



Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number W6225/2019/1

Applicant Shire of Ashburton

File Number DWERVT1867

Premises Pilbara Regional Waste Management Facility
Lot 550 and Lot 551 on Plan 414367, being Reserve 53324
Onslow Road
TALANDJI WA 6710
Certificate of Title: Volume LR3169, Folio 963

Date of Report 18 October 2019

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1. Definitions of terms and acronyms

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

Table 1: Definitions

Term	Definition
Acceptance Criteria	has the meaning defined in the LWCWD
AHD	Australian Height Datum
AEP	Annual Exceedance Probability and means the probability that a given rainfall total accumulated over a given duration will be exceeded in any one year
Applicant	Shire of Ashburton
Application	the works approval application submitted by the Applicant for the proposed construction of infrastructure at the Premises
ARI	Annual Recurrence Interval and means the average or expected value of the periods between exceedances of a given rainfall total accumulated over a given duration
AS 1289.0-2000	Australian Standard AS 1289.0-2000 Methods for testing soils for engineering purposes
AS 1289.6.7.2	Australian Standard AS 1289.6.7.2-2001 Methods of testing soils for engineering purposes: Soil strength and consolidation tests – Determination of permeability of a soil – Falling head method for a remoulded specimen
AS 1851-2012	Australian Standard AS1851-2012 Routine Service of Fire Protection Systems and Equipment
AS 1940-2017	Australian Standard 1940-2017 The storage and handling of flammable and combustible liquids
AS 3798-2017	Australian Standard AS 3798-2017 Guidelines on earthworks for commercial and residential developments
AS 3959-2009	Australian Standard AS 3959-2009 Construction of buildings in bushfire-prone areas
AS 4775	Australian Standard AS 4475-2007 Emergency eyewash and shower equipment
AS/NZS 1170.2:2011	Australian and New Zealand Standard AS/NZS 1170.2:2011 Structural Design Actions – Part 2: Wind Actions

Term	Definition
AS/NZS 4261	Australian and New Zealand Standard AS/NZS 4261 Reusable containers for the collection of sharp items used in human and animal medical applications
ASTM: D5092-04	American Society for Testing and Materials Standard ASTM: D5092-04 Standard practice for the design and installation of groundwater monitoring wells
asbestos	has the meaning defined in the <i>Guidelines for Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia</i> (DOH, 2009)
Asbestos Containing Material	has the meaning defined in the <i>Guidelines for Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia</i> (DOH, 2009)
Asbestos Guidelines	<i>Guidelines for managing asbestos at construction and demolition waste recycling facilities</i> (DEC, 2012)
BGL	below ground level
BOD	biological oxygen demand
BoM	Bureau of Meteorology
BTEX	benzene, toluene, ethylbenzene and xylenes
BWA	Bulk Waste Areas
C&D	construction and demolition
CALM Act	<i>Conservation and Land Management Act 1984</i> (WA)
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CEO	means Chief Executive Officer of the Department. “submit to / notify the CEO” (or similar), means either: Director General Department administering the <i>Environmental Protection Act 1986</i> Locked Bag 10 Joondalup DC WA 6919 or: info@dwer.wa.gov.au
CHC	chlorinated hydrocarbons
Clean fill	has the meaning defined in the LWCWD

Term	Definition
COD	chemical oxygen demand
Conservation Park	has the meaning defined in the CALM Act
Controlled Waste	has the meaning defined in the <i>Environmental Protection (Controlled Waste) Regulations 2004</i>
Controlled Waste Regulations	<i>Environmental Protection (Controlled Waste) Regulations 2004 (WA)</i>
CRCP	Cane River Conservation Park
CQA	construction quality assurance
DBCA	Department of Biodiversity, Conservation and Attractions
Decision Report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DFES	Department of Fire and Emergency Services
Discharge	has the same meaning given to that term under the EP Act.
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation As of 1 July 2017, the Department of Environment Regulation (DER), the Office of the Environmental Protection Authority (OEPA) and the Department of Water (DoW) amalgamated to form the Department of Water and Environmental Regulation (DWER). DWER was established under section 35 of the <i>Public Sector Management Act 1994</i> and is responsible for the administration of the <i>Environmental Protection Act 1986</i> along with other legislation.
Emission	has the same meaning given to that term under the EP Act.
EBS	engineered barrier system
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EP Regulations	<i>Environmental Protection Regulations 1987 (WA)</i>
EPA	Environmental Protection Authority

Term	Definition
ERP	Emergency Response Plan
FoS	Factory of Safety
GCL	geosynthetic clay liner
Green Waste	means waste that originates from flora and which does not contain or has not been treated or coated with, preserving agents, biocides, fire retardants, paint, adhesives or binders
Hazardous Waste	has the meaning defined in the LWCWD
HDPE	high density polyethylene
HELP	Hydrologic Evaluation and Landfill Performance software
Inert Waste Type 1	has the meaning defined in the LWCWD
Inert Waste Type 2	has the meaning defined in the LWCWD
LFG	landfill gas
LFGMP	Landfill Gas Management Plan
LLDPE	linear low density polyethylene
LWCWD	means the document titled <i>Landfill Waste Classification and Waste Definitions 1996</i> published by the CEO as amended from time to time
MTBE	methyl tert-butyl ether
NEPM	<i>National Environment Protection (Ambient Air Quality) Measure</i> as amended
Neutralised Acid Sulfate Soils	has the meaning defined in the LWCWD
Noise Regulations	<i>Environmental Protection (Noise) Regulations 1997 (WA)</i>
NPUG	refers to Non-potable use guidelines as defined in the <i>Contaminated Sites Ground and Surface Water Chemical Screening Guidelines</i> (DOH, 2014)
OBE	operating base earthquake
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PDWSA	Public Drinking Water Source Area

Term	Definition
PFAS	poly- and per-fluoroalkyl substances
Pindan Sand Ridge	means the topographic feature within the Prescribed Premises boundary defined by an elevation greater than 20 mAHD as depicted in the Premises map in Schedule 1 of the Works Approval.
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Primary Activities	refers to the Prescribed Premises activities listed in Table 2
Priority flora	means those plant taxa described as priority flora classes 1, 2, 3 and 4 in the <i>Department of Biodiversity, Conservation and Attractions Threatened and Priority Flora List for Western Australia</i> (as amended)
PRWMF	Pilbara Regional Waste Management Facility
Putrescible Waste	means the component of the waste stream likely to become putrid – including wastes that contain organic materials such as food wastes or wastes of animal or vegetable origin, which readily bio-degrade within the environment of a landfill
Risk Event	as described in <i>Guidance Statement: Risk Assessment</i>
RIWI Act	<i>Rights in Water and Irrigation Act 1914 (WA)</i>
SEE	safety evaluation earthquake
Special Waste Type 1	has the meaning defined in the LWCWD
Special Waste Type 2	has the meaning defined in the LWCWD
TEC	Threatened Ecological Community
TOC	top of casing
TSS	total suspended solids
Uncontaminated fill	has the meaning defined in the LWCWD
VIC BPEM	<i>Best practice environmental management, siting, design, operation and rehabilitation of landfills</i> published by the Environment Protection Authority Victoria 2015 (EPA Victoria, 2015)

Term	Definition
Works Approval	refers to W6225/2019/1 which evidences the grant of the works approval by the CEO under s.54 of the EP Act, subject to the Conditions.

2. Purpose and scope of assessment

On 1 November 2018 the Shire of Ashburton (the Applicant) submitted a works approval application under Part V, Division 3 of the *Environmental Protection Act 1986* (EP Act) to construct the Pilbara Regional Waste Management Facility (PRWMF) located on Onslow Road in Talandji (the Premises), approximately 36 km south of Onslow in the Pilbara region of Western Australia.

The PRWMF is proposed to service domestic and industrial waste generators across the Pilbara region by providing infrastructure for waste management, including waste reuse, liquid waste disposal, asbestos and tyre disposal and a Class IV secure landfill site. The prescribed premises categories included in the works approval application are detailed in Table 2 below.

Due to the waste management service demands related to infrastructure and major industry presence in the region, funding for the PRWMF is derived from a suite of commitments and obligations under the State Development Agreement 2011 *Gas Processing (Wheatstone Project) Agreement* and the Commonwealth of Australia's *Building Better Regions Fund*. The Applicant is proposing to commence the development prior to the end of 2019.

The existing nearby Onslow Waste Transfer Station, currently approved under Part V of the EP Act (Licence L8872/2014/1), will continue to serve as the primary waste management service point for the local Onslow community.

Table 2: Classification of premises and proposed design capacity

Category number	Category description	Production or design capacity
13	Crushing of building material: premises on which waste building or demolition material (for example, bricks, stones or concrete) is crushed or cleaned.	50,000 tonnes per annual period
57	Used tyre storage (general): premises (other than premises within category 56) on which used tyres are stored.	10,000 tyres
61	Liquid waste facility: premises on which liquid waste produced on other premises (other than sewerage waste) is stored, reprocessed, treated or irrigated.	25,000 tonnes per annual period
61A	Solid waste facility: premises (other than premises within category 67A) on which solid waste produced on other premises is stored, reprocessed, treated, or discharged onto land.	10,000 tonnes per annual period
62	Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or re-use.	20,000 tonnes per annual period
63	Class I inert landfill: 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.	10,000 tonnes per annual period

Category number	Category description	Production or design capacity
65	Class IV secure 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.	50,000 tonnes per annual period
85	Sewage facility: premises – On which sewage is treated (excluding septic tanks); or From which sewage is discharged onto land or into waters.	15,000 m ³ per annual period

Appendix 1 lists the documents submitted during the assessment process.

This Decision Report is an assessment of the foreseeable Risk Events that have the potential to impact public health, public amenity and the environment, arising from the Primary Activities associated with the construction and operation of the proposed PRWMF.

2.1 Exclusions from scope

Through ongoing consultation between the Department of Water and Environmental Regulation (DWER) and the Applicant through this assessment, the Applicant has formally requested that the following aspect of the Application be excluded from the scope of this assessment and decision:

- Prescribed premises Category 61 activities including acceptance and treatment of liquid waste; and
- Acceptance and burial of Class II and III putrescible waste, including the proposed disposal of sludge/solids generated from the acceptance of sewage.

It is noted that the Application included a request to accept and landfill putrescible waste as part of Category 65 activities.

Clearing of native vegetation has not been assessed under the works approval application. The works approval does not authorise clearing activities to be undertaken. Clearing has been assessed and approved through a separate process (further information is provided in Section 4).

3. Overview of Premises

3.1 Construction summary

The Application has been submitted for approval to construct Phase 1 of the PRWMF as depicted in Figure 1. Phase 1 construction works will incorporate the elements listed in Table 3. Further details on the construction works specifications are summarised in Section 3.3.

Following Phase 1 additional works the Applicant intends to expand the facility, including additional waste management infrastructure (landfill cells, leachate ponds, waste processing areas and storm water management infrastructure).

The proposed prescribed premises boundary covers 435 ha. The entire landfill development envelope, including the surface water management infrastructure covers 139 ha of the Premises with the majority of the Class IV landfill infrastructure contained within a 70 ha area. The actual infrastructure elements cover a total footprint area of 32 ha within the development envelope.

Table 3: Summary of PRMWF construction elements

Summary of construction elements
All prescribed activities (general): Progressive clearing of native vegetation (as per Clearing permit CPS 8395/1) and earthworks for road access, fencing, amenities, maintenance and equipment shed, vehicle wash down and utilities, service infrastructure and the construction of waste management infrastructure summarised in the rows below.
All prescribed activities (storm water): Storm water management flood protection bund, diversion drains, interception drains, culverts, rock armouring, attenuation pond and infiltration/evaporation pond.
All prescribed activities (fire/ emergency/ incident management): Buffers for maintenance of fire management sensitive design and vegetation management, asset protection zone, access tracks, emergency water storage and delivery capabilities, infra-red camera for screening the surface of all incoming waste loads and a clear emergency/fire load isolation and management area.
Inert Waste Type 2 (tyre storage and landfilling): Construction of the tyre baling shed and a landfill mono-cell that will be excavated on a demand basis.
Bulk waste management: Construction of hardstand areas for green waste, construction and demolition waste and scrap metal waste including drainage collection and evaporation pond for the green waste area.
Asbestos and building and demolition waste management: Landfill mono-cells for asbestos waste that will be excavated on a demand basis.
Class IV secure landfill waste management: Construction of Class IV secure landfill Cell 1, including subgrade preparation, installation of an engineered attenuation layer, anchor trenches, installation of a double composite lined system, leachate collection and extraction system, and composite lined leachate evaporation pond system.
Sewage treatment: Construction of the two concrete sewage receival ponds and a HDPE lined evaporation pond.
All prescribed activities (monitoring): Installation of ambient environmental monitoring infrastructure, including construction of twelve (12) groundwater monitoring bores.

Construction will be carried out during dry season to minimise impacts to the development due to inclement weather. A Construction Quality Assurance (CQA) Plan for construction of Cell 1 was provided with the Application (Talis, 2019c). The CQA Plan and accompanying Technical Specifications, provide detail on the material and construction specifications, quality assurance testing methods and procedures required for the development of the PRMWF infrastructure including: Cell 1, leachate collection and storage system, evaporation ponds, surface water management infrastructure and levee embankment construction.

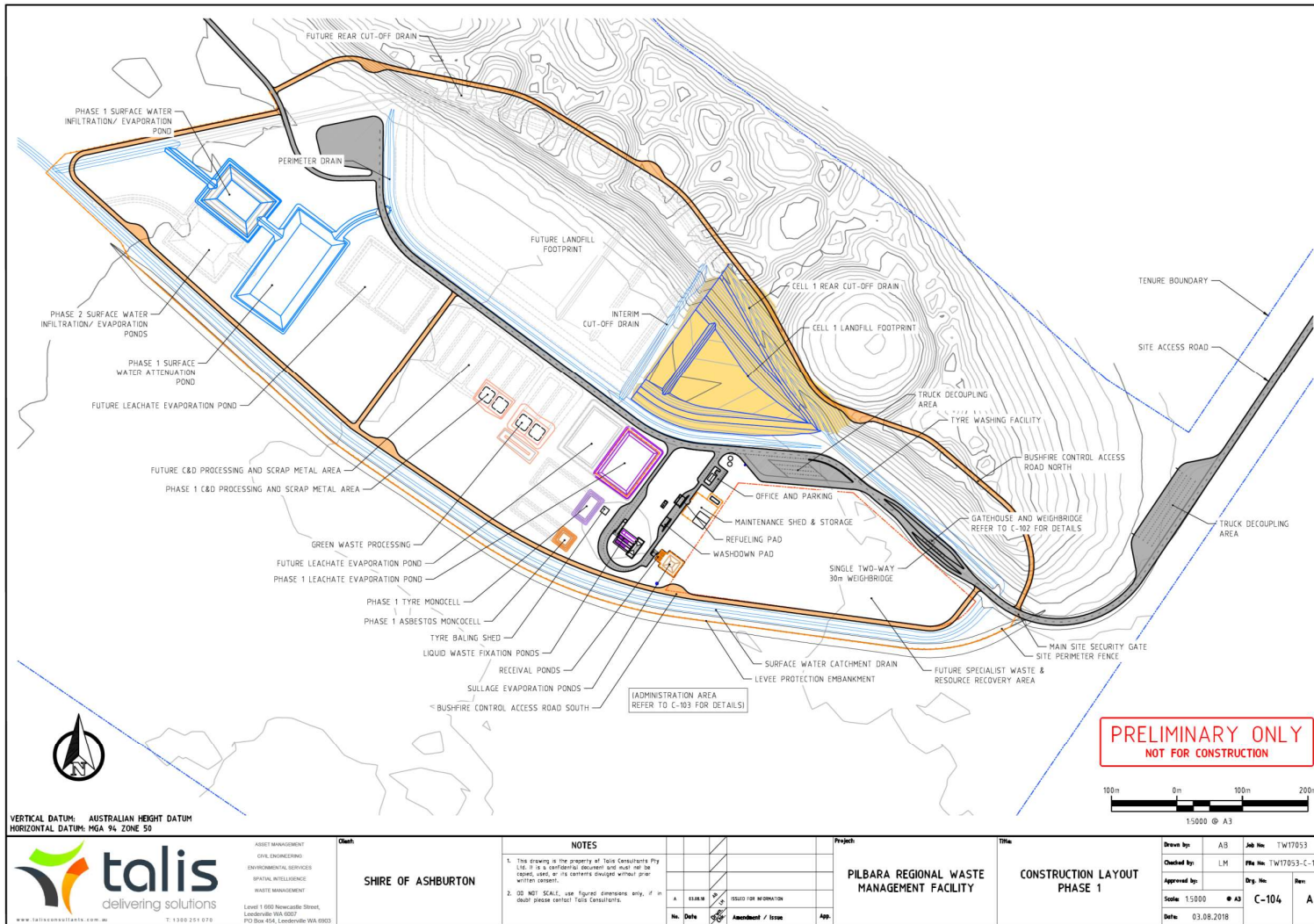


Figure 1: Site Layout

3.2 Operations summary

Operations are proposed to commence following construction of landfill Cell 1 and associated infrastructure as described in Table 3 and subject to the application for and determination of licence under Part V of the EP Act. All waste accepted at PRWMF will be from contractors and approved entities only and the Premises will not be open to general public for waste drop off or disposal.

All waste accepted will be screened via the gatehouse and weighbridge and will require relevant paperwork to confirm waste classifications, laboratory certification and/or controlled waste tracking forms. Screening will include closed circuit television and infra-red camera scanning to assess incoming waste loads. Non-conforming loads will not be accepted at the Premises.

The waste types accepted for the relevant Primary Activities (Table 2), will be handled and managed according to the processes summarised in Table 4.

All relevant maps and plans submitted in the Application and referred to in the summaries are contained in Appendix 4 of this Decision Report.

Operations are proposed to occur between 0600 and 1700 hours, seven days per week.

3.3 General construction and operation specifications

The general infrastructure and operational areas for the PRWMF are depicted in Figure 1 and will include the infrastructure construction and operational arrangements listed in Table 4.

Table 4: Summary of Primary activities, general infrastructure and operation elements.

Summary of elements - general infrastructure and equipment	
1)	Sealed access road from Onslow Road at the north-eastern end of the Premises, internal sealed roads in eastern areas complemented by internal and perimeter unsealed roads/tracks and an emergency egress track from the west end of the Premises.
2)	A 1.8 m high floppy top fence with 600 mm overhang and skirt security fence, for the purpose of preventing feral animals accessing the Premises, and lockable gates will surround the Premises infrastructure and internal fences around the Class IV landfill leachate evaporation ponds.
3)	Gatehouse for load screening and entry to the Premises. Includes: gatehouse with closed circuit and infra-red cameras adjacent weighbridge, sealed parking areas, truck turn around and 'layby area' for water carts and an isolation area for 'load fires' (waste loads on fire/smouldering).
4)	Site office, amenities, utilities, onsite generator and critical service infrastructure. Ablution waste will be pumped to the sullage ponds.
5)	Equipment and vehicle maintenance and equipment shed with perimeter drain all on concrete hardstands, meeting a permeability of not greater than 1×10^{-9} m/s, with perimeter bund, sumps and oily water separators
6)	Vehicle wash down and tyre wash facilities, each with a separate wash down pad sump (element 7), a separate refuelling pad, all concrete hardstands, meeting a permeability of not greater than 1×10^{-9} m/s, with perimeter bunds.

7)	<p>Wash down pad sumps will collect run-off that will be directed through oily water separators before being used in dust suppression or discharge to the environment, based on a discharge criteria of <15 mg/L Total Petroleum Hydrocarbons being met. Sediment removed from sumps will be landfilled.</p> <p>Tanks and containers will be washed down utilising the wash down pad infrastructure as required.</p>
Summary of elements - Bulk Waste Area	
<p>The Applicant has proposed to establish a Bulk Waste Area (BWA) which will include storing and sorting activities to divert recoverable waste from landfill. The BWA includes the Green Waste Processing Area, Scrap Metal Stockpiling Area, and the Construction and Demolition Recycling Facility. These areas are discussed individually in the following sections.</p>	
Construction and demolition waste: Categories 13 and 61A	
8)	<p>Acceptance and handling:</p> <ul style="list-style-type: none"> • All construction and demolition (C&D) waste must have the waste source confirmed, will be inspected at the gatehouse prior to acceptance and rated for potential undeclared asbestos. • All high risk loads of building and demolition waste will be inspected at the time of unloading.
9)	<p>Storage and processing:</p> <ul style="list-style-type: none"> • Only occurring on a C&D hardstand, meeting a permeability of not greater than 1×10^{-9} m/s, will grade a minimum 1:200 gradient onto adjacent land or into the storm water management system. • The C&D waste hardstand storage/ processing area will incorporate a sprinkler system to manage dust. • C&D waste will be crushed and screened with equipment containing dust suppression systems. Crushing and screening will occur periodically when sufficient volumes are stockpiled.
10)	<p>Re-use:</p> <ul style="list-style-type: none"> • Crushed C&D waste will be stockpiled prior to use for the construction of access roads or hardstand areas within the Premises and for use in civil works activities around the Shire of Ashburton. • Any offsite use will be subject to materials testing procedures for asbestos content. • The Applicant provided the Construction and Demolition Sampling Plan, Pilbara Regional Waste Management Facility, prepared by Talis Consultants for the Shire of Ashburton, June 2019, as part of the Application. The procedures for handling and sampling of C&D waste as outlined in this plan are generally reflected of those outlined in the Department's <i>Guidelines for managing asbestos at construction and demolition waste recycling facilities</i> (December 2012).
Used tyres: Category 57 and 63	
11)	<p>Acceptance and handling:</p> <ul style="list-style-type: none"> • The Applicant has applied to accept Inert Waste Type 2, being used tyres and conveyor belt rubber. • Up to 10,000 tyres are proposed to be stored at any one time. • Tyres are classified as Inert Waste Type 2, under the <i>Landfill Waste Classification and Waste Definitions 1999</i> (LWCWD), and controlled waste code T140.

12)	<p>Storage:</p> <ul style="list-style-type: none"> • Tyres will be stored in accordance with the Department of Fire and Emergency Services <i>Guidance Note: GN02 Bulk storage of rubber tyres including shredded and crumbed tyres</i> (DFES, 2019). • Maximum of four (4) separate stacks of unbaled tyres to be stored. • Tyre stacks will not exceed 3 m high, 100 m² in area and will be separated by a minimum 2.5 m.
13)	<p>Processing:</p> <ul style="list-style-type: none"> • A shed with a concrete hardstand will be constructed for the compression and baling of Inert Waste Type 2 on a demand basis, prior to landfilling. Bales will be approximately ≤2 m x ≤1.5 m x ≤1 m in size. • The baling shed is proposed to be constructed adjacent to the tyre monocell.
14)	<p>Landfilling:</p> <ul style="list-style-type: none"> • Tyre monocells will be constructed on an as needs basis for the filling of tyre bales. • Monocells will be excavated to a maximum depth of 3 m BGL. • After placement, bales will have a minimum 0.5 m of cover material applied. • The cover material is proposed to be graded to allow for surface water drainage.
Green waste: Category 61A	
15)	<p>Acceptance and handling:</p> <ul style="list-style-type: none"> • Following acceptance onto the Premises, all green waste will be covered until being unloaded onto the designated green waste hardstand where minor contaminants will be manually removed to landfill.
16)	<p>Storage:</p> <ul style="list-style-type: none"> • Infrastructure and operational management arrangements have been developed with consideration of the Department of Fire and Emergency Services, <i>Information Note: Bulk Green waste storage Fires</i> (DFES, 2014). • The green waste hardstand will be constructed as a 200 mm thick hardstand, meeting a permeability of not greater than 1 x 10⁻⁹ m/s, grading a minimum 1:200 gradient into a low permeability compacted soil pond that drains into a pond designed to cater for a 72 hour, 1 in 10-year rainfall event, meeting a permeability of not greater than 1 x 10⁻⁹ m/s. • The pond will be maintained with a 0.4 m freeboard. • In the event of freeboard exceedance, pond contents will be pumped into the leachate evaporation pond. • A 100 m buffer around the green waste stockpile area will be maintained. • Green waste and mulch stockpiles will be stored in maximum volumes of 3 m high, 10 m wide and 40 m long and stockpiles will be separated by a minimum 10 m.
17)	<p>Processing:</p> <ul style="list-style-type: none"> • Green waste will be stockpiled and mulched periodically when sufficient volumes are stockpiled.
18)	<p>Re-use:</p> <ul style="list-style-type: none"> • Mulch will be reused at the Premises for rehabilitation and landscaping.
Scrap metal: Category 62	
19)	<p>Acceptance:</p> <ul style="list-style-type: none"> • The Applicant proposes to accept, store and bale scrap metal prior to transport offsite for reuse at other locations. The anticipated scrap metal waste will be in the form of electrical cables, exotic and specialist alloys, drill rods and general metal waste.

