waste that does not meet packaging requirements will

Emission	Sources	Potential pathways	Proposed controls
			be rejected; • All asbestos waste will be wet down with a fine mist prior to unloading and disposal; • An exclusion zone will be established during the unloading of asbestos; • Asbestos will be offloaded at the foot of the excavation at the landfill site in such a manner as to avoid the generation of dust and the release of asbestos fibres; • The GPS coordinate of each disposed asbestos load greater than 1 m^3 will be recorded; • Asbestos waste will be covered with 1 m of fill as soon as practicable; • No compaction of asbestos to occur; • After burial, asbestos should not be disturbed; • Asbestos spill procedure has been developed for the site; and • Monocell to be capped with a HVSG, a 2 m thick capping layer and a vegetation layer.
Category 64: Class III Putrescible Landfill			
Noise	Waste acceptance and handling, disposal of waste, decomposition of wastes, tipping, application of landfill cover and vehicle movements	Air / windborne pathway	• All trucks and mobile equipment to be installed with broadband noise reverse alarms; • Vehicles to maintain a maximum speed of 10 km/hr; • Noise reducing workplace procedures will be adopted, such as slow unloading of materials from the lowest height possible; • All equipment and machinery will be maintained in good working condition. • Waste acceptance and operation of equipment restricted to operational hours only; and

Emission	Sources	Potential pathways	Proposed controls
			• Material handling to be confined to the designated areas.
Dust			• Vehicles to maintain a maximum speed of 10 km/hr; • All works and receival of waste will cease during periods of strong winds; and • A water cart will be used as necessary.
Windblown waste			• Mobile litter screens will be placed around the tipping area where required; • All works and receival of waste will cease during periods of strong winds; • Waste will be compacted and covered as soon as practicable on a daily basis; • The tipping area will be kept to a maximum of 30 m x 30 m; • Daily compaction and covering of waste; • Suitable fencing will be installed around the perimeter of the facility; and • Any windblown waste located around the perimeter fence and immediately outside the RRRP will be collected on a regular basis.
Odour			• Installation of a landfill gas management system; • Daily compaction and covering of waste; • Consideration of meteorological conditions during material handling; • Regular maintenance and monitoring of leachate treatment system; • Maintaining a complaints register; and • Odour levels across the site will be continuously monitored by

Emission	Sources	Potential pathways	Proposed controls
			staff and action taken if required.
Pests / vermin		Biological pathway	• Daily compaction and covering of waste; • Implementation of a Feral Animal and Vermin Management Plan; • Perimeter fencing; • Feral and pest register to be maintained; • Staff training and inductions; • The tipping area will be kept to a maximum of 30 m x 30 m; and • Staff to undertake an annual review of feral animal and pest management measures.
Weeds		Biological pathway Air / windborne pathway	• Staff training and inductions; • Vehicles to adhere to established roads; • Vehicles entering/exiting the site are free of soil, mud and vegetative material; • Use of wash down bay to remove any potential introduced flora or seeds from vehicles and/or equipment; • Regular monitoring of weeds to be undertaken across the site by staff; • Twice yearly and/or during peak active growing periods whole of site weed inspections to be completed; and • Regular weed management methods to be undertaken via manual removal and/or by chemical application following flowering periods by a weed contractor.
Landfill gas		Air / windborne pathway Lateral migration through soil	• Installation of composite lining system; • Progressive installation of landfill gas management system including strategically placed vertical gas extraction wells using aspirating cowls during passive extraction;

Emission	Sources	Potential pathways	Proposed controls
		Dissolution into groundwater	• Progressive capping of landfill cells; and • Ongoing regular monitoring of landfill gas management system.
Fire / smoke		Air / windborne pathway	• Development and implementation of a Bushfire Management Plan; • Installation of a water tank system onsite; • Procurement of a 10,000L all-wheel-drive water tanker stored on site; • Maintain the RRRP Site in a 'low bushfire threat state'; • Establishment of a 10 m asset protection zone / fire breaks around the site; • Bushfire control access road around the perimeter of the site; • Installation of fire suppression equipment around the site; • Monitoring of DFES local and regional fire warnings; • Induction/staff training to cover fire and emergency response; • Emergency access road to the north of the site providing secondary access; • An infra-red camera will be installed at the weighbridge to identify any ignited loads; • Daily covering and compaction of waste; • Induction/ staff training to recognise the signs of surface and subsurface fires; • Maintain an emergency response procedure; • Regular maintenance of all equipment, plant, vehicles and machinery; • Regular pre-start checks to be undertaken on all vehicles and machinery;

Emission	Sources	Potential pathways	Proposed controls
			• Fire suppression equipment will be installed in all vehicles, machinery and in operational areas; • Fire suppression equipment to undergo regular testing; and • Induction/training of staff in fire risks, mitigation and response capability.
Leachate		Infiltration into groundwater	• Construction of a leachate collection and extraction system including an aggregate drainage layer, HDPE perforated pipe network, monitoring point, extraction riser and pump and a leachate evaporation pond; • Development and implementation of a leachate management plan; • Progressive landfill capping and restoration; and • Implementation of a surface water management system.
Contaminated stormwater		Overland runoff Infiltration into groundwater	• Surface water management system to divert clean stormwater away from landfill; and • All stormwater entering the landfill cells to be collected by the leachate management system.

6.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account potential source-pathway and receptor linkages as identified in Section 6.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 6.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 6.

Works approval W6895/2024/1 that accompanies this decision report authorises construction and time-limited operations. The conditions in the issued works approval, as outlined in Table 6 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required to authorise emissions associated with the ongoing operation of the premises. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 6: Risk assessment of potential emissions and discharges from the premises during construction and operation

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Construction								
Vehicle movements on unsealed surfaces, earthworks, construction and installation of site infrastructure	Dust	Air / windborne pathway causing impacts to health and amenity	**Human:** Residential premises 3 km south-west, 3.5 km south and 3.7 km west of premises Mamabulanjin Aboriginal Corporation Nursery directly adjacent north of premises Goorlarabooloo Community (Coconut Wells) 5.3 km north-west of premises Broome Motorcross Club 150 m south of premises Industrial premises 1.2 km south of premises **Ecological** Yawuru Birragun Conservation Park directly adjacent to the west of the premises	Refer to Section 6.1	C = Minor L = Possible **Medium Risk**	Y	N/A	Emission to be regulated under the general provisions of the EP Act
	Noise			Refer to Section 6.1	C = Minor L = Possible **Medium Risk**	Y	N/A	Emissions to be regulated under the *Environmental Protection (Noise) Regulations 1997* (EP Noise Regulations)
Operation								
Category 63: Class I Inert Landfill								
Acceptance, handling and disposal of asbestos and asbestos containing material	Dust / Asbestos fibres	Air/windborne pathway causing impacts to health	**Human:** Residential premises 3 km south-west, 3.5 km south and 3.7 km west of premises Mamabulanjin Aboriginal Corporation Nursery directly adjacent north of premises Broome Motorcross Club 150 m south of premises Industrial premises 1.2 km south of premises	Refer to Section 6.1	**Human:** C = Severe L = Unlikely **High Risk**	Y	Conditions 1, 12, 13, 14, 15 & 19	N/A

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Operation (to be further assessed as part of the licence application)								
Category 64: Class III Putrescible Landfill								
Waste acceptance and handling, disposal of waste, decomposition of wastes, tipping, application of landfill cover and vehicle movements Collection, storage and management of leachate Ongoing management of premises	Noise	Air/windborne pathway causing impacts to health and amenity	**Human:** Residential premises 3 km south-west, 3.5 km south and 3.7 km west of premises Mamabulanjin Aboriginal Corporation Nursery directly adjacent north of premises Goorlarabooloo Community (Coconut Wells) 5.3 km north-west of premises Broome Motorcross Club 150 m south of premises Industrial premises 1.2 km south of premises **Ecological** Yawuru Birragun Conservation Park directly adjacent to the west of the premises	Refer to Section 6.1	**Human:** C = Minor L = Unlikely **Medium Risk** **Ecological:** C = Slight L = Unlikely **Low Risk**	Y	N/A	The delegated officer considers that noise emissions are effectively regulated by the proposed noise management controls and by the EP Noise Regulations.
	Dust			Refer to Section 6.1	**Human:** C = Moderate L = Possible **Medium Risk** **Ecological:** C = Minor L = Unlikely **Medium Risk**	Y	N/A	The delegated officer considers that dust emissions are effectively regulated by the proposed dust management controls and by the general provisions of the EP Act.
	Odour			Refer to Section 6.1	**Human:** C = Moderate L = Possible **Medium Risk**	Y	N/A	Operational controls for odour will be considered as part of the licence assessment.
	Windblown waste	Air/windborne pathway causing impacts to amenity	**Human:** Mamabulanjin Aboriginal Corporation Nursery directly adjacent north of premises Broome Motorcross Club 150 m south of premises Industrial premises 1.2 km south of premises **Ecological** Yawuru Birragun Conservation Park directly adjacent to the west	Refer to Section 6.1	**Human:** C = Minor L = Possible **Medium Risk** **Ecological:** C = Minor L = Possible **Medium Risk**	Y	N/A	Supporting infrastructure has been excluded from the assessment (see Section 2.2.1). Further operational controls for windblown waste may be considered as part of the licence assessment.