20)	<p>Storage:</p> <ul style="list-style-type: none"> • A designated scrap metal hardstand will be constructed measuring 50 m x 100 m, meeting a permeability of not greater than 1 x 10⁻⁹ m/s, grading a minimum 1:200 gradient onto adjacent land or into the storm water management system. • Any stormwater which becomes contaminated within this storage area will be collected and treated through the Leachate Management System. • Scrap metal will be stockpiled until sufficient volumes are stored for the material to be removed from the Premises for recycling.
Summary of elements - Class IV landfill: Category 65	
21)	<p>Acceptance:</p> <ul style="list-style-type: none"> • All waste is visually inspected at the gatehouse prior to acceptance onsite. • Contaminated solid wastes will require provision of laboratory testing on acceptance to verify that contaminant levels meet waste classification acceptance criteria for Class IV landfills.
22)	<p>Handling, disposal and burial:</p> <ul style="list-style-type: none"> • Accepted waste will be disposed direct to the landfill tipping face and visually assessed prior to cover material being applied. • The tipping face will not exceed an area of 30 x 30 m and 2 m in height. • The first layer (0.5 – 1 m) of waste in each cell, over the liner depicted in Appendix 4 A4.7 will not be compacted, compromise the cell liner system or contain waste that could damage the liner. • Waste will be spread in 500 mm layers to form 2 m deep platforms across the entire cell floor or the lower waste platform, with all waste layers being compacted except the first layer. • 300 mm of intermediate cover material will be applied to landfilled waste at the end of each day, this material may be partially removed at the beginning of operations the next day prior to landfilling. • Landfill cells will be progressively capped and revegetated.
23)	<p>Landfill cell arrangement and liners¹:</p> <ul style="list-style-type: none"> • Landfill Cell 1 will be constructed as part of Phase 1 works. • Each landfill cell will comprise of a separation geotextile covering the leachate collection aggregate and pipework, located above dual 2 mm thick HDPE liners that are separated by a geosynthetic clay liner and leak detection layer, located over a geosynthetic clay layer and 500 mm engineered attenuation (soil) layer as depicted in Appendix 4 Figure A4.7. • Each landfill cell will be designed to direct leachate, via pipework as depicted in Appendix 4 Figures A4.8 and A4.10, to an individual leachate collection sump with a separate sump for the leak detection layer; each sump consists of a side riser pipe and pump as depicted in Appendix 4 Figure A4.9. • Maximum excavation depth for the landfill cells (base of leachate sump), described in Appendix 4 Figure A4.6, will be to a maximum 3 m BGL (~13 m AHD) providing ≥2.9 m separation distance to the standing groundwater level. • Landfill cell internal embankments will be graded from 1V:3 to 1V:4H for side slopes, from the base of the side slopes to the primary leachate collection pipe the grade will be ≥3% (1.72 degrees) and the primary leachate collection pipe will grade towards the leachate sumps by ≥1% (0.57 degrees). <p><i>Note 1: The specifications for each landfill cell liner component are detailed further in Section 6.1.</i></p>

<p>24)</p>	<p>Leachate management:</p> <ul style="list-style-type: none"> • Leachate levels at the base of the landfill cells will be maintained as low as reasonably practicable through regular extraction. This is proposed to be between 0.3 and 1.0 m. • There will be an ongoing automated monitoring of leachate levels in the sump which will trigger the pump for extraction to maintain leachate levels as low as reasonably practicable between 0.3 and 1m maximum level. Additional operational controls for leachate management will be considered as part of the licence application. • Leachate will be abstracted from the leachate collection sumps via the side riser pump and leachate will be discharged via HDPE pipe to the leachate evaporation ponds. • The leachate evaporation ponds, will be lined by a double 2 mm thick HDPE liner separated by a leak detection layer over a 300 mm engineered attenuation (soil) layer, as depicted in Appendix 4 Figure A4.14. • Each leachate pond will have a maximum evaporation area of 3,700 m², operational capacity of 4,754 m³ and service a catchment of 4,480 m² providing storage capacity to cater for two consecutive wet years. • Leachate volumes in excess of the leachate pond capacity are proposed to be recirculated onto the landfill area back through the landfill cells in the event that the leachate cannot be managed in another manner. • The leachate ponds will be enclosed by a fence with a perimeter embankment 0.5 m above surrounding ground level, operated with a minimum 0.5 m freeboard and enclosed within a 1.8 m high fence. • Monitoring of leachate is described further in Section 7.4 of this Decision Report.
<p>25)</p>	<p>Landfill gas management:</p> <ul style="list-style-type: none"> • Landfill cells will have vertical wells, horizontal pipes, gas manifolds, condensate traps and aspirating cowls constructed into them for passive venting. A gas flare will be installed if volumes are sufficient. Detailed design for the configuration of the extraction and monitoring system was not provided with the Application. • Landfill gas monitoring wells will be installed every 150 m around the perimeter of the landfill, setback 20 m. • Landfill cell caps will comprise of 300 mm of surface Pindan soils below the sealing liner (GCL or LLDPE) to act as a gas collection layer. • Monitoring of landfill gas is addressed in Section 7.4 of this Decision Report.
<p>26)</p>	<p>Construction quality assurance (CQA):</p> <ul style="list-style-type: none"> • CQA will address all earthworks for the Class IV secure landfill, installation of the engineered attenuation layer and each landfill cell liner component including material specifications, installation and leak detection. • CQA will also address installation of all lining systems for the leachate collection system, stormwater management system and sullage pond. • An independent CQA consultant will be responsible for the final certification reporting, including all project hold-points, for all elements of the CQA.

27)	<p>Landfill stability and post closure:</p> <ul style="list-style-type: none"> • Stability has been addressed in the Application within the <i>Stability risk assessment Pilbara Regional Waste Management Facility</i> (Talis, 2019b) that considered the stability of the basal subgrade and lining system, the side slope subgrade and lining system, the waste and capping. Landfill stability is discussed further in Section 6.4 of this Decision Report. • Landfill cells will be progressively filled, closed and capped from Cell 1 in the east and moving west for future phases of work. • Final waste profiles and slope of the landfill are proposed to be between $\geq 1V:20H$ and $\leq 1V:5H$ and the final pre-settlement landfill profile will be approximately 16-17 m above natural ground level, no higher than the adjacent Pindan Sand Ridge. • Final capping of the landfill cells is proposed for revegetation, incorporating the following layers as depicted in Appendix 4 Figure A4.18: <ul style="list-style-type: none"> ○ 300 mm Pindan soil gas collection layer over the final waste cover; overlain by ○ Geosynthetic clay liner (GCL) and low-density polyethylene (LLDPE) geomembrane; overlain by ○ Geocomposite drainage layer for managing water infiltration; overlain by ○ 1 m thick sandy soil restoration and GCL/ LLDPE protection layer; overlain by ○ 0.2 m topsoil growth medium; and ○ A final profile and slope $\leq 1V:7H$ in steepness. • The perimeter ditch around the Class IV secure landfill cells and storm water management system will remain in place after closure and capping.
Summary of elements – other Primary activities	
Asbestos: Category 63	
28)	<p>Acceptance and Handling:</p> <ul style="list-style-type: none"> • ≥ 24 hours prior notification to the gatehouse is required before the arrival of declared asbestos waste loads for disposal. • Transport and management of asbestos waste is subject to the provisions of the <i>Environmental Protection (Controlled Waste) Regulations 2004</i> including wrapping and labelling requirements for waste acceptance. • All declared loads will be inspected at the gatehouse prior to acceptance. • Declared asbestos waste will not be handled and will instead be directed to the asbestos monocell.
29)	<p>Landfilling:</p> <ul style="list-style-type: none"> • All asbestos waste will be disposed of to the designated asbestos monocell immediately upon acceptance. • All waste identified as containing asbestos or potentially containing asbestos after being accepted on site will also be disposed of to the asbestos monocell. • The asbestos monocell is planned to cover a total area of 3,100 m² and will be excavated to a maximum 4 m BGL, providing a minimum separation to groundwater of 2 m, after placement a minimum 1 m of cover material following waste disposal. • Once covered, compaction will occur, and placement will be recorded within an asbestos disposal register.
Biomedical/clinical waste: Category 65	
30)	<p>Acceptance:</p> <ul style="list-style-type: none"> • All Special Waste Type 2 will be contained in accordance with <i>AS/NZS 4261 Reusable containers for the collection of sharp items used in human and animal medical applications</i>.

31)	Landfilling: <ul style="list-style-type: none"> All clinical waste will be disposed of at the base of the tipping face and immediately covered.
Hazardous wastes – general	
32)	The Applicant has advised that the storage and bunding of hazardous wastes will be in accordance with Australian Standard AS 1940-2017 <i>The storage and handling of flammable and combustible liquids</i> .
Sewage facility: Category 85	
33)	Acceptance: <ul style="list-style-type: none"> Sewerage will be accepted onto the Premises via pipes from liquid waste tankers into one of the two receival ponds. The pipes will be fitted with shut off valves.
34)	Storage/treatment: <ul style="list-style-type: none"> The two receival ponds will be constructed of concrete to the dimensions of 5.5 x 5.5 m each with a maximum holding capacity of 12 m³. The receival ponds will retain solid residue and liquid components will be gravity fed into the evaporation pond. The evaporation pond will be HDPE lined and constructed to the dimensions of 20 x 20 m and will have a maximum capacity of 245 m³. The liquid content will evaporate from the evaporation pond.
35)	Disposal: <ul style="list-style-type: none"> The Applicant has proposed that the sludges and solids will be removed as required and landfilled onsite. Landfilling of this waste will require assessment under any subsequent Part V applications and will be subject to the inclusion of prescribed premises category 64 (class II or III putrescible landfill).

4. Legislative context

Table 5 summarises approvals relevant to the assessment.

Table 5: Relevant approvals and tenure

Legislation	Number	Subsidiary	Approval
<i>Conservation and Land Management Act 1984</i>	Unallocated crown land – former leasehold proposed for conservation – ex Mount Minnie	Department of Biodiversity Conservation and Attractions	Pending extension of the Cane River Conservation Park (refer to Section 4.1)
<i>Land Administration Act 1997</i>	Reserve under Management Order for Lots 550 and 551 on Deposited Plan 414367	Shire of Ashburton	For the purpose designated as a 'waste disposal site' with conditions (refer to Section 4.2)
<i>Mining Act 1978</i>	Mining tenement M 0800521 Exploration licence E 0802618 and E 0802837	North Rossa Pty Ltd	refer to Section 4.3 below

Legislation	Number	Subsidiary	Approval
<i>Planning and Development Act 2005</i>	N/A	Shire of Ashburton	Section 6 <i>Planning and Development Act 2005</i> exemption claimed for public works. The Applicant, as the subsidiary, does not foresee any issues with regard to the <i>Shire of Ashburton Town Planning Scheme No. 7</i> and the amenity of the area.
<i>Rights in Water and Irrigation Act 1914 (RIWI Act)</i>	GWL202785 CAW202784 (1)	Shire of Ashburton	Bore construction and abstraction of up to 20,000 kL/year from Carnarvon superficial aquifer. The approval provides for the taking of water for dust suppression, construction and industrial processing purposes and is valid over the period 21 May 2019 to 20 May 2029.
<i>Environmental Protection Act 1986 (EP Act) – Part IV</i>	N/A	N/A	The project was referred under Part IV of the EP Act to the EPA on 1 November 2018. On 1 February 2019 the EPA determined that the proposal would not be assessed under Part IV of the EP Act. This determination was appealed however on 8 May 2019 the Minister dismissed the appeal (009 of 2019; OAC, 2019) upholding that the EPA's decision to not formally assess the proposal.
EP Act – Part V, Division 2	CPS 8395/1	Shire of Ashburton	Clearing permit for the clearing of 70 hectares of native vegetation granted on 19 September 2019 for a period of 5 years (19/09/2024).
<i>Environmental Protection (Controlled Waste) Regulations 2004</i>	N/A	Shire of Ashburton	Prior to the acceptance of any controlled waste at the Premises, the Applicant is required to request through DWER that the Premises is listed as a controlled waste disposal facility, via Form 14 – Application to list a waste facility, which is available on DWER's website.

4.1 Conservation and Land Management Act 1984

The lands surrounding the Premises were previously a pastoral station that were purchased by the Government of Western Australia and are now unallocated crown land. The purchased lands are proposed to form an extension to the Cane River Conservation Park (CRCP).

Conservation parks are defined under the *Conservation and Land Management Act 1984* (CALM Act) and management of the lands are the responsibility of the Department of Biodiversity, Conservation and Attractions (DBCA). The Application notes that consultation with DBCA was undertaken during the planning process for the PRWMF and the Premises was excised from the lands that were proposed to form the extension to the CRCP.

As part of this assessment DWER consulted with DBCA. The consultation response is summarised in Appendix 2.

4.2 Land Administration Act 1997

The Shire applied to the Department of Planning, Lands and Heritage (DPLH) for Power to Lease on the Management Order of the land. As part of the application to DPLH, the land (being Lots 550 and 551 on Plan 414367), was set apart as Reserve 533241 for the purpose of “Waste Disposal Facility” with the Management Order issued to the Shire on 5 November 2018 for a period of 21 years.

The Conditions under the Management Order are:

- The Shire of Ashburton ‘... acknowledges that a sand resource exists within the Reserve boundary may be required for extraction in the future, to the extent is not required ...’ for the purpose of the ‘Waste disposal site’; and
- The Shire of Ashburton enters into an agreement with the proprietor of the Macedon gas pipeline to ensure the pipeline is adequately protected.

Key Findings:

1. The Delegated Officer notes that the extent to which the Pindan Sand Ridge required for the waste disposal site has not been defined in the Application. For the purposes of this assessment it has been assumed that the extent required is contained within the proposed prescribed premises boundary.
2. The Delegated Officer has determined to include the whole of Lots 550 and 551 within the prescribed premises boundary for the purposes of this works approval assessment.
3. In the event that another person or entity becomes the occupier of any portion of the Pindan Sand Ridge in the future, the Delegated Officer may consider amending the boundary to encompass the areas of land that are required to maintain long term stability and integrity of all landfill infrastructure.
4. The Delegated Officer requests that the delineation of the areas of land that are required to maintain long term stability and integrity of all landfill infrastructure is provided by the Applicant prior to the assessment of the licence application.

4.3 Mining Act 1978

Two exploration licences were granted to North Rossa Pty Ltd over the Pindan Sand Ridge. A mining lease has been submitted to the Department of Mines, Safety and Industry Regulation (DMIRS) and the decision is currently pending.

The proposed mining lease has not impacted on the assessment or determination of the

works approval application.

If required, any change to the proposed prescribed premises boundary resulting from occupancy by another person or entity will be considered, as noted in Section 4.2.

As part of this assessment DWER consulted with the Mining Lease Applicant and with DMIRS. The consultation responses are summarised in Appendix 2.

5. Location and siting

5.1 Siting context

The Premises is located in the Pilbara region of Western Australia, approximately 36 km south of the township of Onslow. The Pilbara bioregion is characterised by vast coastal plains and inland mountain ranges with cliffs and deep gorges. Vegetation is predominantly mulga low woodlands, or eucalyptus over bunch and hummock grasses (DEE, 2008).

The area immediately surrounding the Premises is dominated by broad sandy plains with linear sand dunes, supporting shrubby hard and soft spinifex grasslands (Phoenix, 2017).

The Pilbara region supports the majority of major export industry in Western Australia being petroleum, natural gas and iron ore and other mining developments. Land use within the region is dominated by pastoral tenure, with residential areas clustered around town centres.

5.2 Residential and sensitive receptors

The description of residential and sensitive receptors and distance from the proposed prescribed activities are detailed in Table 6.

Table 6: Receptors and distance from activity boundary

Sensitive Land Uses	Description and distance from Prescribed Activities
Pastoral stations and leases	Lands used for agricultural purposes (grazing) on Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises. Minderoo Station homestead is located ~20 km south-west of the Premises. Peedamulla Station homestead and campground are located ~40 km east north east of the Premises.
Onslow town site and industrial areas	Wheatstone oil and gas worker accommodation is located ~22 north-west of the Premises. Onslow town site is located ~30 km north-west of the Premises.
Users of Conservation Park (existing and proposed)	The proposed extension to the CRCP includes all lands surrounding the Premises except easements associated with the Onslow Road and associated infrastructure. The boundary of the proposed extension to the CRCP is located between 150 and 1,500 m from the PRMWF infrastructure. (refer to Table 7 for more information)

5.3 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 undertaken at, or Emissions and Discharges generated from, the Premises.

The description of specified ecosystems and distances from the Premises are discussed in Table 7 and shown in Figure 2.

Table 7 and Figure 2 also describe other relevant ecosystem and environmental values considered in this assessment.

Table 7: Environmental receptors

Specified ecosystems	Distance from the Premises
Cane River Conservation Park (CRCP)	<p>Current: located approximately 32 km south-east. Proposed extension: Surrounding the Premises, between approximately 150 m and 1,500 m from the PRMWF infrastructure.</p> <p>No management plan has been published for the existing or proposed extension to the CRCP. Consistent with Section 56 of the CALM Act, the purpose of conservation parks is to conserve the natural environment, protect flora and fauna and preserve features of archaeological, historic or scientific interest while providing for suitable levels of public recreation.</p>
Public Drinking Water Source Area (PDWSA) under the <i>Country Areas Water Supply Act 1947</i>	The Cane River Water Reserve Priority 1 PDWSA is located approximately 21.1 km north-east (up-gradient) of the Premises.
Surface Waters: River systems	<p>The Premises is located along the divide of the Ashburton River and Cane River catchment which discharges into the Ashburton River catchment.</p> <p>Ashburton River: Approximately 20.5 km west of the Premises (down-gradient) Cane River: Approximately 22 km north-east of the Premises (up-gradient)</p>
Surface Water Resource Proclaimed Area	<p>The Premises is situated within the Pilbara Surface Water Area which is proclaimed area under the RIWI Act. The Premises is specifically located within the Ashburton River surface water resource proclaimed portion.</p> <p>Surface water areas are proclaimed for the purposes of regulating the taking of water from watercourses and wetlands and where there is a need for systematic management of the use of water.</p>
Surface water bodies	<p>A series of non-perennial lakes are situated to the west (down-gradient), south-west (up-gradient) and north-east (up-gradient) of the Premises. The closest of these is located approximately 2.3 km west of the Premises.</p> <p>Beyond these is a series of Saline Coastal Flats which extend towards the Indian Ocean.</p>

Specified ecosystems	Distance from the Premises
Threatened Ecological Communities (TEC) (buffers)	<p>The closest TEC buffer, being a Tanpool land system, is situated 36.8 km north-east of the Premises.</p> <p>A Tanpool land system is a “highly restricted land system that occurs between Pannawonica and Onslow. It consists of stony plains and low ridges of sandstone and other sedimentary rocks supporting hard spinifex grasslands and snakewood shrublands” (DBCA, 2017), with a Priority 1 category rating.</p>
Indian Ocean	Approximately 40.3 km north-west (down-gradient) of the Premises.
Groundwater: superficial and confined aquifers	<p>The Premises is located within the Carnarvon confined Birdrong aquifer and Carnarvon superficial aquifer. Talis (2018c) reported that the superficial aquifer was not encountered during intrusive investigations at the Premises.</p> <p>Depth to groundwater ranges across the Premises from 5.389 m BGL (BH03 January 2018) to 20.928 m BGL (BH10 April 2019)</p> <p>Groundwater dependent ecosystems have not been identified within the unallocated crown land surrounding the Premises, proposed as an extension to the CRCP.</p> <p>Refer to Section 5.7 for additional information relating to the groundwater receptors.</p>
Users of groundwater resources:	<p>The Premises is located within the RIWI Act proclaimed Pilbara Groundwater Area.</p> <p>Groundwater licences are granted ~20 km south-west (Ashburton River – bore is up-gradient)), ~27 km north-east (Cane River – up-gradient)) and from ~16 km north-west (down-gradient) of the Premises. A series of licences are also granted along the Onslow Road from ~5 km north-west (up-gradient) and ~1 km south-east (up-gradient) that are predominantly granted to Main Roads Western Australia.</p> <p>The proposed extension of the CRCP is intended to provide a ≥ 3 km buffer from the Premises to potential future groundwater users.</p>

Key Finding:

- For the purposes of the risk assessment, the Delegated Officer considers that all land adjacent to the Premises has values consistent with a Conservation Park as defined under the CALM Act. This is consistent with the *Planning and Development Act 2005* which designates adjacent lands as a specified ecosystem, an area of high conservation value as per the Department’s *Guidance statement: Environmental Siting*.

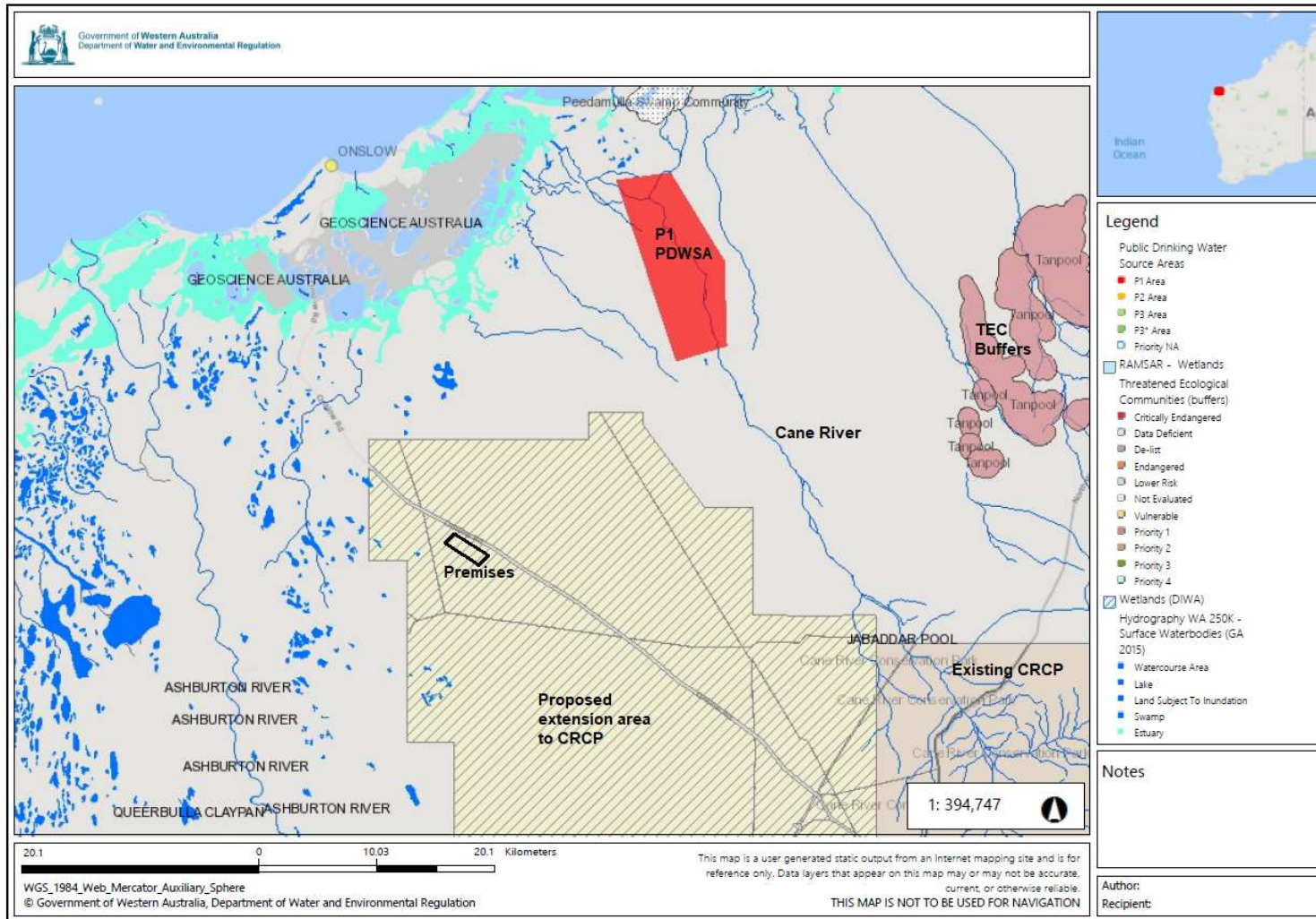


Figure 2: Proximity of Premises to sensitive environmental receptors

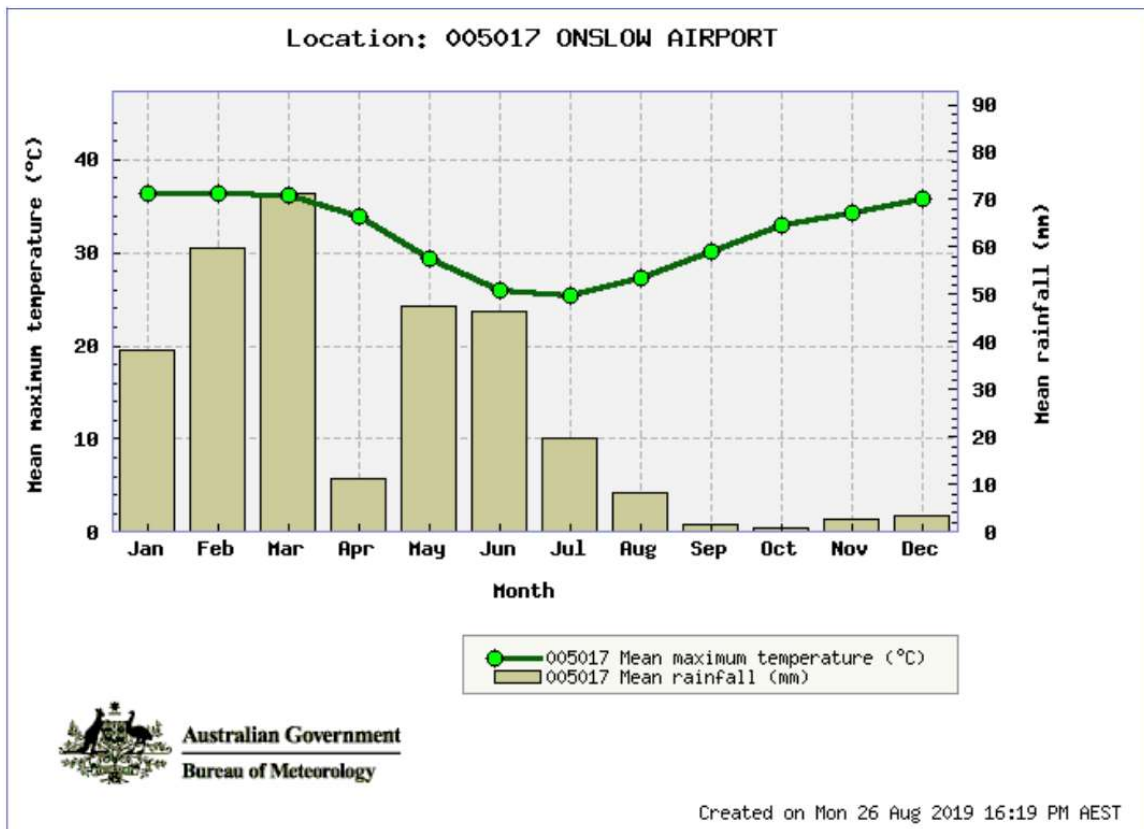
5.4 Climate

The Pilbara region is characterised by very hot summers, mild winters and low and variable rainfall. Climate systems are classified as hot desert in northern and inland areas of the region and hot grasslands in the north-west. The Pilbara has variable inter-annual rainfall and is the most cyclone-prone area along the Australian coastline.