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
			of the premises					
	Pests / vermin	Biological pathway causing impacts to health and amenity	**Human:** Mamabulanjin Aboriginal Corporation Nursery directly adjacent north of premises Residential premises 3 km south-west, 3.5 km south and 3.7 km west of premises Broome Motorcross Club 150 m south of premises Industrial premises 1.2 km south of premises **Ecological** Yawuru Birragun Conservation Park directly adjacent to the west of the premises	Refer to Section 6.1	**Human:** C = Minor L = Unlikely **Medium Risk** **Ecological:** C = Moderate L = Possible **Medium Risk**	Y	N/A	Supporting infrastructure has been excluded from the assessment (see Section 2.2.1). Further operational controls for pest / vermin may be considered as part of the licence assessment.
	Weeds	Air/windborne or biological pathway causing impacts to amenity	**Ecological** Yawuru Birragun Conservation Park directly adjacent to the west of the premises	Refer to Section 6.1	**Ecological:** C = Major L = Unlikely **Medium Risk**	Y	N/A	Operational controls for weeds may be considered as part of the licence assessment.
	Landfill gas	Lateral migration through soil, movement through groundwater, or passive venting to air causing impacts to human health, amenity or explosion risk	**Human:** Mamabulanjin Aboriginal Corporation Nursery directly adjacent north of premises Broome Motorcross Club 150 m south of premises **Ecological** Yawuru Birragun Conservation Park directly adjacent to the west of the premises	Refer to Section 6.1	**Human:** C = Severe L = Unlikely **High Risk** **Ecological:** C = Moderate L = Unlikely **Medium Risk**	Y	Conditions 2, 3, 4 & 5	The delegated officer considers that the volume of landfill gas generated during the operation of cells 1 and 2 will be negligible based on modelling results. The applicant proposes to install a landfill gas monitoring network around the perimeter of the landfill as a contingency measure. Construction and sampling of the landfill gas monitoring wells will be assessed and conditioned under the licence.
	Fire / smoke	Air/windborne pathway causing impacts to health and amenity	**Human:** Mamabulanjin Aboriginal Corporation Nursery directly adjacent north of premises	Refer to Section 6.1	**Human:** C = Severe L = Unlikely	Y	Condition 2	The delegated officer considers that fires will be effectively managed by the proposed fire risk prevention and management controls. Supporting infrastructure relating to fire

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
			Residential premises 3 km south-west, 3.5 km south and 3.7 km west of premises Broome Motorcross Club 150 m south of premises Industrial premises 1.2 km south of premises **Ecological** Yawuru Birragun Conservation Park directly adjacent to the west of the premises		**High Risk** **Ecological:** C = Major L = Unlikely **Medium Risk**			management has been excluded from the assessment (see Section 2.2.1). Further operational controls for fire may be considered as part of the licence assessment.
	Leachate	Infiltration into groundwater causing contamination and impacting water quality	**Human** Beneficial users of groundwater **Ecological** Yawuru Birragun Conservation Park directly adjacent to the west of the premises Groundwater approximately 16-32 m bgl Buckley's Plains 3 km west-southwest of the premises	Refer to Section 6.1	See detailed risk assessment outlined in Section 6.3			
	Contaminated stormwater	Overland runoff / migration onto surrounding land causing ecosystem disturbance Seepage through soil to groundwater causing contamination and impacting water quality	**Human** Beneficial users of groundwater **Ecological** Yawuru Birragun Conservation Park directly adjacent to the west of the premises Groundwater approximately 16-32 m bgl Buckley's Plains 3 km west-southwest of the premises	Refer to Section 6.1	Human: C = Major L = Rare **Medium Risk** Ecological: C = Major L = Unlikely **Medium Risk**	Y	Condition 2	The delegated officer considers that contaminated stormwater can be effectively managed though the surface water management system (assessed under W6738/2022/1) and leachate management system. Further operational controls for leachate may be considered as part of the licence assessment.