5.4.1 Rainfall and temperature

The Bureau of Meteorology (BoM) data for the Onslow Airport weather station (Station No. 005017) shows that the area in the vicinity of the Premises has an annual average of 311.6 mm (based on data between 1940 and 2019), with the majority of rainfall received between January and March (BoM, 2019). Rainfall averages are dominated by seasonal cyclones which affect the area from November through to April. Cyclones with more intense rainfall tend to occur late in the cyclone season.

The average annual temperature is 32°C, with temperatures 30°C and over between September and April (BoM, 2019). The monthly mean rainfall and maximum temperature is shown on Figure 3.



Source: BoM (Station No. 005017 - 2019)

Figure 3: Rainfall and maximum temperature Onslow Airport

5.4.2 Wind direction and strength

Based on the climate data for the Onslow Airport station (August 1940 to August 2019), the prevailing wind direction is easterly to southerly to south-easterly in the morning and westerly to north-westerly in the afternoon. This is depicted in the wind roses shown in Figure 4.

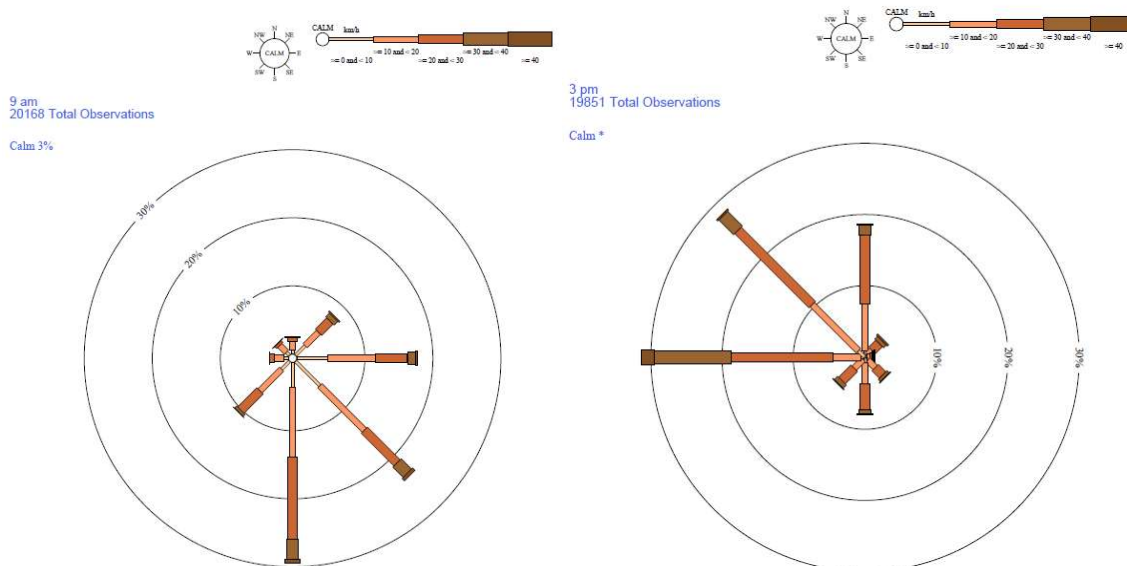


Figure 4: Wind direction and strength Onslow Airport

It is important to note that these wind roses show historical wind speed and wind direction data for the Onslow Airport weather station and should not be used to predict future data.

5.5 Topography and soils

The topography at the Premises is depicted in Figure 5. The topography is dominated by the Pindan Sand Ridge, which is surrounded by relatively flat sand plains, ranging from approximately 13 m AHD in the west to approximately 17 m AHD in the east. The Pindan Sand Ridge extends approximately 3 km from the north-west to south-east of the Premises and is aligned along the northern boundary of the Premises. The ridge is up to 350 m wide and is approximately 30 m AHD in height with the highest points reaching 40 m AHD. The surface is gently sloped and is hummocky with basins and swales formed by natural wind and water erosion.

The soil profile at the Premises was defined during site investigations which included 112 trial pits, excavated to a depth of 5 m BGL, and drilling of 13 groundwater monitoring wells. The Pindan Sand Ridge is described as residual quartz sand, and the soil profile horizons are generally described, from the surface to depth, as:

- Sand: loose fine-medium grained Pindan soil;
- Pindan soil silty/ clay/ sand;
- Cemented gravel (silcrete) silty/ sand matrixes; and
- Sandstone interspersed with small layers of cemented gravels.

Laboratory permeability tests (falling head permeability) were conducted on the sand and Pindan soil horizons described above. Observed permeabilities ranged from 1.634×10^{-7} to 6.107×10^{-9} m/s. The permeability of the cemented gravel horizon was assessed in laboratory triaxial permeability tests. Results ranged from 1.188×10^{-8} to 3.382×10^{-9} m/s. The hydraulic conductivity in the soil profile is likely to be highly variable and is estimated to be a maximum of 0.36 m/day.

Further information on the soil and subsurface geology of the Premises, including descriptions of the site investigations is detailed in the Application (Talis, 2018b). The suitability of the geological profile in relation to the stability of the proposed PRWMF Class IV secure landfill is

discussed in Section 6.4.



Source: adapted from Figure 4 (Talis, 2018b)

Figure 5: Topographic contours for the Premises

5.6 Hydrology

Surface water runoff in the vicinity of the Premises mimics topography, with no defined permanent flow paths or channels. On the sand plain area surrounding the base of the Pindan Sand Ridge, topography slopes gently from east to west towards the Ashburton River, through Minderoo Pastoral Station and the proposed extension of the Cane River Conservation Park. Based on the surface soil profiles, infiltration rates are likely to be high. There are no defined permanent surface water bodies in the vicinity of the Premises. Being within the coastal sand plain, the area may be prone to flooding during high rainfall events. A flood risk assessment was provided with the Application and is summarised in Section 7.3.

5.7 Hydrogeology

Thirteen (13) groundwater monitoring wells were installed as part of site investigations undertaken at the Premises. Groundwater monitoring commenced in January 2018. Monitoring well locations and depth to groundwater (contours) are shown in Figure 6.

The aquifer encountered during intrusive investigations beneath the Premises was an unconfined sedimentary aquifer comprising fine to medium grained sandstone. Talis (2018c) interpreted this aquifer to be the Windalia Radiolarite Sandstone Member, a formation that forms part of the Carnarvon-Birdrong Aquifer. The Carnarvon-Birdrong aquifer is a regionally extensive aquifer covering the western coastal areas of the Pilbara and Gascoyne regions of Western Australia. Recharge predominantly occurs in the Kennedy Range, and through surficial layers where the aquifer is unconfined.

Groundwater monitoring levels since January 2018 have recorded a consistent flow direction to the west or north-west towards the Ashburton River and Indian Ocean (Talis, 2018d). The

highest groundwater elevations are generally recorded in BH01 (~12 m AHD) and the lowest groundwater elevations are generally recorded in BH05 (~6.5 m AHD). Falling head 'slug' permeability tests conducted on ten monitoring wells installed in this aquifer recorded a hydraulic conductivity range of 0.003 to 0.36 m/day (Talis, 2018c).

Table 8 below presents groundwater level monitoring data provided by the Applicant and collected at the Premises between January 2018 and April 2019. The shallowest groundwater level recorded during this period was 5.389 m BGL in BH03 (Jan 2018) and the deepest groundwater level recorded was 20.928 m BGL in BH10 (April 2019).

A superficial or perched aquifer was not encountered during the Phase 1 Hydrogeological Risk Assessment (Talis, 2018c), however, it was noted that there is the potential for seasonal perched groundwater to exist within sand lenses, a gravelly sand horizon or above the cemented gravel/silcrete horizon (Talis, 2018c). The construction of the landfill will include excavation of the majority of the extent of gravelly sand and cemented gravel/silcrete horizons that have the potential to contain perched groundwater. It is considered that, based on the topography, material characteristics of surficial soils, and expected reduction of infiltration provided by the landfill liner, that following Cell 1 construction, the presence of perched groundwater following rainfall is unlikely.

Groundwater monitoring indicates that the groundwater is brackish (total dissolved solids ranging between 1,290 mg/L in bore BH03 and 2,680 mg/L in bore BH04) in the vicinity of the Premises, becoming more saline as it flows towards the Indian Ocean. The groundwater quality is neutral pH with a major ion composition dominated by sodium and chloride (Talis, 2018c). The concentrations of chloride samples in groundwater wells in 2018 exceed Non-potable use guidelines (DOH, 2014).

The proposed groundwater monitoring network for monitoring during construction and operation of the Premises is depicted in Figure 7.



Source: Figure 10 (Talis, 2018d)

Figure 6: Groundwater monitoring locations and depth to groundwater

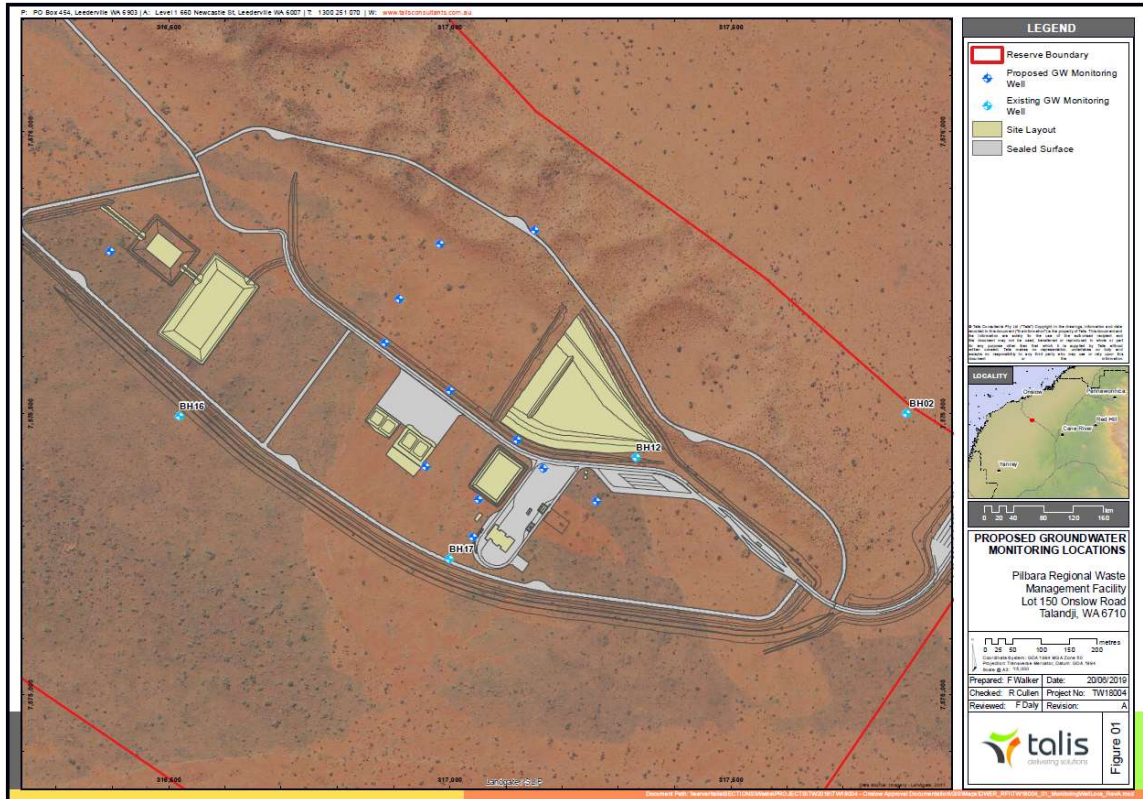
Table 8: Summary of groundwater level monitoring 2018 to 2019

Bore No.	Ground level elevation (m AHD)	Groundwater level (m AHD)	Groundwater level (m BGL)						
			Jan 2018	Jan 2018 ¹	March 2018 ¹	April 2018 ¹	May 2018 ¹	June 2018 ¹	July 2018 ¹
BH01	18.739	12.026	6.713	6.811	6.847	6.861	6.875	6.915	-
BH02	20.937	11.722	9.215	9.305	9.34	9.373	9.362	9.413	5.965
BH03	16.734	11.345	5.389	5.434	5.466	-	-	-	5.631
BH04	12.758	6.69	6.068	6.124	6.153	6.172	6.197	6.215	6.143
BH05	12.524	6.586	5.938	5.988	6.018	6.034	6.068	6.083	6.008
BH10	31.541	10.919	20.622	20.668	20.693	20.767	20.813	20.824	20.928
BH11	26.708	9.325	17.383	17.417	17.466	-	-	-	-
BH12	17.15	11.071	6.079	6.131	6.159	6.173	6.197	6.232	-
BH13	15.784	9.593	6.191	6.236	6.291	6.275	6.297	6.315	6.281
BH14	16.257	9.221	7.036	7.198	7.266	7.155	7.186	7.209	-
BH15	14.376	8.857	5.519	5.569	5.604	5.628	5.653	5.706	5.594
BH16	15.629	9.643	5.986	6.051	6.076	6.064	6.089	6.108	6.051
BH17	16.822	10.591	6.231	6.283	6.313	6.366	6.383	6.404	-

Note 1: Data sourced from Talis (2018c)

Note 2: Data sourced from email correspondence between Talis and DWER (DWERDT163933)

'-' Data not provided in reference documents



Source: Supporting document to Talis (2019d)

Figure 7: Proposed groundwater monitoring network

6. Landfill engineering and design

The following sections provide a summary of the proposed cell construction and incorporate the Delegated Officer’s key findings relevant to the assessment of risks related to potential Emissions and Discharges from Primary Activities.

The Class IV landfill has been designed by the Applicant with consideration to the Environmental Protection Authority Victoria’s (EPA Vic) *Best Practice Environmental Management Guidelines for the Siting, Design, Operation and Rehabilitation of Landfills* (VIC BPEM).

The key aspects of the Class IV landfill design are summarised in Table 9 and shown in Appendix 4 Figures A4.3 and A4.6.

Table 9: Class IV landfill design summary

Landfill design aspect	Description
Footprint	Entire expanded landfill - 138, 000 m ² Cell 1 - 12,138 m ²
Capacity	Total capacity - 865,000 m ³ Cell 1 – 43,426 m ³
Groundwater separation distance	Based on the base of the leachate sump - >2.9 m
Cell lifespan	2.5 years

Landfill design aspect	Description
Side slopes	1V:3H outer embankment 1V:4H cut slope (abutting Pindan Sand Ridge)
Basal gradient	>3% to primary collection pipe and 1% to leachate collection sump
Final slope profile	Upper surface 1V:5H Slopes 1V:17H
Maximum height	Pre-settlement 16 to 17 m above natural ground surface
Containment system	Basal and side-slope liner system, leachate collection system, gas management system and capping system (described in Sections 6.1 to 6.6)

6.1 Landfill liner system and performance

6.1.1 Landfill liner design

The Applicant has proposed a dual basal landfill lining system as shown in Figure 8 and described below (from bottom to top):

- Secondary Lining System:
 - Layer 1: Engineered Attenuation Layer - a minimum 500 mm thick engineered attenuation layer, meeting hydraulic conductivity of 1.6339×10^{-7} m/s, constructed from compacted Pindan sand (sourced on site) will be constructed on the base and side slopes of the landfill to form an engineered attenuation layer above the in-situ subbase soils.
 - Layer 2: lower Geosynthetic Clay Liner (GCL) meeting hydraulic conductivity of 5×10^{-11} m/s. It will consist of a layer of bentonite needle punched between two layers of geotextile and installed in direct contact with the engineered attenuation layer.
 - Layer 3: 2.0 mm High Density Polyethylene (HDPE) overlying the lower GCL.
 - Layer 4: Drainage Geocomposite which will act as a Leak Detection Layer consisting of a fused geonet and geotextile to direct potential seepage to an extraction/monitoring sump.
- Primary Lining System:
 - Layer 5: upper GCL meeting hydraulic conductivity of 5×10^{-11} m/s consisting of layer of bentonite needle punched between two layers of geotextile.
 - Layer 6: 2.0mm HDPE
 - Layer 7: Cushion/Protection geotextile - the composite lining system will be protected from the leachate collection system and overlying materials with a non-woven cushion/protection geotextile.
 - Layer 8: Leachate Collection System - a 300 mm thick layer of permeable gravel no larger than 40 mm in particle size with an associated network of perforated collection pipes. The collection pipes will direct leachate to the leachate collection sump which will be pumped to direct leachate to the lined leachate evaporation ponds. The leachate drainage gravel layer will be covered with a separation geotextile.

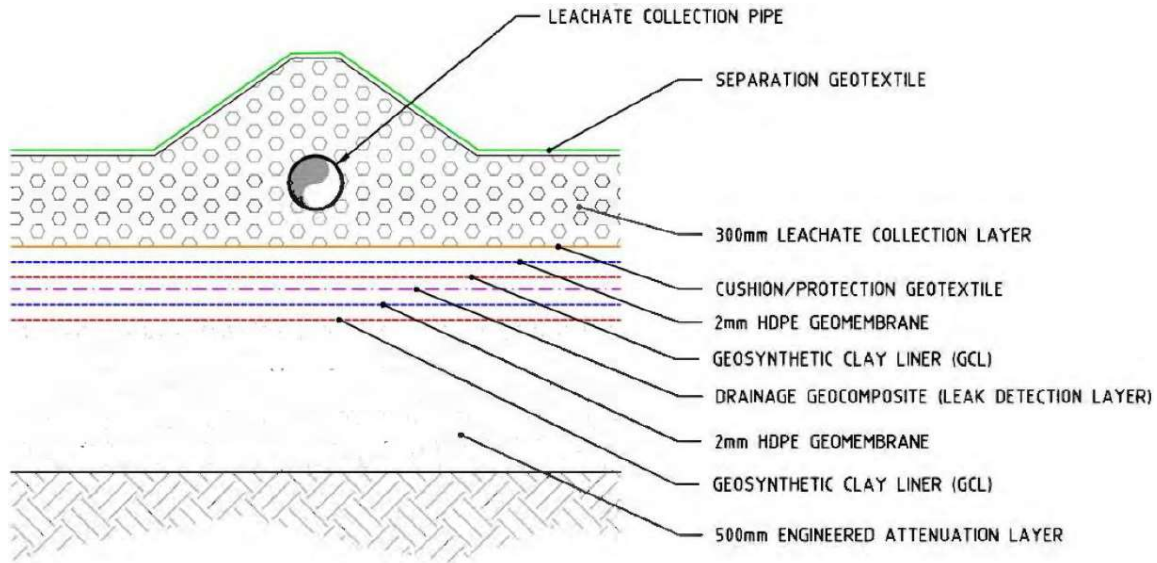


Figure 8: Proposed landfill liner system

6.1.2 Landfill liner performance

The Applicant provided a seepage and liner performance assessment with the Application. Seepage modelling was undertaken using the Hydrologic Evaluation of landfill Performance (HELP) software. The Applicant has compared modelled landfill liner performance against VIC BPEM. VIC BPEM indicates that a liner system should control seepage rates to an amount not exceeding 10 L/ha/day.

The anticipated leakage rates through the liner have been estimated using HELP (Figure 9) and range between 0.00575 to 0.27973 L/ha/day for operational phases and between 0.00164 to 0.00603 L/ha/day once the landfill cell has been capped/closed.

Scenario	Maximum Seepage as a function on Geomembrane Installation / Placement Quality		
	Excellent	Good	Poor
No Cap - Operational (mm/m ² /year)	0.00021	0.00058	0.01021
No Cap - Operational (L/ha/day)	0.00575	0.01589	0.27973
Capped - Restored (mm/m ² /year)	0.00006	0.00007	0.00022
Capped - Restored (L/ha/day)	0.00164	0.00192	0.00603

Note: 1mm/m²/day = 10,000L/ha/day.
 The seepage rate through Layer No. 4 represented the maximum seepage for Operational Phase and the seepage rate through Layer No. 9 represented the maximum seepage for Capped Phase.

Source: Table 2-12 (Talis, 2018d)

Figure 9: Summary of predicted liner performance

To support the seepage assessment, a detailed hydrogeological assessment was undertaken and submitted as supporting information to the Application (Talis, 2018d). This included a LandSim 2.5 contaminant fate transport model for the proposed landfill which considers the likely concentration of contaminants in leachate and the degradation of engineering controls (liner and leachate extraction systems) over time. Leachate concentrations used in the model were reflective of leachate that may be expected from a Class IV landfill.

The model was run for operational, post closure and long term post closure phases of the proposed landfill as summarised in Table 10.

Table 10: Summary of LandSim model scenarios and assumptions

Assumptions	Landfill Phase - Active	Landfill Phase - Post closure	Landfill Phase - Long term post closure (up to 20,000 years)
Landfill cap	No cap – annual rainfall considered to be infiltration rate	Cap in place and intact. Infiltration 104.8 mm/yr	Cap in place and intact. Infiltration 104.8 mm/yr
Leachate management	Active management of leachate to 0.3-1.0 m head	Active management of leachate to 0.3-1.0 m head	No active leachate management
Liner integrity	Intact (to a level of High CQA status)	Liner assumed intact as active status for 150 years then degraded in line with model defaults	Liner completely degraded

Based on the scenarios and assumptions, the LandSim model identified the following:

- No leachate seepage is expected to occur through the engineered lining system while active landfill leachate management is being undertaken (Section 7.2 describes the proposed active leachate management controls). This period is expected to last for approximately 60 years.
- Following the cessation of active landfill management, leachate seepage is expected to gradually rise to a peak seepage rate of ~219 L/ha/day.
- In relation to hazardous contaminants such as cadmium and mercury, the model predicts that a significant release of hazardous contaminants, at concentrations above relevant regulatory guidelines, would not be detected, at the nominated monitoring point 1 km down-gradient of the proposed landfill, through the lifecycle of the PRWMF.
- Concentration of non-hazardous contaminants (e.g. ammonia) at the monitoring point are not predicted to exceed the relevant guidelines or background concentrations during the operational or post closure managed phases of the facility. Concentrations of non-hazardous contaminants were also shown to remain within background ranges for the duration of the modelling for the long-term post-closure phase (20,000 years).
- The following non-hazardous contaminants were predicted to exceed background concentrations at the down-gradient monitoring bore:
 - Chloride exceeded background concentrations after 300 years, with peak concentrations predicted at 3,000 years;
 - Sulfate exceeded Non-potable Use Guidelines (NPUG) after 750 years;
 - Nitrite exceeded NPUG at 3,700 years; and
 - Sodium gradually increases to exceeding background concentrations after 300 years.