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

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

6.3 Detailed risk assessment for leachate / groundwater contamination

6.3.1 Description of leachate / groundwater contamination

Landfill leachate is generated through the disposal and decomposition of accepted wastes, infiltration of water into landfill cells and the moisture content of buried waste. Leachate seepage to groundwater can occur if there is a failure in the landfill liner either through defects from improper placement or damage to the liner. No landfill liner system can be made completely impermeable and all liners will therefore experience a certain amount of leachate seepage over the lifecycle of the operation. Leachate emissions may also occur as a result of overtopping of leachate storage infrastructure, or failure of leachate conveyance infrastructure.

6.3.2 Identification and general characterisation of emission

Leachate generated from the decomposition of putrescible wastes disposed in the landfill may contain organic matter, salts, nutrients, hydrocarbons, metals, pesticides and herbicides, persistent organic pollutants and pathogens. The quantity and quality of leachate produced will be influenced by a number of factors including waste types, management of waste within cells, the integrity of the landfill liner, management of leachate head within the waste mass, meteorological conditions and recirculation of leachate into the waste mass.

A leachate collection and extraction system has been incorporated into the design of the landfill. Leachate will drain through the waste mass to a leachate collection layer built into the lining system. Perforated pipes will direct leachate to a sump, whereby leachate will be extracted via a pneumatic pump and transferred to the Leachate Evaporation Pond for storage and evaporation. Evaporation is the only proposed treatment method for leachate, however, recirculation of leachate back into the waste mass may be considered during consecutive wet years.

6.3.3 Description of potential adverse impacts from the emission

Receptors that may be affected by leachate emissions include beneficial users of groundwater. Groundwater may become contaminated be leachate seepage through the soil and into groundwater. Contaminants dissolved in groundwater may become highly mobile and be carried down the hydraulic gradient to receptors.

Groundwater occurs approximately 16 to 32 mBGL at the premises in sandstone beneath Pindan sand and is unconfined. Groundwater monitoring conducted at the premises indicates that groundwater is responsive to rainfall and groundwater level has a seasonal variability of around 1 m. Groundwater is fresh, with salinity ranging from 185 to 410 mg/L, making it of high-value to beneficial users.

Groundwater modelling conducted as part of the application indicates that groundwater flows toward the south-west then west towards Buckley's Plain and then to the Indian Ocean.

Modelling indicates there is no drainage to Roebuck Bay or Dampier Creek to the south.

Hydraulic testing determined a groundwater seepage velocity beneath the site of approximately 21 m/year. Contaminant modelling suggests that travel times for a potential contaminant plume are 72 years to the closest downgradient beneficial groundwater bore and 144 years to Buckley's Plain.

A range of human and ecological beneficial users of groundwater exist in the immediate area and downgradient to the Broome RRRP. A conceptual site model has been developed to assess the risk to receptors that may be adversely impacted from contaminated groundwater as a result of leachate emissions and is detailed below in Table 7.

Table 7: Source-Pathway-Receptor Linkages and potential impacts

Source	Pathway	Receptor	Complete Pathway? (Y/N)	Description of potential impact
Contaminated groundwater resulting from infiltration of leachate, waste or contaminated stormwater resulting from loss of containment or overland runoff	Migration of contaminated groundwater downgradient across the aquifer	Residential premises 3.5 km south of premises	N	Receptor is outside of the modelled groundwater flow area. Incomplete pathway.
		Residential premises 3 km south-west of premises	N	Receptor is outside of the modelled groundwater flow area. Incomplete pathway.
		Residential premises 3.7 km west of premises	Y – with temporal limitations	Residential properties fall within the modelled groundwater flow pathway and are beneficial uses of bore water. It is undetermined what purpose the private bores serve, however, conservatively it is assumed that bore water is used for human consumption either directly or indirectly through irrigation of edible gardens. A pathway therefore exists whereby contaminated groundwater may be ingested by human receptors, however, contaminant modelling suggests that it would take a contaminant plume 177 years to reach the dwellings. Provided the site is appropriately managed, there should be no impact to residential properties. Additional regulatory controls shall be placed on the works approval to conduct monitoring of groundwater wells on the western boundary of the premises. Should contamination be identified, remedial action should be undertaken to prevent contaminated groundwater from reaching residential properties.
		Goolarabooloo Community (Coconut Wells) 5.3 km north-west of premises	N	Receptor is outside of the modelled groundwater flow area. Incomplete pathway.
		Mamabulanjin Aboriginal Corporation	N	Receptor is outside of the modelled groundwater flow area. Incomplete pathway.