- Under the most likely, 50%ile modelling scenario, exceedances of non-hazardous contaminants including chloride, sulfate, nitrite and sodium were either not predicted, or were marginal.

The LandSim model predictions have been considered in the assessment of risk in relation to potential impacts resulting from seepage of leachate through the landfill liner over the lifecycle of the operations and into long-term post-closure phases.

6.2 Separation distance to groundwater

The lowest point of the Class IV landfill, being the base of the leachate sump in Cell 1, has been designed with a separation distance to groundwater of 2.9 m (Appendix 4 Figure A4.6). This distance has been determined using the highest natural groundwater level as recorded during the pre-construction groundwater monitoring events (Section 5.7).

The Applicant has proposed a groundwater monitoring strategy to continue to monitor depth to groundwater and potential impacts to groundwater during construction and operations (Section 7.4).

6.3 Leachate extraction, collection and storage

6.3.1 Leachate extraction and collection

The design of the proposed leachate collection and extraction system is shown in Figure 10.

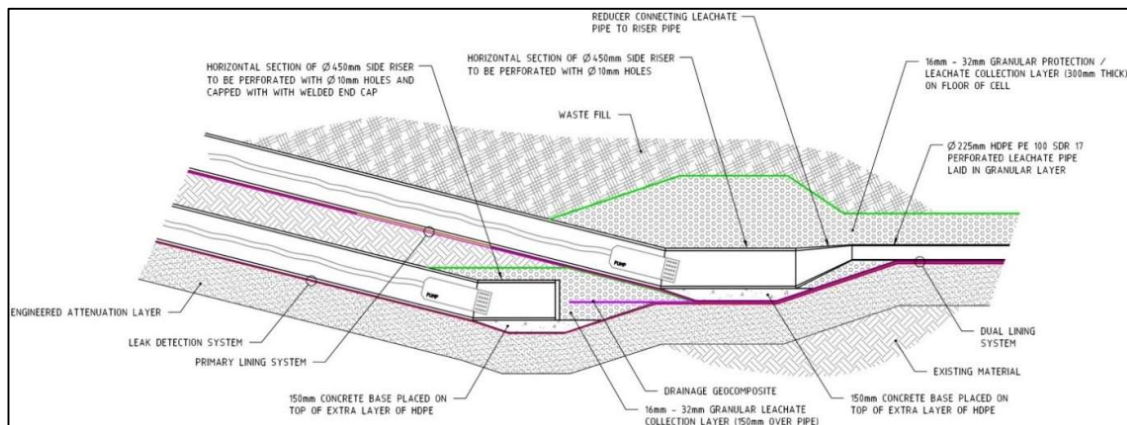


Figure 10: Proposed leachate collection and extraction design

During operations the depth of leachate within the landfill (height above the basal liner surface) will range between 0.3 to 1.0 m and will be managed through regular extraction of leachate from the sump to the leachate ponds. Maintenance of leachate within the landfill will assist in prolonging the performance of the liner.

The leachate sump will be constructed with an automated pump system installed which will trigger and operate continuously when leachate levels are above the trigger levels at the inlet.

6.3.2 Leachate ponds

Following extraction leachate is proposed to be stored within two leachate evaporation ponds for evaporation and recirculation. The ponds will have a combined capacity of 9,507 m³ with an operational storage depth of 1 m. An operation freeboard of 0.5 m is proposed and will be maintained via recirculation of leachate if required.

The pond liner specifications are shown on Figure 11 and are described as follows:

- 300 mm compacted subgrade;

- Secondary 2 mm HDPE geomembrane liner;
- Leak detection system; and
- Primary 2 mm HDPE geomembrane liner.

The leachate ponds will be enclosed a perimeter embankment 0.5 m above surrounding ground level and a 1.8 m high fence.

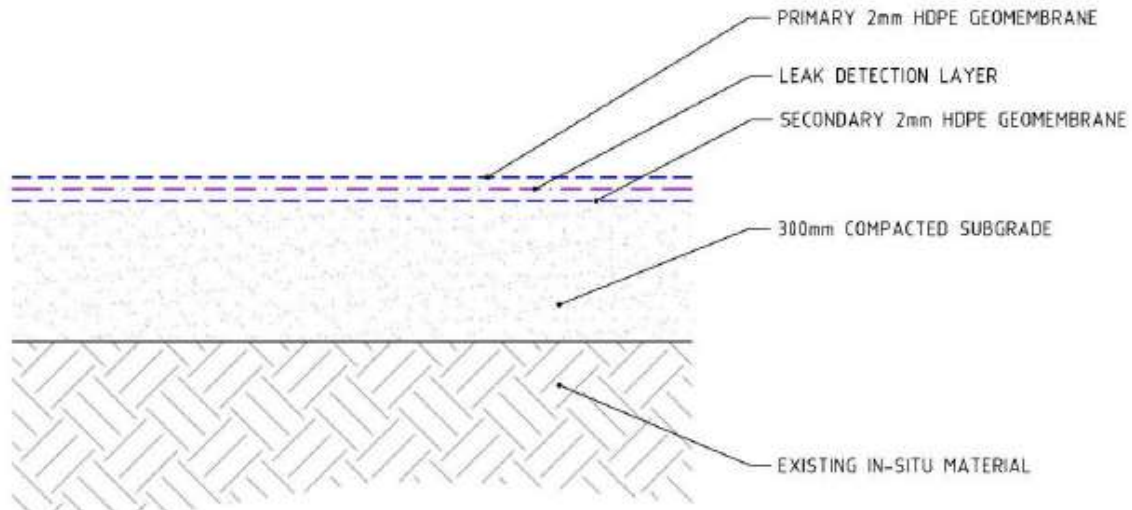


Figure 11: Proposed leachate pond liner

The proposed ponds have been designed to sufficiently contain rainfall during wet season rains typically experienced in the Pilbara region and can contain all leachate and stormwater produced as a result of a 1 in 100 year ARI rainfall event. Based on local climate and rate of evaporation, the ponds are expected to be empty during the dry season.

The capacity design adopted a conservative assumption in that leachate recirculation would not occur during operations.

Based on the expectation that the liner will be exposed (without any leachate coverage) for part of the year, liner integrity and performance may be impacted by temperature fluctuations, exposure to UV radiation and exposure to wind drag and sediment accumulation (transported by wind). The Applicant has advised that any defects of the liner can be inspected and repaired while the liner is exposed and prior to the onset of wet season each year.

Key Findings:

6. The proposed leachate pond liner configuration is not equivalent to the landfill liner configuration. The Delegated Officer considers that it is generally considered to be good practice to design both a landfill and leachate storage pond with the same liner configuration.
7. The Delegated Officer considers that the climate conditions at the Premises will likely result in the leachate ponds being empty during a period of each year (dry season). The Delegated Officer considers exposure of the liner in a dry state could impact the integrity and liner performance.

6.4 Stability assessment

The stability of the landfill design was assessed in a post-construction, operational and post-closure state. The Stability risk assessment (Talis, 2019b) was prepared with general

consideration of United Kingdom Environment Agency approach to Stability Risk Assessment, and similar stability assessments undertaken for major infrastructure in Western Australia. The landfill design and the long term stability of the landfill as presented by the Applicant assumes that the Pindan Sand Ridge will remain undisturbed.

The assessment was undertaken for both static and pseudo-static stability and adopted the following methods in both confined and unconfined conditions (where appropriate):

- Limit equilibrium for derivation of Factors of Safety (FoS) of side slope and outer embankments, with acceptable FoS set at:
 - ≥ 1.5 for static loading;
 - ≥ 1.1 and ≥ 1.0 for pseudo-static loading for an operating base earthquake (OBE) and safety evaluation earthquake (SEE) respectively; and
 - ≥ 1.3 for temporary waste slopes under static loading;
- Finite difference for determination of geosynthetic tension within the basal liner; and
- Closed-form for determination of capping stability (no limit equilibrium or peak-ground-acceleration conditions were applied), with acceptable FoS set at ≥ 1.3 .

The stability analysis was undertaken with SLIDE 8.016 (RocScience) software using the Bishop simplified and Morgenstern-Price methodology for circular and non-circular analysis. For the waste mass limit equilibrium analysis, the Janbu corrected Spencer and Morgenstern-Price non-circular analysis was used. The geomembrane integrity assessment was undertaken using FLAC Version 8.0 software. The Closed-form analysis for the cap was undertaken using a proprietary approach developed by Talis (2019b).

Data inputs for the model were based on the results of hydrogeological and geotechnical studies conducted at the Premises. The material parameters adopted are shown in Figure 12.

Material	Bulk Unit Weight γ (kN/m ³)	Effective cohesion c' (kPa)	Angle of Shearing Resistance ϕ' (°)	Undrained Shear Strength S_u (kPa)	Typical Description
Engineered Attenuation Layer/Fill	19	1	32 (26)	>60	Re-compacted Sandy Clayey Fill
Pindan Sand	17.5	1	32 (26)	>75	Natural Sandy Silty Clayey Dune Sand
Silcrete/Calcrete - Cemented Gravel	20	1	38 (30)		Well Cemented Sand and Gravel.
Sandstone	24	15 (12)	34 (27)		Fine grained red sandstone

Source: Table 3-2 (Talis, 2019b)

Figure 12: Material parameters adopted for stability assessment

Principle components considered by the model include; basal subgrade, side slope subgrade, basal lining system, side slope lining system, waste mass and capping system. For the purposes of the model the following assumptions were made (Talis, 2019b):

- Subgrade assumptions:
 - Assumed to be comprised of Pindan Sand, cemented gravel and sandstone for the base and Pindan Sand and cemented gravel calcrete/silcrete for the side slopes;
 - The chosen slopes were considered to be worst-case scenarios based on slope angle cut (1V:4H) and slope length (17 m);

- Groundwater interactions are negligible; and
- No cavities present;
- Liner assumptions:
 - Stability was modelled in the unconfined state on the basis that liner strain was greatest in the absence of waste mass;
- Waste mass assumptions:
 - Temporary waste slopes will be placed at a gradient of 1V:3H to a maximum restoration height (worst-case scenario);
 - Pindan Sand will be utilised as daily cover; and
 - Nomination of an elevated r_u value to represent the effect of leachate recirculation on pore-pressure within the waste mass;
- Capping system assumptions:
 - A conservative restoration profile of 1V:17H was adopted;
 - Haul roads for cap placement assumed to be at least 1 m depth and constructed out of soil materials available on site; and
 - The regulation layer will act to reduce pore pressure increase (from water or gas);
- Seismic conditions:
 - Total risk factor was determined using methodology set by the International Commission on Large Dams (ICOLD) 2009 Guidelines;
 - Recommended analysis for seismic design ground motions and return periods were adopted from ANCOLD 2017 draft Guidelines;
 - Seismic design values (peak ground acceleration values) were determined using the 2018 National Seismic Hazard assessment for Australia (Geoscience Australia, 2018);

The model analysis included sensitivity analysis for pore pressure build up in the waste profile and weakened interface with the lining system. The model results indicated that:

- All relevant pseudo-static analysis have FoS exceeding the relevant OBE and SEE FoS limits;
- Analysis of the short and long-term stability of the unconfined side slope shows acceptable FoS have been achieved
- Calculated FoS for temporary waste slopes for static and pseudostatic scenarios exceed relevant FoS limits;
- High FoS exist for long term integrity of the HDPE geomembrane in the basal liner, for all modelled waste stiffness and interface friction scenarios; and
- The analysis of capping system stability with regards to interface friction and pore pressure conditions demonstrated that acceptable FoS could be achieved.

DWER engaged an independent geotechnical consultant to review the landfill design basis and stability assessment. The independent consultant was provided with copies of the Application and data used in the stability analysis. The consultant identified some gaps in the assessment and ran additional model analysis to test the performance of the structure with modified input parameters (to test more conservative scenarios). The analysis demonstrated that the FoS were higher than the minimum FoS adopted for each scenario indicating that the excavation and landfill performance were likely to be stable over the range of static and pseudo-static conditions modelled. A number of recommendations were provided by the independent consultant.

The information provided in the Application does not identify the area of prescribed premises

that is required to not be interfered with in order to maintain the stability and integrity of any landfill infrastructure. Regulatory controls will be applied to prevent any interference with the Pindan Sand Ridge during construction of the infrastructure included within the scope of this assessment, without prior approval from the CEO (Section 9.4). Additional information will be required to be provided to DWER in order for DWER to assess risk and determine regulatory controls for operation and closure to maintain the integrity of landfill infrastructure.

Key Findings:

8. The Delegated Officer has considered the stability outcomes provided by the Application along with the recommendations provided by the independent consultant in the assessment of risk in relation to potential emissions from the landfill.
9. As described in Section 4.2, the Management Order relating to the prescribed premises boundary acknowledges that a sand resource exists within the Reserve boundary may be required for extraction in the future to the extent that it is not required for the PRWMF infrastructure. The Delegated Officer considers that the information provided in the Application does not identify the area of prescribed premises that is required to not be interfered with in order to maintain the stability and integrity of any landfill infrastructure.

6.5 Capping system

Progressive capping of landfill cells will be undertaken throughout the operational phases of the facility. The landfill cap proposed to be installed at closure of Cell 1 is designed to minimise infiltration of rainfall and runoff into the waste mass, reduce leachate generation rates over time, prevent human and animal access to the waste, assist in controlling releases of landfill gas, and to aid a beneficial after use of the site after closure.

The application has proposed the following final capping system (from top down):

- Top soil/mulch/growth medium;
- 1.2 m restoration soils;
- Drainage geonet;
- 1.5 mm linear low-density polyethylene (LLDPE) geomembrane liner;
- GCL meeting hydraulic conductivity of 5×10^{-11} m/s; and
- 300 mm gas collection/regulating layer above the waste fill.

A perimeter ditch will be installed around the toe of the landfill Cell 1 during construction of the cap so that any surface water is directed away from the capped landfill towards either the infiltration pond or surface water attenuation pond.

The landfill capping overview is shown in Figure 13 and Appendix 4 Figure A4.17.

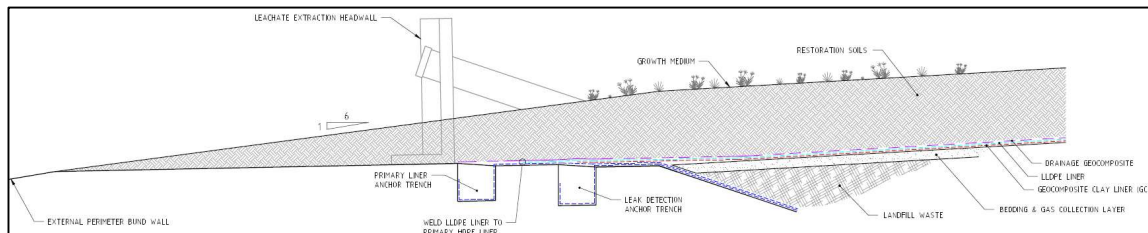


Figure 13: Cross-section showing proposed final cap design

6.6 Landfill gas infrastructure

A landfill gas management plan was not submitted with the Application. DWER noted that the scope of the current Application does not include acceptance of putrescible waste. In addition, acceptance of waste is not included within the scope of the works approval to be issued as part of this assessment.

The Applicant has provided a Landfill Gas Risk Assessment (Talis, 2018e) which modelled predicted landfill gas generation and migration pathways. It has assumed that putrescible waste will be contained within the landfill. The modelling was undertaken using GasSim software (Version 2.5). Modelling predicted that limited gas will be generated during the operational phase of the landfill, with the peak gas generation rates predicted approximately 20 years after commencement of operations.

Conceptual infrastructure has been proposed to monitor and manage landfill gas during operations and includes:

- Landfill surface final cap;
- Installation of vertical and horizontal gas extraction well;
- Aspirating cowls or flares; and
- Landfill gas monitoring program (gas monitoring wells, accumulation monitoring and surface emission monitoring).

Key Findings:

10. As no waste will be accepted at the Premises as part of the works approval and construction phase, the Delegated Officer considers that the information detailed above is sufficient for the purposes of the works approval assessment.
11. Should the Applicant propose to accept putrescible waste as part of any future works approval amendment or licence application the suitability of proposed landfill gas management infrastructure to control potential risks will be assessed as part of that application. For the purposes of this assessment only fugitive landfill gas emissions will be considered.

7. Facility operations and management

The Operational Environmental Management Plan (OEMP) provided with the Application (Talis, 2019a) outlines the proposed operational and environmental management procedures that will be adopted to control and mitigate potential environmental impacts associated with operation of PRWMF. The OEMP is supported by technical studies undertaken to support the design and proposed construction of the Premises.

A description of activities associated with construction and operation of the Premises are described in Section 3. Select aspects of the OEMP and supporting technical studies related to the risk assessment undertaken for the Premises construction and operations are summarized in the following sections. Specific controls proposed in the document are referred to in relevant subsections in Section 9.

7.1 Waste acceptance and general site operations

The PRWMF will be a manned facility operating between the hours of 0600 and 1700 hours Monday to Saturday. All contractor and visitors to the site will enter via the weighbridge/gatehouse. Signage will be displayed at the site entrance and will include at a minimum:

- Operating hours;
- Speed limits;
- Waste types accepted; and
- Emergency contact details.

The machinery and equipment that will be utilised during operations include:

- Landfill compactor;
- Back hoe excavator;
- Forklift;
- Dump truck;
- Water cart; and
- Utility vehicles.

Section 3.3 summarises the operational activities and processes proposed to be undertaken on the Premises.

7.1.1 Waste acceptance

Waste types proposed to be accepted onto the Premises that are included within the scope of this assessment are:

- Clean Fill and Uncontaminated Fill;
- Neutralised Acid Sulfate Soil
- Inert Waste Type 1 – building and demolition and asphalt waste, casting sand, blasting sand and garnet;
- Inert Waste Type 2 – tyres and plastics;
- Contaminated solid waste meeting up to an including Class IV acceptance criteria specified in the LWCWD;
- Special Waste Type 1 – asbestos and asbestos cement products
- Special Waste Type 2 – clinical waste; and
- Special Waste Type 3 – PFAS contaminated waste

The acceptance and handling of putrescible wastes or liquid wastes is not within the scope of this application.

Any controlled wastes will only be accepted through the gatehouse on inspection and provision of relevant paperwork and meeting the site specifications for that controlled waste.

The Delegated Officer notes that in addition to the proposed waste acceptance criteria for Class IV landfills that:

- Wastes classified as a 'Controlled Waste' under Schedule 1 of the *Environmental Protection (Controlled Waste) Regulations 2004* (Controlled Waste Regulations) may be subject to transport and disposal requirements under these regulations. It is the Applicant's responsibility to ensure that all relevant waste tracking forms and approvals are provided upon receipt of controlled waste.
- Wrapping and labelling requirements for waste acceptance may also be applicable under the Controlled Waste Regulations and other Departmental legislation such as *Dangerous Goods Safety Act 2004*. Approval to accept and dispose of wastes under

the EP Act does not negate or limit the Applicant's responsibilities under any other legislation.

7.1.2 Landfill cover

The proposed landfill cover requirements include daily, intermediate and final cover. The cover material is planned to be sourced from excavated surplus soils generated during construction of the Premises. Proposed cover application is summarized as follows:

- Daily cover placed at the end of each day to a depth of 300 mm, with the exception of Special Waste Types 1 and 2 which will have cover applied immediately on burial.
- Intermediate cover to be applied in areas that are inactive for over a week, at a thickness of 300 mm or greater depending on the types of materials deposited.
- Final cover as outlined in Section 6.5.

7.2 Leachate management

Leachate generation rates for the Class IV landfill were estimated using HELP (HELP3.95D) software. Climate records (rainfall, temperature, relative humidity and solar radiation) for years 2007 to 2018 for Onslow Airport weather station (Station No. 005017) were used for the model simulation. The model assumed a total landfill footprint area of three (3) adjacent cells (4.4 ha) on the assumption that this would represent the largest catchment of the landfill operating in an uncapped state at any given time in the lifecycle of the facility.

The HELP model predicted the maximum annual volume of leachate generated in the facility to be 9,080 m³ with the highest monthly leachate generation rates (2,240 m³ in March) occurring in the wet season when tropical cyclones or larger low pressure systems are most likely to occur in the region. Leachate generation rates are predicted to be lowest at the onset of dry season (17 m³ in August).

Based on the design of the leachate ponds and the predicted liner performance, it is proposed that leachate generated by the Class IV landfill will be managed through evaporation. During operations, it is anticipated that landfill cells will be filled and closed in a phased approach, minimising the generation of leachate while each cell is receiving waste. In addition to the leachate ponds being designed to hold and evaporate leachate during operations (Section 6.3.2), recirculation of leachate onto the waste mass can be undertaken to manage storage volumes if required. The Applicant proposes to undertake regular inspections of the leachate collection and storage system to ensure leachate is contained within the leachate ponds or the landfill cell footprint.

The leachate generated from the green waste processing area will be collected within a drainage pond which has been designed to hold a 1 in 10, 72 hour storm event, while maintaining a 0.4 m freeboard during a 90%ile rainfall year. It is expected, based on the modelled scenarios, that the pond will be dry for two to three months of the year allowing for any maintenance and inspections of the pond if required.

Leachate monitoring will be conducted as part of the proposed Environmental Monitoring and Sampling activities detailed in the OEMP (Section 7.4).

7.3 Stormwater management

The Premises infrastructure has been designed with consideration of local climate conditions. The Surface Water Management study provided with the application considered a 1 in 100 year, 72 hour storm event for the design of infrastructure at the Premises as well as assessing potential for flooding, catastrophic failure and overtopping of surface water and leachate storage ponds and structures.

Local scale flood modelling was undertaken using TUFLOW software, with the proposed infrastructure and undisturbed topography included within the boundary of the modelled area. The flood study indicated that the Premises and surrounding areas could be affected by flooding. In order to protect the Premises throughout the lifecycle of the facility, surface water management infrastructure has been proposed as part of the construction works and includes:

- Levee embankment extending around the southern perimeter of the Premises;
- Swale system to manage surface water volume and flow velocity;
- Rock armouring of potential scour surfaces;
- Perimeter drains and surface water retention ponds.

Storm water management infrastructure and operational areas are described in Table 11.

Table 11: Summary of storm water construction and operation elements.

Summary of elements - all prescribed activities (storm water management infrastructure)	
1)	Earthworks for the construction of levee embankment, open channel swales, junctions, intersections, surface water attenuation ponds and surface water infiltration/ evaporation pond.
2)	Construction of flood protection levee embankment approximately 2 m high and 1.6 km long, including some rock armouring, across the entire southern boundary of the PRWMF as depicted in Appendix 4 Figures A4.4 and A4.5.
3)	Definition of catchment areas divided at the lower gradient boundaries by 1 m deep open channel swales, with 1V:3H or 1V:6H embankment slopes, and associated diversion/ cut-off drains.
4)	Installation of geomembrane liner along the swale for the Class IV landfill cells catchment.
5)	Construction of internal cut off drains between active and future Class IV landfill cells.
6)	Construction of box culverts at the five road/ access track storm water drain crossing points.
7)	Installation of rock armouring of all drainage junctions, intersections, culverts and drains where the slope gradient is >0.020.
8)	Construction of one HDPE geomembrane lined surface water attenuation pond 3.42 m deep and 34,620 m ³ operational capacity with a perimeter embankment 0.5 m above surrounding ground level, operated with a 0.5 m freeboard and enclosed within a 1.8 m high fence.
9)	Construction of two surface water infiltration/ evaporation ponds, 1.76 m deep and 5,611 m ³ operational capacity with a perimeter embankment 0.5 m above surrounding ground level and operated with a 0.5 m freeboard. The surface water infiltration/ evaporation ponds will discharge to the perimeter storm water management system and the environment.

Ponding of water outside of the surface water perimeter drains but within the proposed prescribed premises boundary will be managed by use of a mobile pump operated by site personnel.

The surface water management infrastructure, including performance of rock armouring and any installed liners will be regularly inspected and maintained.