Source	Pathway	Receptor	Complete Pathway? (Y/N)	Description of potential impact
		Nursery adjacent to the north of the premises		
		Broome Motocross Club 150 m south of premises	Y – partial	The Broome Motorcross Area partially falls within the modelled groundwater flow pathway, however, the motorcross groundwater production bore does not. There should be no impact to the Broome Motorcross Area, however, in the event that an additional production bore is installed within the flow pathway at some point in the future, regulatory controls shall be placed on the works approval to install an additional monitoring bore on the southern boundary of the premises conduct monitoring on all of the southern boundary bores.
		Industrial premises 1.2 km south of premises	N	Receptor is outside of the modelled groundwater flow area. Incomplete pathway.
		Yawuru Birragun Conservation Park adjacent to the west of the premises	Y	The Yawuru Birragun Conservation Park is immediately downgradient from the premises. Contaminated groundwater originating from the premises has the potential to adversely impact groundwater dependant species and degrade ecosystem function. Should the site be managed appropriately, groundwater should not become contaminated and should not adversely impact the Yawuru Birragun Conservation Park. Additional regulatory controls including groundwater monitoring shall be conducted as contingency measures to ensure on-going protection of sensitive ecological receptors.
		Buckley's Plain 3 km west of the premises	Y – with temporal limitations	Buckley's Plain falls within the modelled groundwater flow pathway and is a groundwater dependant ecosystem. Contaminant plume modelling suggests that a plume of contaminated groundwater from the premises would take 144 years to reach Buckley's Plain. Provided the site is appropriately managed, there should be no impact to Buckley's Plain. Additional regulatory controls including groundwater monitoring shall be conducted as contingency measures to ensure on-going protection of sensitive

Source	Pathway	Receptor	Complete Pathway? (Y/N)	Description of potential impact
				ecological receptors.
		Roebuck Bay / Dampier Creek 4.2 km south of the premises	N	Receptor is outside of the modelled groundwater flow area. Incomplete pathway.
		Indian Ocean 5.5 km of the premises	Y – with temporal limitations	All groundwater flowing through the premises will eventually discharge into the Indian Ocean. Contaminant plume modelling suggests that a plume of contaminated groundwater from the premises would take over 200 years to reach the Indian Ocean. Provided the site is appropriately managed, there should be no impact to the Indian Ocean. Additional regulatory controls including groundwater monitoring shall be conducted as contingency measures to ensure on-going protection of sensitive ecological receptors.
	Migration of contaminated groundwater up natural hydraulic gradient due to reversal of localised groundwater flow	Priority 1 Public Drinking Water Source Area – Broome Water Reserve and beneficial users of the Broome Water Reserve (town water supply)	Partial linkage (may occur in exceptional circumstances)	There is a slight potential for reversal of groundwater flow at the premises due to pumping at the Broome Town Water Supply (TWS) bore field. The premises is adjacent to the Priority 1 Public Drinking Water Source Area (PDWSA) and approximately 1.2 km from the closest well head protection zone. Available data submitted to DWER by the Water Corporation shows that the production bores can cause groundwater levels to drop to 0 m AHD during pumping cycles. Assuming that individual TWS bores are pumped at about 50% duty cycle, then the gradients towards the production bores would derive velocities of less than 10m/year. This drawdown gradient is opposing the natural gradient (causing a localised reversal of groundwater flow). A smaller, slower contaminant plume may move eastwards from any seepage point towards the TWS production bores as a result. Groundwater travel times show that any contaminated groundwater would take years or decades to move beyond the boundaries of the premises (depending on seepage location) and significantly longer to reach the TWS bores over 1.5km away. Consultation with the Water Corporation was undertaken as part of this application on addition to the assessment of Stage 1 (W6738/2022/1) and it was concluded that the Water Corporation did not have enough evidence to support any objections to the proposed Broome RRRP. However, the Broome Public