7.4 Environmental Monitoring and Sampling

The proposed Environmental Monitoring and Sampling includes the following environmental aspects:

- Leachate;
- Landfill gas;
- Surface water;

- Groundwater;
- Operation emissions;
- Feral animals and vermin; and
- Weeds.

A summary of key aspects of the proposed sampling is provided in Table 12. The detailed plan, including detailed monitoring parameters, contingency actions and proposed trigger levels are described in Section 14 of the OEMP provided in the Application (Talis, 2019a).

Table 12: Summary of proposed environmental monitoring and sampling

Environmental aspect	Location	Frequency	Parameters
Leachate	To be determined in licence application – at a minimum in each leachate sump	Monthly	Leachate level and volume removed from sump
		Quarterly	Basic parameters – physiochemical, metals, hydrocarbons, BTEX, nutrients, TSS, major ions, BOD and COD
		Annually	Detailed parameters – basic parameters, organic acids, PCBs, MTBE, CHC, PFAS, PAH, phenols, pesticides and microbial pathogens.
Landfill gas	Gas monitoring wells and other locations to be determined in licence application	Quarterly	Bores: <ul style="list-style-type: none"> • Gas concentrations • Pressure and flow • Ambient conditions
		Annually	Surface emissions and accumulation: <ul style="list-style-type: none"> • Concentration of methane • Ambient conditions
Surface water	Attenuation pond (variable depths)	Monthly or as required	Physiochemical, metals, nutrients, major ions and TSS, TOC and COD.
Groundwater	Groundwater monitoring wells (Figure 7)	Monthly	Depth to groundwater
		Quarterly	Basic parameters - physiochemical, metals, Hydrocarbons, BTEX, nutrients, TDS, TSS, major ions, BOD and COD.

Environmental aspect	Location	Frequency	Parameters
		Annually	Detailed parameters – basic parameters, organic acids, PCB, MTBE, CHC, PFAS, PAH, phenols, pesticides and microbial pathogens.
Treated wastewater	Oil water separator	Quarterly or as required	Parameters to be determined in licence application
Feral animals and vermin	Camera traps, bait stations, tipping face, surface water structures, ponds	Continuously, or as specified by contractor	Visual inspections
Weeds	Premises	Annually and periodically	Visual inspections

7.5 Fire management/Emergency Response Plan

The Applicant has developed an Emergency Response Plan (ERP) (Talis, 2019e) to outline the responses to be implemented for any emergencies that may occur onsite or external situations that may impact the site. The ERP defines the roles and responsibilities for the emergency management resources and covers cyclones, extreme weather, floods, fires (natural bushfires and those that may result from operational activities), leaks and spills, explosions, medical emergencies, accidents and service failures.

The ERP includes specified emergency response procedures/plans for the following situations/scenarios:

- Cyclones
- Floods
- Storms
- Fires (infrastructure, landfill, liquid waste facility, tyre, vehicle, fuel storage, equipment and bushfires)
- Explosions (landfill gas and storage of dangerous goods)
- Spills and leaks
- Accidents
- Service failures
- Evacuations

The ERP states that procedures will be monitored and reviewed following an emergency to identify any changes or improvements that may be required. Key controls outlined in the ERP include:

- Inductions, training and drills;
- Fire Plan – to be located at the gatehouse or entry gate to outline the location of the turkey nest, production bores, fire tank(s) and associated infrastructure, hazardous materials storage, fuel storage, medical supplies, muster points and emergency access etc.
- Emergency access, muster points and communications systems:

- Fire prevention infrastructure and equipment – including appropriately designed building sand structures, fire breaks, scanning cameras, designated clear zone and extinguishers.
- Water supply – Water required for suppression will be available from a 100,000 L tank (or two 50,000L) tanks, trucks next and 10,000 L water cart. The water cart will have an in-cab remote controlled fixed water monitor that can apply a spray and jet to 50 m distance. If additional assistance is required, additional resource may be sourced from local contractors in the Onslow area. All equipment will be maintained.
- Emergency response equipment – including first aid kits, emergency shower and eye wash stations, lighting and emergency power supply, and personal protection equipment required for emergency response activities.

8. Consultation

The Applicant engaged with stakeholders as part of the development of the PRWMF. A summary of stakeholders consulted by the Applicant directly is provided in Table 13.

Table 13: Stakeholders consulted by the applicant

Sector	Stakeholders
Government (Commonwealth)	<ul style="list-style-type: none"> • Department of the Environment and Energy • Department of Industry, Innovation and Science
Government (State)	<ul style="list-style-type: none"> • Department of Water and Environmental Regulation (WA) • Environmental Protection Authority (WA) • Department of Biodiversity, Conservation and Attractions (WA) • Department of Jobs, Tourism, Science and Innovation (WA) • Department of Planning, Lands and Heritage (WA) – Incl. Department of Aboriginal Affairs • Department of Fire and Emergency Services (WA)
Local community and community groups	<ul style="list-style-type: none"> • Onslow community • Local environmental groups • Volunteer and not-for-profit groups
Local business and industry	<ul style="list-style-type: none"> • Onslow local business operators • Onslow resource companies (including Onslow Salt, Chevron Australia and BHP) • Onslow marine support base and Agility Logistics • Pilbara resource companies (including Rio Tinto, Woodside, Newcrest and Fortescue Metals Group) • Infrastructure organisations (including Dampier Bunbury Pipeline and Pilbara Ports) • Private waste service providers (including Cleanaway, North West Alliance/ Veolia, Remondis and Suez)

The Application was referred to external stakeholders by DWER as part of this assessment. Stakeholders consulted, a summary of consultation comments received and DWER response to comments are listed in Appendix 2.

9. Risk assessment

9.1 Determination of emission, pathway and receptor

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

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as other legislation, that emission will not be risk assessed further and will be screened out through Table 14 and Table 15.

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

Table 14: Identification of emissions, pathway and receptors during construction

Risk Events					Continue to detailed risk assessment?	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Construction of landfill cell, leachate evaporation ponds, waste storage areas and supporting infrastructure	Vehicle movements on unsealed access roads	Dust	Transient workers on pastoral stations/leases at Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises	Air / wind dispersion	Impacts to health, wellbeing and amenity	The Delegated Officer considers it unlikely a Risk Event for dust emissions will occur given the minimum distance of 3.2 km between the Premises boundary and these receptors. As such, the Delegated Officer does not consider the risk to be significant enough to warrant further assessment.
	Earthworks		Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises			
	Placement of machinery, equipment and infrastructure		Onslow town site is located ~30 km north-west of the Premises			
			Minderoo Station homestead is located ~20 km south-west of the Premises.			
					No	
					No	
					No	
					No	

Risk Events					Continue to detailed risk assessment?	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
				Peedamulla Station homestead and campground are located ~40 km east north-east of the Premises	No		
				Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure	Yes	Refer to Section 9.5	
				Users of Onslow Road located adjacent to the eastern side of the Premises.	Yes	Refer to Section 9.5	
				Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora	Yes	Refer to Section 9.5	
Construction of landfill cell, leachate evaporation ponds, waste storage areas and supporting infrastructure	Vehicle movements including reversing alarms Earthworks Placement of machinery, equipment and infrastructure	Noise	Air / wind dispersion	Impacts to health, wellbeing and amenity	Transient workers located on pastoral stations/leases at Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises	No	The Delegated Officer considers it unlikely a Risk Event for noise emissions will occur given the minimum distance of 3.2 km between the Premises boundary and these receptors. As such, the Delegated Officer does not consider the risk to be significant enough to warrant further assessment.
					Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises	No	
					Onslow town site is located ~30 km north-west of the Premises	No	
					Minderoo Station homestead is located ~20 km south-west of the Premises.	No	
					Peedamulla Station homestead and campground are located ~40 km east north-east of the Premises	No	

Risk Events					Continue to detailed risk assessment?	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
				Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure	Yes	Refer to Section 9.7	
					Yes	Refer to Section 9.7	
				Native fauna within the CRCP proposed extension area (150 -1,500 m from Premises)	Disruption to feeding and breeding habits	Yes	Refer to Section 9.7
Fuel storage and chemical use	Fuel and other chemicals and liquids stored and used onsite for use during construction activities	Hydrocarbon and contaminated liquid spills	Land and waters	Contamination of waters or deterioration of local/regional surface water ecosystems	No	<p>The Applicant proposes to only store a maximum of 30,000L of fuel onsite during construction activities. Any fuel will be stored to and managed in accordance with the <i>Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007</i> and <i>Australian Standard 1940:-2017 - The storage and handling of flammable and combustible liquids</i>.</p> <p>Fuelling activities will be undertaken within a designated bunded area and spill kits will be available onsite. Groundwater monitoring is proposed to be undertaken as part of construction works.</p> <p>The Delegated Officer considers that hydrocarbons and other liquid spill impacts can be sufficiently managed and do not require a detailed risk assessment.</p>	
							Surface water: Ashburton River ~20.5 km west of the Premises
							Surface water: Cane River ~22 km north-east of the Premises
							Surface water: minor watercourse (non-perennial) located ~10.6 km west of Premises
							Surface water: minor watercourse (non-perennial) located ~15.5 km north of Premises
							Surface water: series of non-perennial lakes are situated to the west, south-west and north-east of the Premises commencing ~2.3 km west from Premises
Surface water: series of Saline Coastal Flats located ~14 km north and north-west from the Premises							

Risk Events					Continue to detailed risk assessment?	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway		
			Surface water: Indian Ocean located ~40.3km north-west of Premises			Discharges of hydrocarbons and other chemicals may also be subject to the provisions of the <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>
			Beneficial users of groundwater (including future users)		Contamination of soil and groundwater	
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora			

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

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
<p>Category 65: Class IV secure landfill site</p> <p>Acceptance, storage, sorting, burial and decomposition of up to Class IV wastes including asbestos and biomedical wastes</p> <p>Collection, storage and management of leachate</p> <p>Ongoing management of Premises</p>	Landfill leachates	Surface water: Ashburton River ~20.5 km west of the Premises	Overland flow due to overtopping of leachate storage ponds or failure of leachate conveyance infrastructure;	Contamination of waters or deterioration of local/regional surface water ecosystems	No	The Delegated Officer considers it unlikely that a Risk Event resulting in unacceptable leachate emissions will occur given the minimum distance of 20 km between the Premises boundary and these receptors. As such, the Delegated Officer does not consider the risk to be significant enough to warrant further assessment.	
		Surface water: Cane River ~22 km north-east of the Premises			No		
		Surface water: minor watercourse (non-perennial) located ~10.6 km west of Premises			Movement through groundwater;	Yes	Refer to Section 9.4
		Surface water: minor watercourse (non-perennial) located ~15.5 km north of Premises			Overland runoff (from stormwater migration)	Yes	Refer to Section 9.4
		Surface water: series of non-perennial lakes are situated to the west, south-west and north-east of the Premises commencing ~2.3 km west from Premises				Yes	Refer to Section 9.4
		Surface water: series of Saline Coastal Flats located ~14 km north and north-west from the Premises				Yes	Refer to Section 9.4

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
Category 65: Class IV secure landfill site	Acceptance, storage, sorting, burial and decomposition of up to Class IV wastes including asbestos and biomedical wastes Collection, storage and management of leachate Ongoing management of Premises	Landfill leachates	Surface water: Indian Ocean located ~40.3km north-west of Premises	Overland flow due to overtopping of leachate storage ponds or failure of leachate conveyance infrastructure; Movement through groundwater; Overland runoff (from stormwater migration)	Contamination of waters or deterioration of local/regional surface water ecosystems	No	The Delegated Officer considers it unlikely that a Risk Event resulting in unacceptable leachate emissions will occur given the minimum distance of 20 km between the Premises boundary and this receptor. As such, the Delegated Officer does not consider the risk to be significant enough to warrant further assessment.
			Beneficial users of groundwater (including future users)	Abstraction of groundwater Direct exposure via irrigation and/or spraying	Degradation to the beneficial use of groundwater Health impacts to groundwater users	Yes	Refer to Section 9.4
			Terrestrial habitats including the proposed extension of the CRCP (150 - 1,500 m from Premises) including native flora and groundwater dependent vegetation	Seepage Overland runoff	Impacts to conservation values of the CRCP	Yes	Refer to Section 9.4

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
Category 65: Class IV secure landfill site	Acceptance, storage, sorting, burial and decomposition of up to Class IV wastes including biomedical wastes and PFAS	Dust (excluding asbestos)	Air / wind dispersion	Transient workers located on pastoral stations/leases at Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises	No	The Delegated Officer considers it unlikely that a Risk Event resulting in unacceptable dust emissions will occur given the minimum distance of 3.2 km between the Premises boundary and these receptors.	
				Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises	No		
				Onslow town site is located ~30 km north-west of the Premises	No		
				Minderoo Station homestead is located ~20 km south-west of the Premises.	No		
				Peedamulla Station homestead and campground are located ~40 km east north-east of the Premises	No		
				Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure	Yes		Refer to Section 9.5
				Users of Onslow Road located adjacent to the eastern side of the Premises.	Yes		Refer to Section 9.5
	Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora	Yes	Refer to Section 9.5				
Acceptance, storage, sorting, burial and decomposition of	Asbestos fibres	Transient workers located on pastoral stations/leases at Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises	Air / wind dispersion	Adverse health impacts including asbestosis,	No	The Delegated Officer considers it unlikely that a Risk Event resulting in emission of asbestos fibres will occur given the minimum distance of 3.2 km	

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
	asbestos wastes		Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises		mesothelioma and cancer	No	between the Premises boundary and these receptors.
			Onslow town site is located ~30 km north-west of the Premises		No		
			Minderoo Station homestead is located ~20 km south-west of the Premises.		No		
			Peedamulla Station homestead and campground are located ~40 km east north-east of the Premises		No		
			Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure		Yes	Refer to Section 9.11	
			Users of Onslow Road located adjacent to the eastern side of the Premises.		Yes	Refer to Section 9.11	
			Workers onsite		No	Impacts to onsite human receptors are not regulated by DWER. Health and safety for onsite workers is regulated by other legislation not covered by the scope of this approval.	
Category 65: Class IV secure	Acceptance, storage, sorting, burial and decomposition of	Odour	Transient workers located on pastoral stations/leases at Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises	Air / wind dispersion	Impacts to health, wellbeing and amenity	No	The Delegated Officer considers it unlikely for odour to travel this distance or cause any distinguishable impacts from background

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities		Potential emissions	Potential receptors	Potential pathway			Potential adverse impacts
landfill site	up to Class IV wastes including asbestos and biomedical wastes		Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises			No	concentrations. This is based on the minimum distance of 3.2 km from the Premises boundary to these receptors.
			Onslow town site is located ~30 km north-west of the Premises			No	
			Minderoo Station homestead is located ~20 km south-west of the Premises.			No	
			Peedamulla Station homestead and campground are located ~40 km east north-east of the Premises			No	
			Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure			Yes	
			Users of Onslow Road located adjacent to the eastern side of the Premises.			Yes	Refer to Section 9.6
Category 65: Class IV secure landfill site	Acceptance, storage, sorting, burial and decomposition of up to Class IV wastes including asbestos and biomedical wastes	Noise	Transient workers located on pastoral stations/leases at Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises	Air / wind dispersion	Impacts to health, wellbeing and amenity	No	The Delegated Officer considers it unlikely that a Risk Event for noise will occur given the minimum distance of 3.2 km between the Premises boundary and these receptors.
			Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises			No	
			Onslow town site is located ~30 km north-west of the Premises			No	
			Minderoo Station homestead is located ~20 km south-west of the Premises.			No	

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
			Peedamulla Station homestead and campground are located ~40 km east north-east of the Premises			No	
			Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure			Yes	Refer to Section 9.7
			Users of Onslow Road located adjacent to the eastern side of the Premises.			Yes	Refer to Section 9.7
Category 65: Class IV secure landfill site	Landfill gas generated through the decomposition of waste within the landfill	Fugitive landfill gas (typically composed of methane, carbon dioxide, nitrogen, oxygen and hydrogen and many trace gases such as hydrogen sulphide, carbon monoxide, halogenated organics and aromatic hydrocarbons).	Transient workers located on pastoral stations/leases at Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises	Lateral migration through soil; Movement through groundwater; or Passive venting to air	Adverse impacts to health including asphyxia. Amenity (from odour) Explosion risk	No	
			Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises			No	The Delegated Officer considers that the predicted volume of gas generation during operation of Cell 1 is negligible noting that the Applicant has not applied to accept putrescible wastes. Any fugitive landfill gas is likely to disperse given the distance from the Premises, and the limited built environment in the area. The engineered cell, gas extraction system and capping profile are also considered to be sufficient at managing fugitive landfill gas emissions. Refer to Section 6.6
			Onslow town site is located ~30 km north-west of the Premises			No	
			Minderoo Station homestead is located ~20 km south-west of the Premises.			No	
			Peedamulla Station homestead and campground are located ~40 km east north-east of the Premises			No	
			Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure			No	

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
				Users of Onslow Road located adjacent to the eastern side of the Premises.	No	
				Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora	Impacts to conservation values of the CRCP	
Category 65: Class IV secure landfill site	Waste providing a breeding habitat for rats, flies, cockroaches and mosquitoes as well as feral animals as disease vectors	Vermin/pests and pathogens	Air and land via insects, birds and rodents	Transient workers located on pastoral stations/leases at Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises	No	The Delegated Officer considers that vermin, pest and weed impacts are unlikely to extend to this distance.
				Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises	No	
				Onslow town site is located ~30 km north-west of the Premises	No	
				Minderoo Station homestead is located ~20 km south-west of the Premises.	No	
				Peedamulla Station homestead and campground are located ~40 km east north east of the Premises	No	
				Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure	Yes	Refer to Section 9.8
				Users of Onslow Road located adjacent to the eastern side of the Premises.	Yes	Refer to Section 9.8

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora		Impacts to conservation values of the CRCP	Yes	Refer to Section 9.8
Category 65: Class IV secure landfill site	Waste materials	Windblown waste/litter	Transient workers located on pastoral stations/leases at Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises	Air / wind dispersion	Amenity and nuisance impacts Attraction of pests and vermin	No	The Delegated Officer considers it unlikely that windblown waste will extend this distance from the Premises.
			Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises			No	
			Onslow town site is located ~30 km north-west of the Premises			No	
			Minderoo Station homestead is located ~20 km south-west of the Premises.			No	
			Peedamulla Station homestead and campground are located ~40 km east north east of the Premises			No	
			Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure			Yes	Refer to Section 9.9
			Users of Onslow Road located adjacent to the eastern side of the Premises.			Yes	Refer to Section 9.9
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora			Yes	Refer to Section 9.9

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities		Potential emissions	Potential receptors	Potential pathway			Potential adverse impacts
Category 65: Class IV secure landfill site	Unplanned events	Smoke (in the event of a fire) / Fire	Transient workers located on pastoral stations/leases at Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises	Air / wind dispersion	Amenity and public health (adverse health)	Yes	Refer to Section 9.10
			Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises			No	The Delegated Officer considers it unlikely that a Risk Event for smoke will occur given the minimum distance of 20 km between the Premises boundary and these receptors
			Onslow town site is located ~30 km north-west of the Premises			No	
			Minderoo Station homestead is located ~20 km south-west of the Premises.			No	
			Peedamulla Station homestead and campground are located ~40 km east north east of the Premises			No	
			Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure			Yes	Refer to Section 9.10
			Users of Onslow Road located adjacent to the eastern side of the Premises.			Yes	Refer to Section 9.10
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora			Yes	Refer to Section 9.10
				Impacts to conservation values of the CRCP	Yes	Refer to Section 9.10	

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
		Landfill leachates emissions caused by fire and emissions of chemicals used to control fire	Beneficial users of groundwater (including future users)	Direct discharge onto land Infiltration to groundwater	Landfill liner damage resulting in increased leachate loss leading to contamination of groundwater	Yes Refer to Section 9.10
Category 13: Crushing of building material	Acceptance and handling of waste Operation of the screening and crushing plant Stockpiling of materials	Dust	Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure and users of Onslow Road located adjacent to the eastern side of the Premises.	Air / wind dispersion	Impacts to health, wellbeing and amenity	Yes Refer to Section 9.5
			Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises; Onslow town site is located ~30 km north-west of the Premises; Minderoo Station homestead is located ~20 km south-west of the Premises; Peedamulla Station homestead and campground are located ~40 km east north east of the Premises.		Impacts to health, wellbeing and amenity	No The Delegated Officer considers it unlikely that a Risk Event for dust will occur given the minimum distance of 20 km between the Premises boundary and these receptors
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora		Impacts to conservation values of the CRCP	Yes Refer to Section 9.5

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
	Acceptance and handling of waste Operation of the screening and crushing plant	Noise	Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure and users of Onslow Road located adjacent to the eastern side of the Premises.	Air/ wind dispersion	Impacts to health, wellbeing and amenity	Yes	Refer to Section 9.7
			Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises; Onslow town site is located ~30 km north-west of the Premises; Minderoo Station homestead is located ~20 km south-west of the Premises; Peedamulla Station homestead and campground are located ~40 km east north east of the Premises.		Impacts to health, wellbeing and amenity	No	The Delegated Officer considers it unlikely that a Risk Event for noise will occur given the minimum distance of 20 km between the Premises boundary and these receptors
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora		Impacts to conservation values of the CRCP	Yes	Refer to Section 9.7
Recycled waste contaminated with asbestos containing materials and/or asbestos fibres	Asbestos fibres from non-conforming waste types at the Premises being released into air and	Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure and users of Onslow Road located adjacent to the eastern side of the Premises.	Air / wind dispersion	Adverse health impacts including asbestosis, mesothelioma and cancer	Yes	Refer to Section 9.11	

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
		included in final product.	<p>Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises;</p> <p>Onslow town site is located ~30 km north-west of the Premises;</p> <p>Minderoo Station homestead is located ~20 km south-west of the Premises;</p> <p>Peedamulla Station homestead and campground are located ~40 km east north east of the Premises.</p>			No	The Delegated Officer considers it unlikely that a Risk Event for asbestos will occur given the minimum distance of 20 km between the Premises boundary and these receptors
Category 62: Solid waste depot	Waste acceptance and handling Stockpiling/ storage of material Tyre washing facility and vehicle washdown area	Dust	Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure and users of Onslow Road located adjacent to the eastern side of the Premises.	Air / wind dispersion	Impacts to health, wellbeing and amenity	Yes	Refer to Section 9.5
			Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises; Onslow town site is located ~30 km north-west of the Premises; Minderoo Station homestead is located ~20 km south-west of the Premises; Peedamulla Station homestead and campground are located ~40 km east north east of the Premises.		Impacts to health, wellbeing and amenity	No	The Delegated Officer considers it unlikely that a Risk Event for dust will occur given the minimum distance of 20 km between the Premises boundary and these receptors
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora		Impacts to conservation values of the CRCP	Yes	Refer to Section 9.5

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
		Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure and Users of Onslow Road located adjacent to the eastern side of the Premises.		Impacts to health, wellbeing and amenity	Yes	Refer to Section 9.7
	Noise	<p>Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises;</p> <p>Onslow town site is located ~30 km north-west of the Premises;</p> <p>Minderoo Station homestead is located ~20 km south-west of the Premises;</p> <p>Peedamulla Station homestead and campground are located ~40 km east north east of the Premises.</p>	Air / wind dispersion	Impacts to health, wellbeing and amenity	No	The Delegated Officer considers it unlikely that a Risk Event for noise will occur given the minimum distance of 20 km between the Premises boundary and these receptors
		Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora		Impacts to conservation values of the CRCP	Yes	Refer to Section 9.7

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	Leachate (scrap metal storage) Waste water from tyre wash-down facilities	<p>Surface water: series of non-perennial lakes are situated to the west, south-west and north-east of the Premises commencing ~2.3 km west from Premises;</p> <p>Surface water: minor watercourse (non-perennial) located ~10.6 km west of Premises;</p> <p>Surface water: minor watercourse (non-perennial) located ~15.5 km north of Premises;</p> <p>Surface water: series of Saline Coastal Flats located ~14 km north and north-west from the Premises;</p> <p>Surface water: Indian Ocean located ~40.3km north-west of Premises.</p>	<p>Overland flow due to overtopping of leachate storage ponds;</p> <p>Movement through groundwater;</p> <p>Overland runoff (from stormwater migration)</p>	Contamination of waters or deterioration of local/regional surface water ecosystems	Yes	Refer to Section 9.4
		<p>Surface water: Ashburton River ~20.5 km west of the Premises;</p> <p>Surface water: Cane River ~22 km north-east of the Premises.</p>			No	The Delegated Officer considers it unlikely that a Risk Event resulting in unacceptable leachate emissions will occur given the minimum distance of 20 km between the Premises boundary and these receptors. As such, the Delegated Officer does not consider the risk to be significant enough to warrant further assessment.