Source	Pathway	Receptor	Complete Pathway? (Y/N)	Description of potential impact
				Drinking Water Source Protection Area is the sole water supply for the town of Broome and a Priority 1 area for which the management objective is 'risk avoidance'. Provided the site is appropriately managed, there should be no impact to the Broome TWS. Additional regulatory controls including additional groundwater monitoring bores and constant monitoring of groundwater flow were included as part of the works approval for stage 1 (W6738/2022/1) and shall be conducted as contingency measures to ensure on-going protection of the water source.

6.3.4 Applicant controls

The applicant's proposed controls are detailed in Section 6.1.

6.3.5 Key findings

The Delegated Officer has reviewed the information regarding leachate/contaminated groundwater and has found:

1. Groundwater in the region is fresh and has beneficial uses to the region.
2. Downgradient human receptors within the groundwater flow-path are sufficiently removed temporally from the premises and that any potential contaminant plume can be sufficiently managed to prevent any adverse impacts to human receptors.
3. Some risk exists to groundwater dependant species in the Yawuru Birragun Conservation Park in the event of groundwater contamination.
4. Other ecological receptors within the groundwater flow path are far enough removed temporally that a contaminant plume can be sufficiently managed to prevent any adverse impacts to sensitive ecological receptors.
5. While reversal of groundwater flow due to pumping cycles from the Broome Town Water Supply production bores is possible, there is not enough evidence to indicate an unacceptable risk to the Broome Town Water Supply. The water supply is being managed to avoid any risk and contingencies have been included in the works approval for Stage 1 to monitor the water supply.

6.3.6 Risk assessment

The Delegated Officer has:

- considered that the consequence to receptors exposed to contaminated groundwater through infiltration of leachate/waste/contaminated stormwater from the site could have major impacts to human and environmental health and amenity;
- considered that the likelihood of impacts to receptors is unlikely based on the controls proposed by the applicant; and
- determined that the overall rating for the risk of impacts from product quality, based on a consequence of major and a likelihood of unlikely, is **medium.**

6.3.7 Regulatory controls

In considering the findings of the risk assessment for contaminated groundwater through the infiltration of leachate from the premises, the delegated officer considers the risk to receptors from leachate impacts to be acceptable subject to the proposed landfill design and construction requirements in conjunction with the additional regulatory requirements under W6738/2022/1. A detailed risk assessment for leachate will be conducted for the operation of the landfill cells and leachate management system as part of the licence assessment.

7. Consultation

Table 8 provides a summary of the consultation undertaken by the department.

Table 8: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 15 March 2024	None received	N/A
Department of Biodiversity, Conservation and Attractions (DBCA) advised of proposal on 19 March 2024	None received	N/A
Department of Health (DoH) advised of proposal on 19 March 2024	None received	N/A
Water Corporation advised of proposal on 19 March 2024	The Water Corporation provided an email response on 8 April 2024. The Water Corporation had no objection to the Broome RRRP subject to the following conditions: • Fencing and surveillance to prevent illegal access to the Broome Public Drinking Water Source Area (PDWSA) • Site surface water drainage should be directed away from the PDWSA. The PDWSA forms the Broome town water supply catchment area and therefore it is integral that water recharging this area is free of contaminants • All leachate ponds are lined and contained to prevent infiltration • All other waste disposal sites are lined and contained to prevent infiltration • Reporting of any spills / overflows that have the potential to impact the PDWSA to DWER and Water Corporation (13 13 75) • Installation of additional monitoring bores along the eastern boundary. Bores should be every 50 m. • Routine monitoring and sampling program of all monitoring bores to assess groundwater quality. Reporting of any water quality results that show	The Delegated Officer has considered the comments made by the Water Corporation. Note that supporting infrastructure was assessed and is managed under W6738/2022/1.