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
				Degradation to the beneficial use of groundwater Health impacts to groundwater users	Yes	Refer to Section 9.4	
				Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora and groundwater dependent vegetation	Yes	Refer to Section 9.4	
Categories 57 and 63: Used tyre storage and tyre monocoil	Acceptance and storage of used tyres at the Premises	Smoke (in the event of a fire)	Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure and Users of Onslow Road located adjacent to the eastern side of the Premises.	Air / wind dispersion	Amenity and public health (adverse health)	Yes	Refer to Section 9.10
			Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises; Onslow town site is located ~30 km north-west of the Premises; Minderoo Station homestead is located ~20 km south-west of the Premises; Peedamulla Station homestead and campground are located ~40 km east north east of the Premises.			No	The Delegated Officer considers it unlikely that a Risk Event for noise will occur given the minimum distance of 20 km between the Premises boundary and these receptors
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora			Yes	Refer to Section 9.10

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	Firewater management (in the event of a fire)	<p>Surface water: series of non-perennial lakes are situated to the west, south-west and north-east of the Premises commencing ~ 2.3 km west from Premises;</p> <p>Surface water: minor watercourse (non-perennial) located ~10.6 km west of Premises;</p> <p>Surface water: minor watercourse (non-perennial) located ~15.5 km north of Premises;</p> <p>Surface water: series of Saline Coastal Flats located ~14 km north and north-west from the Premises;</p> <p>Surface water: Indian Ocean located ~40.3km north-west of Premises.</p>	<p>Overland runoff</p> <p>Movement through groundwater</p>	Contamination of waters or deterioration of local/regional surface water ecosystems	Yes	Refer to Section 9.4
		<p>Surface water: Ashburton River ~20.5 km west of the Premises;</p> <p>Surface water: Cane River ~22 km north-east of the Premises.</p>			<p>Degradation to the beneficial use of groundwater</p> <p>Health impacts to groundwater users</p>	No
		Beneficial users of groundwater (including future users)				Yes

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora and groundwater dependant vegetation		Impacts to conservation values of the CRCP	Yes Refer to Section 9.4
Category 61A: Solid waste facility	Green waste storage and processing	Dust	Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure and Users of Onslow Road located adjacent to the eastern side of the Premises.	Air / wind dispersion	Impacts to health, wellbeing and amenity	Yes Refer to Section 9.5
			Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises; Onslow town site is located ~30 km north-west of the Premises; Minderoo Station homestead is located ~20 km south-west of the Premises; Peedamulla Station homestead and campground are located ~40 km east north east of the Premises.			No The Delegated Officer considers it unlikely that a Risk Event for noise will occur given the minimum distance of 20 km between the Premises boundary and these receptors
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora			Yes Refer to Section 9.5
		Odour	Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure and Users of Onslow Road located adjacent to the eastern side of the Premises.	Air / wind dispersion	Impacts to health, wellbeing and amenity	Yes Refer to Section 9.6

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	Odour	<p>Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises;</p> <p>Onslow town site is located ~30 km north-west of the Premises;</p> <p>Minderoo Station homestead is located ~20 km south-west of the Premises;</p> <p>Peedamulla Station homestead and campground are located ~40 km east north east of the Premises.</p>	Air / wind dispersion	Impacts to health, wellbeing and amenity	No	The Delegated Officer considers it unlikely that a Risk Event for noise will occur given the minimum distance of 20 km between the Premises boundary and these receptors
	Leachate	<p>Surface water: series of non-perennial lakes are situated to the west, south-west and north-east of the Premises commencing ~ 2.3 km west from Premises;</p> <p>Surface water: minor watercourse (non-perennial) located ~10.6 km west of Premises;</p> <p>Surface water: minor watercourse (non-perennial) located ~15.5 km north of Premises;</p> <p>Surface water: series of Saline Coastal Flats located ~14 km north and north-west from the Premises;</p> <p>Surface water: Indian Ocean located ~40.3km north-west of Premises.</p>	Overland flow Movement through groundwater	Contamination of waters or deterioration of local/regional surface water ecosystems	Yes	Refer to Section 9.4

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities		Potential emissions	Potential receptors	Potential pathway			Potential adverse impacts
			Surface water: Ashburton River ~20.5 km west of the Premises; Surface water: Cane River ~22 km north-east of the Premises.			No The Delegated Officer considers it unlikely that a Risk Event resulting in unacceptable leachate emissions will occur given the minimum distance of 20 km between the Premises boundary and these receptors. As such, the Delegated Officer does not consider the risk to be significant enough to warrant further assessment.	
			Beneficial users of groundwater (including future users)		Degradation to the beneficial use of groundwater Health impacts to groundwater users	Yes	Refer to Section 9.4
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora and groundwater dependant vegetation		Impacts to conservation values of the CRCP	Yes	Refer to Section 9.4
Category 85: Sewage facility	Acceptance, storage and treatment of sewage waste	Noise	Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure and Users of Onslow Road located adjacent to the eastern side of the Premises.	Air / wind dispersion	Impacts to health, wellbeing and amenity	Yes	Refer to Section 9.7

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
		<p>Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises;</p> <p>Onslow town site is located ~30 km north-west of the Premises;</p> <p>Minderoo Station homestead is located ~20 km south-west of the Premises;</p> <p>Peedamulla Station homestead and campground are located ~40 km east north east of the Premises.</p>		Impacts to health, wellbeing and amenity	No	The Delegated Officer considers it unlikely that a Risk Event for noise will occur given the minimum distance of 20 km between the Premises boundary and these receptors	
		<p>Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora</p>		Impacts to conservation values of the CRCP	Yes	Refer to Section 9.7	
Category 85: Sewage facility	Acceptance, storage and treatment of sewage waste	Odour	Users of the CRCP: The boundary of the proposed extension is located between 150 and 1,500 m from the PRMWF infrastructure and Users of Onslow Road located adjacent to the eastern side of the Premises.	Air / wind dispersion	Impacts to health, wellbeing and amenity	Yes	Refer to Section 9.6
			<p>Wheatstone oil and gas workers accommodation is located ~22 km north-west of the Premises;</p> <p>Onslow town site is located ~30 km north-west of the Premises;</p> <p>Minderoo Station homestead is located ~20 km south-west of the Premises;</p> <p>Peedamulla Station homestead and campground are located ~40 km east north east of the Premises.</p>	Air / wind dispersion	Impacts to health, wellbeing and amenity	No	The Delegated Officer considers it unlikely that a Risk Event for noise will occur given the minimum distance of 20 km between the Premises boundary and these receptors

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	Leachate/ raw sewage spills	<p>Surface water: series of non-perennial lakes are situated to the west, south-west and north-east of the Premises commencing ~ 2.3 km west from Premises;</p> <p>Surface water: minor watercourse (non-perennial) located ~10.6 km west of Premises;</p> <p>Surface water: minor watercourse (non-perennial) located ~15.5 km north of Premises;</p> <p>Surface water: series of Saline Coastal Flats located ~14 km north and north-west from the Premises;</p> <p>Surface water: Indian Ocean located ~40.3km north-west of Premises.</p>	Overland flow Movement through groundwater	Contamination of waters or deterioration of local/regional surface water ecosystems	Yes	Refer to Section 9.4
		<p>Surface water: Ashburton River ~20.5 km west of the Premises;</p> <p>Surface water: Cane River ~22 km north-east of the Premises.</p>			No	The Delegated Officer considers it unlikely that a Risk Event resulting in unacceptable leachate emissions will occur given the minimum distance of 20 km between the Premises boundary and these receptors. As such, the Delegated Officer does not consider the risk to be significant enough to warrant further assessment.
		Beneficial users of groundwater (including future users)			<p>Degradation to the beneficial use of groundwater</p> <p>Health impacts to groundwater users</p>	Yes

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities		Potential emissions	Potential receptors	Potential pathway			Potential adverse impacts
			Terrestrial environment within the CRCP proposed extension area (150 -1,500 m from Premises) including native flora and groundwater dependant vegetation		Impacts to conservation values of the CRCP	Yes	Refer to Section 9.4

9.2 Consequence and likelihood of risk events

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

Table 16: Risk rating matrix

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

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

Table 17: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	<ul style="list-style-type: none"> onsite impacts: catastrophic offsite impacts local scale: high level or above offsite impacts wider scale: mid-level or above Mid to long-term or permanent impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are significantly exceeded 	<ul style="list-style-type: none"> Loss of life Adverse health effects: high level or ongoing medical treatment Specific Consequence Criteria (for public health) are significantly exceeded Local scale impacts: permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	<ul style="list-style-type: none"> onsite impacts: high level offsite impacts local scale: mid-level offsite impacts wider scale: low level Short-term impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are exceeded 	<ul style="list-style-type: none"> Adverse health effects: mid-level or frequent medical treatment Specific Consequence Criteria (for public health) are exceeded Local scale impacts: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	<ul style="list-style-type: none"> onsite impacts: mid-level offsite impacts local scale: low level offsite impacts wider scale: minimal Specific Consequence Criteria (for environment) are at risk of not being met 	<ul style="list-style-type: none"> Adverse health effects: low level or occasional medical treatment Specific Consequence Criteria (for public health) are at risk of not being met Local scale impacts: mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	<ul style="list-style-type: none"> onsite impacts: low level offsite impacts local scale: minimal offsite impacts wider scale: not detectable Specific Consequence Criteria (for environment) likely to be met 	<ul style="list-style-type: none"> Specific Consequence Criteria (for public health) are likely to be met Local scale impacts: low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	<ul style="list-style-type: none"> onsite impact: minimal Specific Consequence Criteria (for environment) met 	<ul style="list-style-type: none"> Local scale: minimal to amenity Specific Consequence Criteria (for public health) met

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

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

9.3 Acceptability and treatment of Risk Event

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

Table 18: Risk treatment table

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

9.4 Risk Assessment – Leachate emissions

9.4.1 Hazard characterisation and impact

Leachate seepage to groundwater from landfilling operations may arise if defects occur during placement and/or over time in the operation of the landfill cell or leachate management system, including leachate storage ponds. Landfill liner systems cannot be made completely impermeable and all liners will therefore experience a certain level of leachate seepage over the lifecycle of operation. Leachate emissions may also occur as a result of overtopping of leachate storage infrastructure, or failure of leachate conveyance infrastructure.

Leachate emissions may also result from liner system failure, which typically occurs as a result of basal or side slope instability, poor installation and construction practices, poor waste placement practices, or other activities that compromise the structural integrity of the landfill subbase.

Landfill leachate mainly consists of dissolved organic matter and inorganic compounds such as sulfates, chlorides and ammonium salts. Leachate may also contain heavy metals such as lead, nickel and copper, hydrocarbons and synthetic organic compounds. As the PRWMF proposes to accept special wastes and solid wastes up to Class IV criteria, any leachate generated may also include biological contaminants and pathogens, per- and poly-fluoroalkyl substances (PFAS), organochlorine pesticides (OCPs), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and other compounds that may leach from Class IV waste types.

Receptors that may be affected by leachate emissions include beneficial users of groundwater, both on pastoral and mining land, surface water of river systems, water courses and lakes, contamination of on-site soil and adjoining land, and impacts to native vegetation within the proposed extension of the CRCP, including groundwater dependent ecosystems.

Hazard to groundwater

The inferred groundwater flow in the area is in a westerly to north-westerly direction predominantly towards the Ashburton River and Indian Ocean, which are located approximately 20.5 km and 40.3 km from the Premises, respectively.

There are no registered down-hydraulic gradient groundwater users of the PRWMF within the Carnarvon-Birdrong confined Aquifer. The two closest registered users of the Carnarvon-Superficial Aquifer that are down-hydraulic gradient of the Premises are located adjacent to the north-eastern boundary of the PRWMF, being held by Main Roads, and located approximately 4 km west from the site, being held by Forrest & Forrest Pty Ltd for the Minderoo pastoral station.

Based on information provided with the Application for hydrogeological site investigations (Talis, 2018c), the groundwater testing onsite confirmed that the quality of groundwater in the vicinity of the Premises is suitable for potential beneficial use, including for irrigation, stock water and non-potable domestic and industrial uses.

As the surrounding land uses and potential future land uses predominantly consist of pastoral stations and mining leases, groundwater could be abstracted for the purposes of non-potable domestic use, irrigation, stock water and/or dust suppression. Water that has become contaminated with Class IV leachate is likely to pose a health and amenity (odour) risk to human users and could cause health impacts to livestock consuming the water for drinking purposes, and any irrigated crops. The health and biological diversity of species within the receiving environment of the proposed extension of the CRCP could also become degraded with plant root uptake of contaminated groundwater.

The assessment of risk to the groundwater receiving environment considers the following aspect of the PRWMF construction and operation:

- Slug tests completed by the Applicant showed a hydraulic conductivity of up to 0.36 m/day with a seepage velocity of 2.08 m/year.
- There are registered groundwater users for the superficial aquifer down-hydraulic gradient of Cell 1;
- There have been no groundwater dependent ecosystems identified within the Premises.
- The landfill liner system has an estimated conservative operational leakage rate between 0.006 to 0.279 L/ha/day.
- The leachate collection and management system is designed to maintain a leachate head between 0.3 and 1 m on the landfill;
- The minimum separation distance between the Cell 1 liner and the maximum predicted groundwater level beneath Cell 1 is a minimum of 2.9 m.

Hazard to surface water

The closest surface water receptors down-hydraulic gradient of the Premises are considered to be the series of non-perennial lakes commencing 2.3 km west from the site. The closest permanent surface water body is situated 14 km down-hydraulic gradient of the Premises, being the saline coastal flats.

Leachate entering surface water flow systems that recharge the lakes may impact on water quality and have detrimental impacts on the flora and fauna within those surface water ecosystems.

Other hazards

Degradation of soil quality, and remnant native vegetation is possible in the event of minor spillages of leachate (due to failure of conveyance infrastructure) or overtopping of the leachate ponds. There is also potential for leachate to contaminate surrounding land impacting priority flora located within the proposed extension of the CRCP.

Stormwater diversion structures such as swales and levee embankments as well as drainage structures will be constructed to manage surface water flow around the Premises. Sediment emissions may result from the management of stormwater on the Premises.

Sources

The key sources of leachate emissions are outlined below:

- Fire suppressant runoff (in the event of a fire);
- Storage of green waste;
- Class IV landfill operations; and
- Storage of sewage.

Each of these sources has been risk assessed below, with only the closest/most likely human and environmental receptors considered, as the risk levels associated with these receptors represents the highest possible risk for that source.

9.4.2 Criteria for assessment

The Delegated Officer considers that groundwater in the area is potentially suitable for non-potable uses (including dust-suppression), livestock watering, pastoral/agricultural use.

Impacts to groundwater have been assessed against the Non-Potable Use Guidelines (DoH, 2014) (referred to as NPUG). Given that groundwater is likely to be utilised for non-potable purposes, it is considered that the NPUG guidelines are the most appropriate criteria for assessing impacts to groundwater based on the hazard characterisation described above.

9.4.3 Applicant controls

This assessment has reviewed the controls set out below.

- Engineered landfill cell, leachate collection system and stormwater management systems as described in Sections 6, 7.2 and 7.3 above;
- The operational management and monitoring strategies set out in the Leachate Management Plan provided with the Application;
- Waste acceptance procedures and covering of waste as outlined in sections 7.1.1 and 7.1.2 above;
- Proposed monitoring of groundwater detailed in section 7.4;
- Fire management procedures detailed in section 7.5 above; and
- The proposed Operational Environmental Management Plan (Talis, 2019a) for the Premises.

9.4.4 Key findings

The Delegated Officer has reviewed the information regarding leachate emissions and has found:

12. Groundwater has a potential beneficial use as irrigation or stock water or for non-potable use.
13. The proposed Class IV cell liner system and proposed leachate pond liner system are not proposed to be constructed to the same design.
14. The landfill stability assessment has assumed that the extent of the Pindan Sand Ridge within the proposed prescribed premises boundary will remain undisturbed and unaltered expect where required for construction of the Premises infrastructure.

9.4.5 Consequence

Fire suppressant runoff

Human receptors

Beneficial users of groundwater may experience impacts to health from the exposure of contaminated groundwater and amenity is also at risk of being impacted. Based on the potential contaminants within fire suppressant runoff, including PFAS, pathogens and contaminants from up to Class IV waste, the Delegated Officer considers that direct contact with the abstracted contaminated groundwater could cause mid-level impacts to human health. Therefore, the Delegated Officer considers the consequence of leachate emission impacts to be **Major**.

Environmental Receptors

Based on the nature of surface water ecosystems and terrestrial ecosystems, the Delegated Officer has determined that leachate emissions to surface water or terrestrial ecosystems could cause mid-level off site local impacts with the specific consequence criteria being exceeded. Therefore, the Delegated Officer considers the consequence of leachate emission impacts to be **Major**.

Storage of green waste

Human receptors

Beneficial users of groundwater may experience impacts to amenity (odour) from the abstraction of nutrient contaminated groundwater. The Delegated Officer considers that the abstracted groundwater could cause minimal impacts to amenity. Therefore, the Delegated Officer considers the consequence of leachate emission impacts to be **Slight**.

Environmental Receptors

Based on the nature of surface water ecosystems and terrestrial ecosystems, the Delegated Officer has determined that leachate emissions to surface water or terrestrial ecosystems could cause low-level off-site local impacts with the specific consequence criteria at risk of being exceeded. Therefore, the Delegated Officer considers the consequence of leachate emission impacts to be **Moderate**.

Class IV landfill

Human receptors

Beneficial users of groundwater may experience impacts to health from the exposure of

contaminated groundwater and amenity is also at risk of being impacted. Based on the potential contaminants within leachate, the Delegated Officer considers that direct contact with the abstracted contaminated groundwater could cause mid-level impacts to human health. Therefore, the Delegated Officer considers the consequence of leachate emission impacts to be **Major**.

Environmental Receptors

Based on the nature of surface water ecosystems and terrestrial ecosystems, the Delegated Officer has determined that leachate emissions to groundwater or surface water could cause mid-level on site impacts with the specific consequence criteria being exceeded. Therefore, the Delegated Officer considers the consequence of leachate emission impacts to be **Major**.

Storage of sewage

Human receptors

Beneficial users of groundwater may experience impacts to health from the exposure of groundwater contaminated with sewage, including pathogens, and amenity (odour) is also at risk of being impacted. Based on the potential contaminants within leachate/sewage, the Delegated Officer considers that direct contact with the abstracted contaminated groundwater could cause low level health impacts to human health. Therefore, the Delegated Officer considers the consequence of leachate emission impacts to be **Moderate**.

Environmental Receptors

Based on the nature of surface water ecosystems and terrestrial ecosystems, the Delegated Officer has determined that leachate emissions to groundwater or surface water could cause low-level off-site impacts with the specific consequence criteria at risk of being exceeded. Therefore, the Delegated Officer considers the consequence of leachate emission impacts to be **Moderate**.

9.4.6 Likelihood of Risk Event

Fire suppressant runoff

Human receptors

In considering the Applicant's controls, the Delegated Officer has determined that the likelihood of major impacts to human health from leachate/fire suppressant runoff emissions would probably only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood of Risk Events occurring to be **Rare**.

Environmental Receptors

The Delegated Officer has determined that the likelihood of major impact to environmental receptors from leachate/fire suppressant runoff emissions, in considering the Applicant's controls, would probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of Risk Events occurring to be **Rare**.

Storage of green waste

Human receptors

In considering the Applicant's controls, the Delegated Officer has determined that the likelihood of impacts to human health from green waste leachate emissions would probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of Risk Events occurring to be **Unlikely**.

Environmental Receptors

The Delegated Officer has determined that the likelihood of moderate impact to environmental receptors from green waste leachate, in considering the Applicant's controls, would probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of Risk Events occurring to be **Unlikely**.

Class IV landfill

The likelihood of instability of the Cell 1 side slopes resulting in failure of the liner system and emission of leachate from the Class IV landfill assumes that the Pindan Sand Ridge is not disturbed throughout the lifecycle of the landfill. It is noted that the Management Order relating to the prescribed premises boundary acknowledges that a sand resource exists within the Reserve boundary may be required for extraction in the future to the extent that it is not required for the PRWMF infrastructure. As such any condition that may results in an interference with the Pindan Sand Ridge may change the risk outcomes in relation to likelihood of leachate emissions.

Human receptors

In considering the Applicant's controls, the Delegated Officer has determined that while the likelihood of major impacts to human health from leachate emissions from Cell 1 is considered to be unlikely, the likelihood of major impacts to human health from leachate ponds could occur at some time on the basis of the proposed liner design. Therefore, the Delegated Officer considers the likelihood of Risk Events occurring to be **Possible**.

Environmental Receptors

The Delegated Officer has determined that the likelihood of major impact to environmental receptors from leachate/fire suppressant runoff emissions, in considering the Applicant's controls, would probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of Risk Events occurring to be **Unlikely**.

Storage of sewage

Human receptors

The Delegated Officer has determined that the likelihood of moderate impact to human health from leachate emissions/sewage spills, when considering the Applicant's controls, would probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of Risk Events occurring to be **Unlikely**.

Environmental Receptors

In considering the Applicant's controls, the Delegated Officer has determined that the likelihood of moderate impact to environmental receptors from leachate emissions/sewage spills would probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of Risk Events occurring to be **Unlikely**.

9.4.7 Overall rating of leachate emissions

Fire suppressant runoff

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of leachate emissions/fire suppressant runoffs on human receptors is **Medium**.

Environmental Receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of

leachate emissions/fire suppressant runoffs to environmental receptors is **Medium**.

Storage of green waste

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of green waste leachate emissions on human receptors is **Low**.

Environmental Receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of green waste leachate emissions to environmental receptors is **Medium**.

Class IV landfill

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of leachate emissions on human receptors is **High**.

Environmental Receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of leachate emissions to environmental receptors is **Medium**.

Storage of sewage

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of leachate emissions/sewage spills on human receptors is **Medium**.

Environmental Receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating (Table 16) matrix and determined that the overall rating for the risk of leachate emissions/sewage spills to environmental receptors is **Medium**.

9.4.8 Acceptability of risk event

As per DWER's acceptability and treatment of Risk Events the Delegated Officer has determined that the risk event is acceptable and will be subject to some regulatory controls for the construction of infrastructure as part of this works approval.

9.4.9 Regulatory controls for leachate emissions

The Applicant will be required to implement the following controls to manage the potential impacts from leachate emissions:

- Infrastructure controls including construction, testing and maintenance of liners for the Cell 1, the leachate pond(s) and other leachate containment infrastructure;
- Infrastructure controls for the construction and maintenance of the leachate collection system and groundwater monitoring systems;
- Maintenance of surface water diversion and control structures;

- Operational controls including maintaining a minimum of 500 mm freeboard on the leachate ponds;
- Ensuring all leachate ponds are empty / prior to the onset of the 'wet season';
- At a licensing stage, requirements to monitor and assess leachate pond liner integrity and make all necessary repairs prior to the onset of the wet season;
- Limits on waste acceptance/waste processing/waste storage;
- Monitoring of groundwater to detect any emissions resulting from construction activities; and
- The Applicant will also be required to monitor the leachate level within the collection sump as well as undertake monitoring of leachate, surface water and groundwater during operational activities.

These controls generally replicate the Applicant's proposed controls which the Delegated Officer considers necessary in managing potential leachate impacts, with additional controls required to be determined as part of the licensing stage. The design of the landfill Cell 1, leachate extraction system, leachate storage system (capacity) and stormwater infrastructure have been reviewed and are generally considered to be acceptable for the purpose of the proposed operations.

It is noted that additional information is required to be provided at the licence application stage to demonstrate leachate storage management process that will maintain integrity of the liner, whether it is suitable that the leachate ponds can and should remain empty during the dry season (with low or no liquid levels), and a monitoring plan for regular validation of leachate pond liner integrity as part of operations.

As the extent of the Pindan Sand Ridge required to maintain the stability and integrity of the landfill infrastructure is not known, the Delegated Officer has included regulatory controls in the works approval requiring the Applicant to seek the CEO's approval prior to undertaking any interference with the Pindan Sand Ridge beyond what has been approved under other conditions of the works approval. These controls will assist in minimising the risk that the landfill stability will be compromised by any interference of the Pindan Sand Ridge. Should a request of this nature be made, the risks relating to landfill infrastructure stability and potential for emissions and discharges resulting from operations, will be reassessed by DWER.

9.5 Risk Assessment – Dust emissions

9.5.1 Hazard characterisation and impact

Construction

Construction activities may generate dust emissions which may cause adverse health and amenity impacts outside the Premises. Dust emissions may also have potential impacts to plant health of sensitive flora species, by suppressing their photosynthetic and respiratory function.