Consultation method	Comments received	Department response
	potential adverse effects on groundwater to Water Corporation.	
Yawuru Native Title Holders Aboriginal Corporation advised of proposal on 19 March 2024	None received	N/A
Mamabulanjin Aboriginal Corporation advised of proposal on 19 March 2024	None received	N/A
Broome Motocross Club advised of proposal on 19 March 2024	None received	N/A
Applicant was provided with draft documents on 4 June 2024	See Appendix 1	See Appendix 1

8. Conclusion

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

References

1. ANCOLD, 2015 ‘Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure’
2. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
3. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
4. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Risk Assessments*, Perth, Western Australia
5. Dixon and D R V Jones, ‘Stability of Landfill Lining Systems: Report No. 2 Guidance, R&D Technical Report P1-385/TR2’, Environment Agency UK, 2002
6. Environmental Protection Authority Victoria (EPA Vic) 2015, *788.3: Siting, design, operation and rehabilitation of landfills,* Carlton, Victoria.
7. Jones, D.R.V. & Dixon, N, 'The stability of geosynthetic landfill lining systems' Geotechnical Engineering of Landfills, Thomas Telford, London, 1998.
8. Jones, D.R.V. & Pine, R.J., 'Design of inclined geosynthetic lining systems for vertical landfill expansion' Proc. 8th Int. waste Management and Landfill Symposium, 2001.
9. Talis 2023, Broome RRRP Landfill Stability Risk Assessment, Perth, Western Australia
10. Talis 2023a, Landfill Gas Management Plan, Perth, Western Australia

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

Condition	Summary of applicant's comment	Department's response
Works approval expiry date	The Shire is requesting the expiry date of the Works Approval to be set to the maximum possible duration of 5 years. This timeframe is necessary to ensure there is sufficient time to deliver the Stage 2 works, including completion of the procurement process and engaging a construction contractor. Additionally, granting the maximum timeframe will help minimize the administrative burden associated with potential future requests for extensions at a later stage.	Works approval granted for a duration of 5 years.
Condition 1, Table 1, Item 1	Should read "constructed with 1:2.5 (V:H) batter slopes".	Amended as per comment.
Condition 2, Table 2, Item 3	Should read "Figure 7, Figure 8".	Amended as per comment.
Condition 2, Table 2, Item 3	Should read "must have a hydraulic conductivity of ≤3.0 x 10^{-11} m/s (MaxARV) or ≤2.4 x 10^{-11} m/s (typical)".	Amended as per comment.
Condition 12, Table 6	Should read "must maintain 1:2.5 (V:H) batter slopes"	Amended as per comment.
Condition 14	Incorrect condition reference. Should reference Condition 13.	Amended as per comment.

Appendix 2: Application validation summary

<table>
<tr><th colspan="7">SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)</th></tr>
<tr><td colspan="7">Application type</td></tr>
<tr><td>Works approval</td><td>☒</td><td colspan="5"></td></tr>
<tr><td rowspan="5">Licence</td><td rowspan="5">☐</td><td>Relevant works approval number:</td><td colspan="2"></td><td>None</td><td>☐</td></tr>
<tr><td colspan="3">Has the works approval been complied with?</td><td colspan="2">Yes ☐ No ☐</td></tr>
<tr><td colspan="3">Has time limited operations under the works approval demonstrated acceptable operations?</td><td colspan="2">Yes ☐ No ☐ N/A ☐</td></tr>
<tr><td colspan="3">Environmental Compliance Report / Critical Containment Infrastructure Report submitted?</td><td colspan="2">Yes ☐ No ☐</td></tr>
<tr><td>Date report received:</td><td colspan="4"></td></tr>
<tr><td>Renewal</td><td>☐</td><td>Current licence number:</td><td colspan="4"></td></tr>
<tr><td>Amendment to works approval</td><td>☐</td><td>Current works approval number:</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Amendment to licence</td><td rowspan="2">☐</td><td>Current licence number:</td><td colspan="4"></td></tr>
<tr><td>Relevant works approval number:</td><td colspan="2"></td><td>N/A</td><td>☐</td></tr>
<tr><td>Registration</td><td>☐</td><td>Current works approval number:</td><td colspan="2"></td><td>None</td><td>☐</td></tr>
<tr><td colspan="2">Date application received</td><td colspan="5">10 October 2023</td></tr>
<tr><td colspan="7">Applicant and premises details</td></tr>
<tr><td colspan="2">Applicant name/s (full legal name/s)</td><td colspan="5">Shire of Broome</td></tr>
<tr><td colspan="2">Premises name</td><td colspan="5">Broome Regional Resource Recovery Park</td></tr>
<tr><td colspan="2">Premises location</td><td colspan="5">Lot 550 on Deposited Plan 421448</td></tr>
<tr><td colspan="2">Local Government Authority</td><td colspan="5">Shire of Broome</td></tr>
<tr><td colspan="7">Application documents</td></tr>
<tr><td colspan="2">HPCM file reference number:</td><td colspan="5">DER2023/000671</td></tr>
<tr><td colspan="2">Key application documents (additional to application form):</td><td colspan="5">Environmental Assessment and Management Plan
Appendix A – Design Drawings
Appendix B – Special Reports and Management Plans:
Environmental Noise Assessment
Landfill Stability Risk Assessment
Leachate Management Plan
Surface Water Management Plan
Landfill Gas Management Plan
Groundwater Management Plan
Asbestos Management Plan
Construction and Demolition Sampling Plan
Bushfire Management Plan V1</td></tr>
</table>

SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)	
	• *Bushfire Management Plan V1.1* • *Bushfire Risk – Assessment and Management Report* • *Feral Animal and Vermin Management Plan* • *Odour Impact Assessment* • *Weed Management Plan* • *Site Investigation Report* • *Hydrology Report* • *Reconnaissance Flora and Level 1 Fauna Survey* • *Detailed Flora and Veg Assessment* • *Traffic Impact Assessment* • *Asbestos Monocell Filling and Closure Plan* Appendix C – Landfill Technical Specification & CQA Plan Figures (1 to 8) Asbestos Monocell Filling and Closure Plan
Scope of application/assessment	
Summary of proposed activities or changes to existing operations.	Construction of Cells 1 and 2 of the Class III landfill proposed for the RRRP, which will be initially comprised of 16 cells, and the corresponding environmental engineering controls, including a leachate evaporation pond. Construction of a Class I Asbestos Monocell.

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

Table 1: Prescribed premises categories

Prescribed premises category and description	Proposedproduction or design capacity	Proposed changes to the production or design capacity (amendments only)
Category 64: Class III Putrescible Landfill	35,000 tonnes per annum	
Category 63: Class I inert landfill	5,000 tonnes per annum (estimated actual throughput 412 tonnes per annum)	

Legislative context and other approvals		
Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes ☒ No ☐	Referral decision No: APP-0024974 Managed under Part V ☒ Assessed under Part IV ☐
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes ☐ No ☒	N/A

SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)		
Has the proposal been referred and/or assessed under the EPBC Act?	Yes ☐ No ☒	Reference No: N/A
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes ☒ No ☐	Certificate of title ☐ General lease ☐ Expiry: Mining lease / tenement ☐ Expiry: Other evidence ☒ Expiry: 21 year lease term
Has the applicant obtained all relevant planning approvals?	Yes ☐ No ☐ N/A ☐	The RRRP has been deemed a Public Works and is subject to a works exemption under the *Planning and Development Act 2005*. In April 2021, the Shire's Council resolved that it "*Acknowledges the RRRP is deemed a 'public works' and requests the Chief Executive Officer to include and progress the amendment of the Reservation of site D2 through the review of Local Planning Scheme No.6 with the intent to change the Reservation from Public Purpose: Water Supply to Public Purpose: Refuse Site*."
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes ☒ No ☐	CPS No: 9542-1
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes ☐ No ☒	Application reference No: N/A Licence/permit No: N/A
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes ☒ No ☐	Application reference No: N/A Licence/permit No: GWL167287(3)
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes ☒ No ☐	Name: Broome Groundwater Area Type: Proclaimed Groundwater Area Has Regulatory Services (Water) been consulted? Yes ☒ No ☐ N/A ☐ Regional office: North West

SECTION 1: APPLICATION SUMMARY (as updated from validation checklist)		
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes ☐ No ☒	Name: N/A Priority: N/A Are the proposed activities/ landuse compatible with the PDWSA (refer to WQPN 25)? Yes ☐ No ☐ N/A ☒
Is the Premises subject to any other Acts or subsidiary regulations (e.g. *Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx*)	Yes ☐ No ☒	N/A
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes ☐ No ☒	N/A
Is the Premises subject to any EPP requirements?	Yes ☐ No ☒	N/A
Is the Premises a known or suspected contaminated site under the *Contaminated Sites Act 2003*?	Yes ☐ No ☒	Classification: N/A Date of classification: N/A