Potential sources of dust generated during construction activities include:

- vehicle movements on unsealed access roads;
- earthworks;
- machinery movements; and
- stockpiling of excavated material.

Operation

Premises operations may generate dust emissions which may cause adverse health and amenity impacts outside of the Premises. Dust emissions may also have potential impacts to plant health of sensitive flora species, by suppressing their photosynthetic and respiratory function.

Potential sources of dust generated during operations include:

- General landfilling activities including:
 - Vehicle movements throughout the landfill;
 - Stockpiling and general handling of waste including waste loading/unloading;
 - Filling/burial of waste;
 - Placement of cover material;
 - Exposed areas of soil and clean fill during normal operations;
- Operation of the screening and crushing plant and associated stockpiling of materials; and
- Green waste storage and processing.

9.5.2 Criteria for assessment

The relevant criteria for assessment of dust emissions as PM₁₀ is 50 µg/m³ over 24 hours as specified in the National Environment Protection (Ambient Air Quality) Measure (NEPM). The NEPM is the relevant criteria for assessment in relation to human health and wellbeing.

Amenity impacts can also be assessed against the general provisions of the EP Act, specifically whether fugitive dust unreasonably interferes with the health, welfare, convenience, or comfort of any person.

The threshold of dust levels that are likely to cause negative impacts to vegetation is likely to vary for different plant species and assemblages. For the vegetation typical of the Pilbara region, dust generation rates would generally be required to be quite high in order to have noticeable impact.

9.5.3 Applicant controls

This assessment has reviewed the Applicant's proposed controls set out below:

- Vehicle speed restrictions;
- Progressive sealing of some roads;
- Dust suppression/water cart;
- Ceasing operations under high winds (>40km/h);
- All waste loads accepted will be covered;
- The C&D waste hardstand/storage processing area will incorporate a sprinkler system; and
- Crushing and screening equipment fitted with dust suppression system.

9.5.4 Key findings

The Delegated Officer has reviewed the information regarding dust emissions and has found:

15. The nearest human receptors, being users of Onslow Road and the proposed extension to the CRCP, and the workers within the adjacent pastoral lands (Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises) are transient in nature. These are considered in the risk assessment below.
16. The closest homestead is located 20 km from the Premises. It is not reasonably foreseeable that dust will be carried this far via wind/air flow and has been screened out in the Risk Table above.
17. Vegetation types typically found within the Pilbara region are unlikely to be highly sensitive to impacts from dust emissions.

9.5.5 Consequence

Construction

Human receptors

Taking into consideration the limited duration of construction works and controls proposed by the Applicant, if dust emissions occur during construction, then the Delegated Officer has determined that the impact on amenity will be minimal on a local scale. Therefore, the Delegated Officer considers the consequence of dust emissions during construction to be **Slight**.

Environmental receptors

Taking into consideration the limited duration of construction works and controls proposed by the Applicant, if dust emissions occur during construction, then the Delegated Officer has determined that impacts to plant health will be limited on-site. Therefore, the Delegated Officer considers the consequence of dust emissions to plant health during construction to be **Slight**.

General landfilling operations

Human receptors

Taking into consideration the distance to sensitive receptors and the Applicant's proposed controls, if dust emissions occur during general landfilling activities, then the Delegated Officer has determined that the impact of dust emissions on amenity will be low level on a local scale. Therefore, the Delegated Officer considers the consequence of dust emissions from landfilling operations, including application of cover material, to be **Minor**.

Environmental receptors

If dust emissions occur during general landfilling activities, then the Delegated Officer has determined that the impact of dust emissions on plant health will be low level on a local scale. Therefore, the Delegated Officer considers the consequence of dust emissions from landfilling operations, including application of cover material, to be **Minor**.

Crushing and screening activities including stockpiling

Human receptors

If dust emissions occur during crushing, screening and associated stockpiling activities, then the Delegated Officer has determined that the impact of dust emissions on amenity will be low level on a local scale. Therefore, the Delegated Officer considers the consequence of dust emissions from crushing, screening and stockpiling activities to be **Minor**.

Environmental receptors

If dust emissions occur during crushing, screening and associated stockpiling activities, then

the Delegated Officer has determined that the impact on plant health will be minimal on a local scale. Therefore, the Delegated Officer considers the consequence of dust emissions during crushing, screening and stockpiling activities to be **Minor**.

Green waste processing and storage

Human receptors

If dust emissions occur during green waste processing and storage activities, then the Delegated Officer has determined that the impact of dust emissions on amenity will be low level on a local scale. Therefore, the Delegated Officer considers the consequence of dust emissions from green waste processing and storage activities to be **Minor**.

Environmental receptors

If dust emissions occur during green waste processing and storage activities, then the Delegated Officer has determined that the impact of dust emissions on plant health will be minimal on a local scale. Therefore, the Delegated Officer considers the consequence of dust emissions from green waste processing and storage activities to be **Minor**.

9.5.6 Likelihood of Risk Event

Construction

Human receptors

Taking into consideration the distance to sensitive receptors and the Applicant's proposed controls, the Delegated Officer has determined that dust emissions resulting in impacts to public health/amenity during construction activities may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

Environmental receptors

Taking into consideration the distance to the CRCP proposed extension area and the Applicant's proposed controls, the Delegated Officer has determined that dust emissions resulting in impacts to native flora during construction activities may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

General landfilling operations

Human receptors

Taking into consideration the distance to sensitive receptors and the Applicant's proposed controls, the Delegated Officer has determined that dust emissions resulting in impacts to public health/amenity during general landfilling operations may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

Environmental receptors

Taking into consideration the distance to the CRCP proposed extension area and the Applicant's proposed controls, the Delegated Officer has determined that dust emissions resulting in impacts to native flora during general landfilling operations may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

Crushing and screening activities

Human receptors

Taking into consideration the distance to sensitive receptors and the Applicant's proposed controls, the Delegated Officer has determined that dust emissions resulting in impacts to

health/amenity during crushing, screening and associated stockpiling activities will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood to be **Unlikely**.

Environmental receptors

Taking into consideration the distance to the CRCP proposed extension and the Applicant's proposed controls, the Delegated Officer has determined that dust emissions resulting in impacts to native flora during crushing, screening and associated stockpiling activities will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood to be **Unlikely**.

Green waste processing and storage

Human receptors

Taking into consideration the distance to sensitive receptors and the Applicant's proposed controls, the Delegated Officer has determined that dust emissions resulting in impacts to health/amenity during green waste processing and storage activities will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood to be **Unlikely**.

Environmental receptors

Taking into consideration the distance to the CRCP proposed extension and the Applicant's proposed controls, the Delegated Officer has determined that dust emissions resulting in impacts to native flora during green waste processing and storage activities will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood to be **Unlikely**.

9.5.7 Overall rating of dust emissions

Construction

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of dust emissions impacting public health and/or amenity during construction is **Low**.

Environmental receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of dust emissions impacting native flora during construction is **Low**.

General landfilling operations

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of dust emissions impacting public health and/or amenity during general landfilling operations is **Low**.

Environmental receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of dust emissions impacting native flora during general landfilling operations is **Low**.

Crushing and screening activities including stockpiling

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of dust emissions impacting public health and/or amenity during crushing, screening and associated stockpiling activities is **Medium**.

Environmental receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of dust emissions impacting native flora during crushing, screening and associated stockpiling activities is **Medium**.

Green waste processing and storage

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of dust emissions impacting public health and/or amenity during green waste processing and storage activities is **Medium**.

Environmental receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of dust emissions impacting native flora during green waste processing and storage activities is **Medium**.

9.5.8 Acceptability of risk event

As per DWER's acceptability and treatment of Risk Events the Delegated Officer has determined that the risk event is acceptable and will be subject to some regulatory controls to maintain its acceptability.

9.5.9 Regulatory controls for dust emissions

The Applicant will be required to implement the following controls to manage the potential impacts from dust emissions:

- Infrastructure requirements including operation and maintenance of a water cart, dust suppression sprinklers and dust suppression infrastructure on C&D crushing and screening equipment;
- Operational requirements including maximum site speed limit of 10 km per hour on unsealed roads and areas, implemented with signage, use of water cart to maintain stockpiles in a damp state and use of dust suppression infrastructure whilst crushing and screening.

These controls generally replicate the Applicant's proposed controls which the Delegated Officer considers necessary in managing potential impacts.

9.6 Risk Assessment – Odour emissions

9.6.1 Hazard characterisation and impact

Landfills have the potential to cause odour emissions through the decomposition of putrescible materials and other odorous wastes, inadequate covering and decomposition of waste over time causing amenity impacts outside the Premises. Leachate, sewage and green waste stored and processed onsite also have the potential to generate odour emissions which may impact the amenity of persons outside the Premises.

Potential sources of odour emissions during the operation of the landfill include:

- General landfilling activities including:
 - The acceptance, movement and disposal of wastes including clinical and biomedical waste;
 - Un-capped or exposed operational areas of the landfill including the active tipping face; and
 - Leachate, which also includes leachate collection systems (e.g. leachate storage ponds) and treatment infrastructure;
- The green waste processing facility; and
- The sewage facility including receival ponds and associated evaporation pond.

Odour emissions associated with fugitive landfill gas have been assessed separately in Table 15.

9.6.2 Criteria for assessment

There are no set threshold or concentration criteria for odour assessment. Under section 49(5) of the EP Act, it is an offence to emit or cause to be emitted, an unreasonable emission from any premises.

An unreasonable emission is defined in the EP Act (section 49(1)) as an emission or transmission of noise, odour or electromagnetic radiation which unreasonably interferes with the health, welfare, convenience, comfort or amenity of any person.

9.6.3 Applicant controls

This assessment has reviewed the Applicant's proposed controls set out below:

- Waste acceptance screening;
- Storage controls;
- Regular covering and compaction of waste (daily and intermediate cover);
- Processing of odorous wastes direct from handling;
- Progressive capping and revegetation of completed cells;
- Minimising the size of the active landfill face (maximum of 30 m x 30 m);
- Monitoring of odour;
- Environmental Management Plan controls for green waste processing including:
 - Consideration of meteorological conditions during the handling of green waste stockpiles to determine wind direction and potential onsite odour impacts
 - Maintaining aerobic stockpile through regular turning to minimise the generation of odour from decomposing green waste
 - Minimising the moisture content of the stockpiles by minimising surface water runoff onto the green waste processing area through maintenance of drainage systems
 - Duration of stockpiling to be minimised where possible to reduce potential odours
 - Minimising the size of stockpiles (maximum of 3 m height and 10 m width)
 - Maintenance of stockpile area levels to ensure no water logging occurs

9.6.4 Key findings

The Delegated Officer has reviewed the information regarding odour emissions and has found:

18. The nearest human receptors, being users of Onslow Road and the proposed extension to the CRCP, and the workers within the adjacent pastoral lands (Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises) are transient in nature. These are considered in the risk assessment below.
19. The closest homestead is located 20 km from the Premises. It is not reasonably foreseeable that odour will be carried this far via wind/air flow. These receptors have been screened out as per the Risk Table above.
20. Putrescible waste is not included within the wastes permitted to be accepted at the Premises.

9.6.5 Consequence

General landfilling operations

Taking into consideration the Applicant's proposed controls, and the waste types included in this assessment if odour emissions occur from the general landfilling operations, the Delegated Officer has determined that the impacts to amenity would be low level on a local scale. Therefore, the Delegated Officer considers the consequence of odour emissions to be **Minor**.

Green waste processing and storage

Taking into consideration the Applicant's proposed controls, if odour emissions occur from the green waste processing and storage activities, the Delegated Officer has determined that the impacts to amenity would be low level on a local scale. Therefore, the Delegated Officer considers the consequence of odour emissions to be **Minor**.

Sewage facility

Taking into consideration the proposed capacity and distance to sensitive receptors, if odour emissions occur, the Delegated Officer has determined that the impacts to amenity would be low level on a local scale. Therefore, the Delegated Officer considers the consequence of odour emissions to be **Minor**.

9.6.6 Likelihood of Risk Event

General landfilling operations

Taking into consideration the distance to and transient nature of sensitive receptors and the controls proposed by the Applicant, the Delegated Officer has determined that odour impacts during general landfilling operations may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood of odour impacts to be **Rare**.

Green waste processing and storage

Taking into consideration the distance to and transient nature of sensitive receptors and the controls proposed by the Applicant, the Delegated Officer has determined that odour impacts during green waste processing and storage may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood of odour impacts to be **Rare**.

Sewage facility

Taking into consideration the distance to and transient nature of sensitive receptors and the controls proposed by the Applicant, the Delegated Officer has determined that odour impacts from the sewage facility may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood of odour impacts to be **Rare**.

9.6.7 Overall rating of odour emissions

General landfilling operations

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of odour emissions impacting amenity during general landfilling operations is **Low**.

Green waste processing and storage

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of odour emissions impacting amenity during green waste processing and storage activities is **Low**.

Sewage facility

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of odour emissions from the sewage facility impacting amenity is **Low**.

9.6.8 Acceptability of risk event

As per DWER's acceptability and treatment of Risk Events the Delegated Officer has determined that the risk event is acceptable and will not be subject to regulatory controls.

9.6.9 Regulatory controls for odour emissions

The Delegated Officer has determined that additional regulatory controls are not required to manage odour emissions from the Premises. Odour emissions from the Premises will be subject to the general provisions of the EP Act and the *Environmental Protection (Unauthorised Discharge) Regulations 2004*.

9.7 Risk Assessment – Noise emissions

9.7.1 Hazard characterisation and impact

Construction

Construction activities including vehicle movements, earthworks and construction/installation of infrastructure may generate noise emissions which may result in health and amenity impacts for people near the Premises. Noise may also impact native fauna of the CRCP resulting in disruption to feeding and breeding habits.

Operation

Activities within the Premises may generate noise emissions which may result in health and amenity impacts for people near the Premises. Noise may also impact native fauna of the CRCP resulting in disruption to feeding and breeding habits.

The key sources of noise emissions are outlined below:

- General operations on the site inclusive of vehicle movements and machinery

operations; and

- Crushing and screening activities.

The Application states that the Premises will operate between the hours of 0600 hrs to 1700 hrs Monday to Sunday.

9.7.2 Criteria for assessment

The Criteria for assessment of noise emissions is the *Environmental Protection (Noise) Regulations 1986* (Noise Regulations) and the Premises activities during construction and operation will be subject to these regulations.

9.7.3 Applicant controls

This assessment has reviewed the Applicant's proposed controls set out below.

- Restricted operating hours;
- Vehicle speed restrictions;
- White noise reversing alarms;
- All equipment and machinery will be fitted with exhaust silencers and acoustic panels to minimise noise emissions;
- Maintaining all equipment, plant and machinery in good working condition

9.7.4 Key findings

The Delegated Officer has reviewed the information regarding noise emissions and has found:

21. The proposed operating hours include hours assigned as night time noise conditions (pre 0700 hrs) as defined in the Noise Regulations
22. Given the distance to nearest sensitive receptors and restriction of operating hours, the Premises is likely to comply with the Noise Regulations.

9.7.5 Consequence

Construction

Human receptors

If noise emissions occur during construction activities, then the Delegated Officer has determined that the impact of noise emissions to public amenity will be minimal on a local scale. Therefore, the Delegated Officer considers the consequence of noise emissions on public health and amenity during construction to be **Slight**.

Environmental receptors

Given the temporary duration of construction activities, the Delegated Officer has determined that the impact of noise emissions on native fauna in the local area will be minimal. Therefore, the Delegated Officer considers the consequence of noise emissions during construction on native fauna to be **Slight**.

General operations

Human receptors

Taking into consideration the hours of operations and distance to sensitive receptors, the

Delegated Officer has determined that the impact of noise emissions from general operations will be low level amenity impacts on a local scale. Therefore, the Delegated Officer considers the consequence of noise emissions during general operations to be **Minor**.

Environmental receptors

Taking into consideration the hours of operations and distance to sensitive receptors, the Delegated Officer has determined that the impact of noise emissions from general operations on native fauna will be minimal on a local scale. Therefore, the Delegated Officer considers the consequence of noise emissions during general operations to be **Minor**.

Crushing and screening activities

Human receptors

Taking into consideration the hours of operation and distance to sensitive receptors, the Delegated Officer has determined that the amenity impact of noise emissions from crushing and screening activities will be low level on a local scale. Therefore, the Delegated Officer considers the consequence to be **Minor**.

Environmental receptors

Taking into consideration the hours of operations and distance to sensitive receptors, the Delegated Officer has determined that the impact of noise emissions from crushing and screening activities on native fauna will be minimal on a local scale. Therefore, the Delegated Officer considers the consequence of noise emissions during general operations to be **Minor**.

9.7.6 Likelihood of Risk Event

Construction

Human receptors

The Delegated Officer has determined that noise emissions from construction activities impacting amenity may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

Environmental receptors

The Delegated Officer has determined that noise emissions from construction activities impacting native fauna may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

General operations

Human receptors

The Delegated Officer has determined that the likelihood of noise emissions from the general operations at the Premises impacting amenity may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

Environmental receptors

The Delegated Officer has determined that the likelihood of noise emissions from general operations impacting native fauna may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

Crushing and screening activities

Human receptors

The Delegated Officer has determined that the likelihood of noise emissions from crushing

and screening activities impacting amenity will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood to be **Unlikely**.

Environmental receptors

The Delegated Officer has determined that the likelihood of noise emissions from crushing and screening activities impacting native fauna will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood to be **Unlikely**.

9.7.7 Overall rating of noise emissions

Construction

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of noise emissions impacting amenity and public health during construction is **Low**.

Environmental receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of noise emissions impacting native fauna during construction is **Low**.

General operations

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of noise impacting amenity and public health during general landfilling operations is **Low**.

Environmental receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of noise impacting native fauna during general landfilling operations is **Low**.

Crushing and screening activities

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of noise emissions impacting amenity and public health during crushing and screening activities is **Medium**.

Environmental receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of noise emissions impacting native fauna during crushing and screening activities is **Medium**.

9.7.8 Acceptability of risk event

As per DWER's acceptability and treatment of Risk Events the Delegated Officer has determined that the risk event is acceptable and will be subject to some regulatory controls to maintain its acceptability

9.7.9 Regulatory controls for noise emissions

The Applicant will be restricted to operating between the hours of 0600 hrs to 1700 hrs Monday to Sunday. This is consistent with the Applicant's proposed operating hours. Additional controls will be considered as part of the licence assessment including equipment and machinery maintenance.

9.8 Risk Assessment – Vermin/pests and weeds

9.8.1 Hazard characterisation and impact

Typical vermin that can be found on landfill sites include rats, mice, flies, mosquitoes, feral cats, foxes, birds and cockroaches. If uncontrolled, these vermin can be a nuisance and affect public health and surrounding native ecosystems.

Non-native flora (weeds) may also establish on cleared ground and impact on surrounding native vegetation habitat.

Vermin may be transported in wastes received at the site or may be attracted to the area due to the presence of waste (food source). Weeds may be transported on vehicles and may establish due to the disturbed nature of the land around the Premises. The presence of vermin may be a nuisance to residential premises and may impact on native ecosystem function.

9.8.2 Criteria for assessment

Amenity impacts and impacts to ecosystems from pests and vermin can be assessed against the general provisions of the EP Act.

9.8.3 Applicant controls

This assessment has reviewed the Applicant's proposed controls set out below:

- Wheel and vehicle wash facilities to remove any potential introduced flora plants or seeds;
- Feral and Pest Management Plan (Terrestrial Ecosystems, 2018) which includes:
 - Staff induction/training;
 - Maintenance of register of feral and pest species seen or recording in the waste management facility;
 - Non-provision of food and water for native and exotic species by staff or users of the facility;
 - Gatehouse staff observations to prevent feral and pest species entering the facility when open;
 - Covering of waste as soon as practicable;
 - Maintenance of fencing and access gate – the facility will be enclosed with a floppy top fence with an external skirt with a suitable access gate(s) at the entrance;
 - Permanent monitoring of feral mammals using remotely monitored 3G/4G camera traps; and
 - Trapping, baiting, shoot feral and pest species, and hand catch and relocate native fauna.

9.8.4 Consequence

Human receptors

If vermin/pests and/or weeds emissions occur, then the Delegated Officer has determined that

the impact will be a low-level impact to amenity on a local scale. Therefore, the Delegated Officer considers the consequence of vermin/pests and/or weeds impacting public health and amenity to be **Minor**.

Environmental receptors

If vermin/pests and/or weeds emissions occur, then the Delegated Officer has determined that the impact on native ecosystems will be low-level offsite on a local scale. Therefore, the Delegated Officer considers the consequence of vermin/pests and/or weeds on native ecosystems to be **Moderate**.

9.8.5 Likelihood of Risk Event

Human receptors

Taking into consideration the distance and nature of sensitive receptors and the Applicant's proposed controls, the Delegated Officer has determined that impacts to public health and amenity will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of vermin/pests and/or weeds impacting public health and amenity to be **Unlikely**.

Environmental receptors

Taking into consideration the distance to sensitive receptors and the Applicant's proposed controls, the Delegated Officer has determined that impacts to native ecosystems from vermin/pests and/or weeds will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of vermin/pests and weeds impacting native ecosystems to be **Unlikely**.

9.8.6 Overall rating of vermin/pests and weeds

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of vermin/pests and/or weeds impacting public health and amenity is **Medium**.

Environmental receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of vermin/pests and/or weeds impacting native ecosystems is **Medium**.

9.8.7 Acceptability of risk event

As per DWER's acceptability and treatment of Risk Events the Delegated Officer has determined that the risk event is acceptable and will be subject to some regulatory controls to maintain the acceptability during operations.

9.8.8 Regulatory controls for vermin/pests and weeds

Controls proposed by the Applicant with an emphasis on physical barriers (fencing and gates) and inspections and maintenance are considered appropriate for the management of pests and vermin at the Premises.

The Applicant will be required to implement the following controls to manage the potential impacts from vermin/pests and weeds:

- Acceptance and throughput controls;
- Infrastructure controls including fencing to prevent feral animals entering the facility; and

- Operational controls in an operational licence including inspections and maintenance program, regular covering of waste with cover material and maintaining appropriate quantities of cover material onsite.

These controls generally replicate the Applicant's proposed controls and are considered appropriate by the Delegated Officer to manage the risk of vermin/pests and weeds.

9.9 Risk Assessment – Windblown waste

9.9.1 Hazard characterisation and impact

Litter from landfilling of waste may be spread over a wide area by wind movement, impacting public amenity and potentially impacting wildlife and causing detriment to the conservation values of the Cane River Conservation Park (CRCP).

Sources of litter at the Premises include:

- Vehicles transporting waste into the landfill;
- The active tipping face; and
- Exposed surfaces of the landfill.

9.9.2 Criteria for assessment

Litter deposited onto land or into waters may be an offence under the *Litter Act 1979*.

9.9.3 Applicant controls

This assessment has reviewed the Applicant's proposed controls set out below:

- Fencing of perimeter area and use of litter screens with a minimum height of 1.8 m;
- Acceptance of covered waste loads;
- Operating restrictions for 'strong winds' (all works and receipt of waste cease during periods of strong winds (>40 km/h));
- Restricted active tipping area size;
- Routine collection of windblown waste (weekly collections focusing on perimeter fencing, gates and litter screens);
- Regular covering of waste and compaction of waste loads;
- All waste collection vehicles are covered during transport to avoid materials escaping during transport off and onsite;
- Progressive capping following completion of each cell; and
- Maintenance of a complaints register for reporting any issues relating to litter.

9.9.4 Consequence

Human receptors

Taking into consideration the distance to sensitive receptors and the Applicant's proposed controls, if windblown waste emissions occur, then the Delegated Officer has determined that the impact to amenity will be low level on a local scale. Therefore, the Delegated Officer considers the consequence of windblown waste emissions to be **Minor**.

Environmental receptors

If windblown waste emissions occur, then the Delegated Officer has determined that the

impact of windblown waste emissions on native ecosystem function and conservation value of the offsite CRCP will be low level on a local scale. Therefore, the Delegated Officer considers the consequence of windblown waste emissions on the CRCP to be **Moderate**.

9.9.5 Likelihood of Risk Event

Human receptors

Taking into consideration the Applicant's proposed controls, the Delegated Officer has determined that windblown waste emissions will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of windblown waste emissions impacting amenity to be **Unlikely**.

Environmental receptors

Taking into consideration the Applicant's proposed controls, the Delegated Officer has determined that the likelihood of windblown waste emissions impacting native ecosystems will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of windblown waste emissions impacting native ecosystems to be **Unlikely**.

9.9.6 Overall rating of windblown waste emissions

Human receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of windblown waste impacting public amenity is **Medium**.

Environmental receptors

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of windblown waste impacting the CRCP is **Medium**.

9.9.7 Acceptability of risk event

As per DWER's acceptability and treatment of Risk Events the Delegated Officer has determined that the risk event is acceptable and will be subject to some regulatory controls to maintain the acceptability.

9.9.8 Regulatory controls for windblown waste emissions

The Applicant will be required to install fencing around the perimeter of the Premises as part of the Works Approval.

The use of litter screens, regular covering of waste and reducing the area of the active tipping face are appropriate controls to reduce the amount of windblown waste from the Premises.

Regulatory controls to be included in an operational licence to manage the risk of windblown waste will include:

- Infrastructure controls including the requirement to maintain litter screens; and
- Operational controls including the collection of windblown waste from fences, use of litter screens, inspections and maintenance of the site, access roads to enable regular inspection and collection and the regular covering of waste.

These controls are generally consistent with those proposed by the Applicant.

9.10 Risk Assessment – Smoke/fire event

9.10.1 Hazard characterisation and impact

Normal operations are unlikely to cause fire and smoke emissions. Storage of waste at the Premises including tyres, green waste and flammable solid wastes provides a fuel source for a potential fire. There is also the potential for spontaneous combustion of flammable wastes where wastes are exposed to oxygen (i.e. left uncovered) for extended periods of time. Tyre storage and green waste storage/processing onsite also provide potential fuel sources if ignited. Rubber and green waste are both potentially susceptible to spontaneous combustion.

In the event of an unplanned fire event, smoke would be released, this may cause amenity and public health impacts for human receptors. The inhalation of particulate matter can cause respiratory distress. The burning of waste and vegetation surrounding the landfill can cause damage and impact to terrestrial habitat.

Fire within the waste body may impact the liner integrity of the basal or side lining which could give rise to leachate emissions. The risk of leachate emissions has been assessed separately in Section 9.4.

9.10.2 Criteria for assessment

There are no specific consequence criteria for smoke emissions or damage to terrestrial ecosystems. The general provisions of the EP Act make it an offence to cause or allow unreasonable emissions that unreasonably interfere with the health, welfare, convenience, comfort or amenity of any person. Additionally, section 50A of the EP Act makes it an offence for a person who causes, or allows to be caused, material environmental harm.

9.10.3 Applicant controls

This assessment has reviewed the Applicant's proposed controls set out below:

- Waste acceptance screening;
- Daily covering and compaction to remove voids/spaces in landfill;
- Stockpile size restrictions and separation;
- 100 m buffer to vegetative waste (Green Waste) storage area;
- 30 m buffer to Inert Waste Type 2 storage area;
- Fire suppression equipment maintained on the Premises (100,000 L water tank or two 50,000 L tanks, fire extinguishers);
- Use of 10,000 L all-wheel drive water cart for fire suppression;
- Storage of materials in accordance with the *Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007* and AS 1940-2017;
- Tyre storage in accordance with the Department of Fire and Emergency Services *Guidance Note: GN02 Bulk storage of rubber tyres including shredded and crumbed tyres* (DFES, 2019); and
- Emergency Response Plan, Bushfire Management Plan (Bushfire Prone Planning, 2018a) and Risk Management Plan for Bushfire (Bushfire Prone Planning, 2018b).

9.10.4 Key findings

The Delegated Officer has reviewed the information regarding smoke/fire

emissions and has found:

23. Dominant prevailing wind directions are easterly to southerly to south-easterly in the morning and westerly to north-westerly in the afternoon (Figure 4) meaning there is potential for smoke/fire emissions to impact sensitive pastoral stations and leases and the CRCP as well as Wheatstone oil and gas workers and Onslow townsite depending on the extent of a fire/smoke emissions.

9.10.5 Consequence

Landfill fire – smoke emissions

If a landfill fire were to occur, then the Delegated Officer has determined that the impact of smoke emissions could result in low level or occasional medical treatment as well as mid-level impacts to amenity on a local scale. Therefore, the Delegated Officer considers the consequence of smoke emissions from a landfill fire to be **Moderate**.

Tyre fire – smoke emissions

Taking into consideration the composition and quantity of tyres to be accepted onsite, if a tyre fire were to occur at the Premises, then the Delegated Officer has determined that the impact of smoke emissions and fire could be catastrophic onsite with mid-level or above impacts offsite. Therefore, the Delegated Officer considers the consequence to be **Severe**.

Green waste fire – smoke emissions

If a green waste fire were to occur, then the Delegated Officer has determined that the impact of smoke emissions could be mid-level impacts to amenity on a local scale with low or occasional medical treatment. Therefore, the Delegated Officer considers the consequence of smoke emissions from a green waste fire to be **Moderate**.

Damage to landfill liner integrity

If an unauthorised fire occurs within the landfill, then the Delegated Officer has determined that the impact of fire emissions on the integrity of the landfill liner and subsequently groundwater and surrounding ecosystems will be mid-level on a local scale. Therefore, the Delegated Officer considers the consequence of fire impacts on the landfill liner to be **Major**.

Fire emissions

If fire emissions occur from the Premises, then the Delegated Officer has determined that the impact of fire emissions to surrounding conservation category flora and fauna will be mid-level on a local scale. Therefore, the Delegated Officer considers the consequence of fire emissions to native flora and vegetation to be **Major**.

9.10.6 Likelihood of Risk Event

Landfill fire – smoke emissions

The Delegated Officer has determined that smoke emissions from a landfill fire impacting public health and amenity will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood to be **Unlikely**.

Tyre fire – smoke emissions

Taking into consideration the Applicant's proposed controls for tyre storage including storage in accordance with DFES requirements, the Delegated Officer has determined that smoke

emissions from a tyre fire impacting public health and amenity may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

Green waste fire – smoke emissions

Taking into consideration the Applicant's proposed controls for green waste storage and processing, particularly storage and management in accordance with DFES requirements, the Delegated Officer has determined that the likelihood of smoke emissions from a green waste fire impacting public health and amenity may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

Damage to landfill liner integrity

Taking into consideration the Applicant's proposed controls, the Delegated Officer has determined that the likelihood of a fire occurring resulting in damage to the landfill liner and potential contamination of groundwater and associated ecosystems would only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

Fire emissions

Taking into consideration the Applicant's proposed controls, in particular the maintenance of buffers between waste storage areas, the Delegated Officer has determined that the likelihood of fire spreading to surrounding vegetation including flora and fauna in the CRCP would only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood to be **Rare**.

9.10.7 Overall rating of smoke/fire event

Landfill fire – smoke emissions

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of smoke emissions from a landfill fire at the premises is **Medium**.

Tyre fire – smoke emissions

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of smoke emissions from a tyre fire at the Premises is **High**.

Green waste fire – smoke emissions

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of smoke emissions from a green waste fire at the Premises is **Medium**.

Damage to landfill liner integrity

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of damage to landfill liner integrity due to a fire in the landfill at the Premises is **Medium**.

Fire emissions

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 16) and determined that the overall rating for the risk of fire emissions at the Premises is **Medium**.

9.10.8 Acceptability of risk event

As per DWER's acceptability and treatment of Risk Events the Delegated Officer has determined that the risk event may be tolerated and may be subject to multiple regulatory controls.

9.10.9 Regulatory controls for smoke/fire event emissions

The Applicant will be required to implement the following controls to manage the potential impacts of fires:

- Infrastructure controls including maintenance of fire suppression infrastructure and water cart with sufficient water available in the event of a fire;
- Operational controls including having sufficient cover material available onsite and regular covering and compaction of waste; and
- Stockpile/storage requirements including maintenance of buffers.

These controls generally replicate the Applicant's proposed controls and the requirements of DFES.

The Applicant will also be required to adhere to the requirements of the *Bush Fires Act 1954* which includes the maintenance of fire breaks.

9.11 Risk Assessment – Asbestos emissions

9.11.1 Hazard characterisation and impact

Asbestos waste is proposed to be received at the Premises during operations for disposal. Asbestos fibres can pose significant health risks to human receptors such as mesothelioma and other health impacts.

9.11.2 Criteria for assessment

The Department of Health's *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (DOH, 2009) specify criteria for assessment of dust emissions that have the potential to contain asbestos.

9.11.3 Applicant controls

All waste loads accepted to the landfill are to be covered upon receipt, asbestos acceptance will be consistent with *Environmental Protection (Controlled Waste) Regulations 2004*.

This assessment has reviewed the controls set out below:

- ≥24 hours prior notification to the gatehouse is required before the arrival of declared asbestos waste loads for disposal.
- Transport and management of asbestos waste is subject to the provisions of the *Environmental Protection (Controlled Waste) Regulations 2004* including wrapping and labelling requirements for waste acceptance.
- All declared loads will be inspected at the gatehouse prior to acceptance.
- Declared asbestos waste will be directed to the asbestos monocell.
- All asbestos waste will be disposed of to the designated asbestos monocell immediately upon acceptance.
- All waste identified as containing asbestos or potentially containing asbestos after being accepted on site will also be disposed of to the asbestos monocell.

- The asbestos monocell is planned to cover a total area of 3,100 m² and will be excavated to a maximum 4 m BGL with a minimum 1 m of cover material following waste disposal.
- Once covered, compaction will occur, and placement will be recorded within an asbestos disposal register.

9.11.4 Key findings

The Delegated Officer has reviewed the information regarding asbestos emissions and has found:

24. The nearest human receptors, being users of Onslow Road and the proposed extension to the CRCP, and the workers within the adjacent pastoral lands (Minderoo and Peedamulla station extend from ~3.2 km west and ~8 km north of the Premises) are transient in nature. These are discussed in the risk assessment below.
25. The closest homestead is located 20 km from the Premises. It is not reasonably foreseeable that asbestos fibres will be carried this far via wind/air flow and therefore these receptors were screened out in the Risk Table above.

9.11.5 Consequence

Human receptors may experience high level adverse health impacts when exposed to asbestos fibres. Therefore, the Delegated officer considers that the consequence rating for asbestos is **Severe**.

9.11.6 Likelihood of Risk Event

Based on the Applicant's proposed controls to manage asbestos waste and given the large separation distances to the nearest offsite receptors, the Delegated Officer has determined that the likelihood of severe impacts to human health from asbestos emissions may only occur in exceptional circumstances. Therefore, the Delegated Officer considers the likelihood of asbestos emissions to be **Rare**.

9.11.7 Overall rating of asbestos emissions

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix and determined that the overall rating for the risk of asbestos emissions on human receptors is **High**.

9.11.8 Acceptability of risk event

As per DWER's acceptability and treatment of Risk Events the Delegated Officer has determined that the risk event may be tolerated and may be subject to multiple regulatory controls.

9.11.9 Regulatory controls for asbestos emissions

The Applicant will be required to implement the following controls to manage the potential impacts from asbestos emissions:

- Operational controls including waste acceptance and handling requirements and requirements to bury asbestos in the designated monocell area;
- Requirements for covering asbestos waste;
- Maintaining records of where asbestos is disposed; and

- Sampling requirements for crushed C&D waste prior to re-use off the Premises.

These controls are considered necessary by the Delegated Officer due to the high risk rating for asbestos emissions. These controls generally replicate the Applicant's controls as well as the recommendations specified in the Department's *Guidelines for managing asbestos at construction and demolition waste recycling facilities* (DEC, 2012) (Asbestos Guidelines), and are considered necessary by the Delegated Officer in managing potential impacts.

10. Determination of Works Approval conditions

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

Sections 9.4 to 9.11 provide a summary of the regulatory conditions to be applied to this works approval.

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

11. Information to be provided for Licence application

This assessment has identified a number of aspects that will be considered in greater detail as part of the assessment of the licence applications that is expected to be submitted prior to acceptance of waste at the Premises. Table 19 outlines information that should be provided by the Applicant as part of any subsequent licence application. It is noted that this list is not exhaustive and that DWER may request additional information to be provided as part of that assessment.

Table 19: Information to be provided with Licence application

Decision Report section	Item description
Section 3.3 – Table 4	Additional operational controls for leachate management in addition to automated monitoring and extraction of leachate in the sump.
Section 4.2	Delineation of the areas of land that are required to maintain long term stability and integrity of all landfill infrastructure.
Section 6.6	Should putrescible waste be proposed for acceptance in the future, the suitability of proposed landfill gas management infrastructure to control potential risks should be provided.
Section 7.4 – Table 12	Proposed monitoring locations for leachate and landfill gas; and Proposed parameters to be monitored in treated wastewater.
Section 9 – Table 14	Provide confirmation of maximum quantities of fuel and other chemicals that are proposed to be stored onsite.
Section 9.4.4	Sufficient information to demonstrate leachate storage management processes that will maintain integrity of the liner during the dry season (with low or no liquid levels); and A monitoring plan for regular validation of leachate pond liner integrity.
Section 9.7.9	Additional noise controls including equipment and machinery maintenance.

Decision Report section	Item description
Section 9.9	Updates of the Emergency Response Plan to address: <ul style="list-style-type: none"> • Containment and preventative actions to mitigate spread of fire suppressant waters; • Full list of emergency contacts; and • Cyclone events.

12. Applicant's comments

The Applicant was provided with the draft Decision Report and draft Works Approval on 11 October 2019. The Applicant provided comments on 18 October 2019 which are summarised, along with DWER's response, in Appendix 3.

13. Conclusion

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

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

Ed Schuller

Delegated Officer

under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

Document title	In text reference	Availability
Supporting documentation to application		
10) Shire of Ashburton, <i>Department of Water and Environmental Regulation EP Act Part V application form - Pilbara Regional Waste Management Facility</i>	N/A	Application (DWERDT145447)
11) Talis Consultants Pty Ltd 2018, <i>Works approval supporting document Pilbara regional waste management facility</i>	Talis 2018a	Application (DWERDT145444)
12) Talis Consultants Pty Ltd 2018, <i>Application drawing set (x 35)</i> Partially superseded by item 39) below	N/A	Application (DWERDT145442)
13) Talis Consultants Pty Ltd 2018, <i>Asbestos Management Plan Pilbara Regional Waste Management Facility</i>	N/A	(DWERDT145441)
14) Bushfire Prone Planning 2018, <i>Bushfire Management Plan (Development Application)</i>	Bushfire Prone Planning 2018a	Bushfire management plan (DWERDT145438; and DWERDT145439)
15) Bushfire Prone Planning 2018, <i>Risk Management Plan for bushfire</i>	Bushfire Prone Planning 2018b	
16) Terrestrial Ecosystems 2018, <i>Feral and Pest Management Plan for the Pilbara Regional Waste Management Facility</i>	Terrestrial Ecosystems 2018	Feral and pest management plan (DWERDT145436)
17) Pells Sullivan Meynink Pty Ltd 2017, <i>Onslow waste facility flood study report</i>	Pells Sullivan and Meynink 2017	Flood management study (DWERDT145435 and DWERDT146891-899)
18) Talis Consultants Pty Ltd 2018, <i>Surface Water Management Plan Pilbara Regional Waste Management Facility</i>	N/A	(DWERDT145431)
19) Pells Sullivan Meynink Pty Ltd 2018, <i>Pilbara Regional Waste Management Facility Surface Water Review</i>	Pells Sullivan and Meynink 2018	(DWERDT145430)
20) Phoenix Environmental Sciences 2017, <i>Flora and vegetation survey and terrestrial fauna survey for the Pilbara Regional Waste Management Facility</i>	Phoenix 2017	Flora and fauna survey (DWERDT145428)
21) Phoenix Environmental Sciences 2018, <i>Detailed flora and vegetation survey for the Pilbara Regional Waste Management Facility</i>	N/A	(DWERDT145427)

Document title	In text reference	Availability
22) Archae-aus Pty Ltd August 2015, <i>A report of the Aboriginal archaeological survey of the proposed Onslow Waste Management Facility, Pilbara, Western Australia</i>	N/A	(DWERDT145424; and DWERDT145425)
23) Archae-aus Pty Ltd August 2017, <i>A report on an Aboriginal archaeological assessment of an additional area adjacent to the waste management facility, near Onslow, Western Australia</i>	N/A	
24) Talis Consultants Pty Ltd 2018, <i>Geotechnical Investigation Onslow site investigations</i>	Talis 2018b	Geotechnical investigation (DWERDT145420)
25) Talis Consultants Pty Ltd 2018, <i>Phase 1 Hydrogeological Risk Assessment DRAFT</i>	Talis 2018c	Phase 1 hydrogeological risk assessment (DWERDT145419)
26) Rockwater Pty Ltd 2018, <i>Review of hydrogeological investigations for proposed Pilbara regional waste management facility near Onslow</i>	N/A	(DWERDT145418)
27) Talis Consultants Pty Ltd 2018, <i>Phase 2 Hydrogeological Risk Assessment;</i> incl. Talis Consultants Pty Ltd 2018, <i>Seepage assessment liner performance.</i>	Talis 2018d	Phase 2 hydrogeological risk assessment (DWERDT145417)
28) Talis Consultants Pty Ltd 2018, <i>Leachate Management Plan Pilbara Regional Waste Management Facility</i>	N/A	(DWERDT145414)
29) Talis Consultants Pty Ltd 2018, <i>Residual Risk Assessment – works approval application Pilbara Regional Waste Management Facility</i>	N/A	(DWERDT145412)
Submissions in response to DWER requests for information		
30) Talis Consultants Pty Ltd 2019, Letter response to DWER request for information 'Works Approval Application – Pilbara Regional Waste Management Facility' dated 7 January 2019.	N/A	DWERDT124286
31) Talis Consultants Pty Ltd 2018, <i>Landfill gas risk assessment 150 Onslow Road Talanyji, Onslow</i>	Talis 2018e	Landfill gas risk assessment (A1753464)
32) Talis Consultants Pty Ltd 2019, <i>Operational and environmental management plan</i>	Talis 2019a	OEMP (DWERDT124293)
33) Talis Consultants Pty Ltd 2019, Letter response to DWER request for information 'Works Approval Application – Pilbara Regional Waste Management Facility' dated 13 February 2019.	N/A	(DWERDT134535)
34) Talis Consultants Pty Ltd 2019, <i>Stability risk assessment Pilbara Regional Waste Management Facility</i>	Talis 2019b	Stability risk assessment (DWERDT134536)

Document title	In text reference	Availability
35) Talis Consultants Pty Ltd 2019, <i>Construction Quality Assurance Plan Pilbara Regional Waste Management Facility – Cell 1 development and associated works</i> ; incl. Talis Consultants Pty Ltd 2019, <i>Technical Specifications Pilbara Regional Waste Management Facility – cell 1 development and associated works</i>	Talis 2019c	CQA Plan (DWERDT134537)
36) Talis Consultants Pty Ltd 2019, Letter response to DWER request for information 'Application for a Works Approval (W6225/2019/1) – Request for Further Information (Items 1-17)' dated 20 June 2019.	Talis 2019d	(A1802079)
37) Talis Consultants Pty Ltd 2019, <i>Emergency Response Plan Pilbara Regional Waste Management Facility</i>	Talis 2019e	ERP (A1802081)
38) Talis Consultants Pty Ltd 2019, <i>Construction and Demolition Sampling Plan Pilbara Regional Waste Management Facility</i>	N/A	(A1802080)
39) Talis Consultants Pty Ltd 2019, <i>PRWMF Drawing Set</i>	N/A	(A1802082)
Other reference documents		
40) ANCOLD 2017, <i>DRAFT ANCOLD Guidelines for Design of Dams and Appurtenant Structures for Earthquake</i> . Australian National Committee on Large Dams, Hobart.	ANCOLD 2017	www.ancold.org.au
41) BoM 2019, <i>Climate Data Online – Station No. 005017</i> . Bureau of Meteorology.	BoM 2019	www.bom.gov.au
42) DBCA 2017, <i>Priority Ecological Communities for Western Australia</i> Version 27. Species and Communities Branch, Department of Biodiversity, Attractions and Conservation, Perth.	DBCA 2017	www.dbca.wa.gov.au
43) DEC 2012, <i>Guidelines for managing asbestos at construction and demolition waste recycling facilities</i> . Department of Environment and Conservation, Perth.	DEC 2012	www.dwer.wa.gov.au
44) DEE 2008, <i>Bioregion – Pilbara</i> . Department of the Environment and Energy, Canberra.	DEE 2008	www.environment.gov.au
45) DER 2015, <i>Guidance Statement: Regulatory principles</i> . Department of Environment Regulation, Perth.	N/A	www.dwer.wa.gov.au
46) DER 2015, <i>Guidance Statement: Setting conditions</i> . Department of Environment Regulation, Perth.	N/A	
47) DER 2016, <i>Guidance Statement: Licence duration</i> . Department of Environment Regulation, Perth.	N/A	

Document title		In text reference	Availability
48)	DER 2016, <i>Guidance Statement: Environmental Siting</i> . Department of Environment Regulation, Perth.	N/A	
49)	DER 2017, <i>Guidance Statement: Risk Assessments</i> . Department of Environment Regulation, Perth.	N/A	
50)	DFES 2014, <i>Bulk Green Waste Storage Fires</i> . Department of Fire and Emergency Services, Perth.	DFES 2014	www.dfes.wa.gov.au
51)	DFES 2019, <i>Guidance Note: GN02 – Bulk Storage of Rubber Tyres including Shredded and Crumbed Tyres</i> . Department of Fire and Emergency Services, Perth.	DFES 2019	
52)	DOH 2009, <i>Guidelines for Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia</i> . Department of Health, Perth.	DOH 2009	www.health.wa.gov.au
53)	DOH 2014, <i>Contaminated Sites Ground and Surface Water Chemical Screening Guidelines</i> . Department of Health, 2014.	DOH 2014	
54)	DWER 2019, <i>Guideline: Decision making</i> . Department of Water and Environmental Regulation, Perth.	N/A	www.dwer.wa.gov.au
55)	DWER 2019, <i>Guideline: Industry Regulation Guide to Licensing</i> . Department of Water and Environmental Regulation, Perth.	N/A	
56)	EPA Victoria 2015, <i>Best practice environmental management, Siting, design, operation and rehabilitation of landfills (VIC BPEM)</i> . Environment Protection Authority Victoria, Melbourne.	EPA Victoria 2015	www.epa.vic.gov.au
57)	Geoscience Australia 2018, <i>National Seismic Hazard Assessment</i> .	Geoscience Australia 2018	www.ga.gov.au
58)	NEPC 1998, <i>National Environment Protection (Ambient Air Quality) Measure as amended</i>	NEPC 1998	www.environment.gov.au
59)	OAC 2019, <i>Pilbara Waste Management Facility, 150 Onslow Road, Talandji</i> . Office of the Appeals Convenor, Perth.	OAC 2019	www.appealsconvenor.wa.gov.au

Appendix 2: DWER consultation

Date	Entity	Items raised/ referred	Comments	DWER Response
4 April 2019	Department of Biodiversity Conservation and Attractions	Application referral, including bush fire management, vermin and pest controls, flora and fauna surveys and environmental values	<p>Received 29 April 2019 (dated 24 April 2019)</p> <ul style="list-style-type: none"> • DBCA notes that the proposed facility is located within Mt Minni ex-pastoral land, a proposed addition to the Cane River Conservation Park (CRCP), and hence the department does have an interest in the development and management of the facility. • DBCA's Pilbara Regional Manager will provide advice and comment on the works approval in due course. <p>Received 10 May 2019:</p> <ul style="list-style-type: none"> • For context, the lease upon which the facility will sit is surrounded by the former part Mount Minnie Pastoral Lease. DBCA purchased the former part Mount Minnie pastoral lease in 1999 with State and Commonwealth Government funding to be an addition to the CRCP. • No comment has been provided on the bushfire management and risk plans as these are being reviewed by the Department of Fire and Emergency Services as the lead agency. The biological surveys have been assessed, and comment provided under Clearing Permit CPS8395/2019/1 • DBCA has reviewed the "<i>Feral and Pest Management plan for the Pilbara Regional Waste Management Facility</i>" (Terrestrial Ecosystems, 2018) and provides the following comments: <ul style="list-style-type: none"> ○ It is recommended that references to the now repealed <i>Wildlife Conservation Act 1950</i> are 	<p>The proposed extension of the CRCP has been considered as a receptor in DWER's risk assessment.</p> <p>The works approval includes the requirement to install a security fence a minimum height of 1.8m with a 600 mm overhang and skirt around the entire site boundary, which will assist in limiting the migration of native fauna into the Premises and limit the risk of any pest species leaving the Premises.</p> <p>Conditions are likely to be included on any subsequent licence for the Applicant to maintain the integrity of the permitter fence, maintaining sufficient cover material on site and applying cover daily to the waste to discourage scrounging from feral animals.</p>

Date	Entity	Items raised/ referred	Comments	DWER Response
			<p>replaced with the <i>Biodiversity Conservation Act 2016</i>;</p> <ul style="list-style-type: none"> ○ All references to the requirement for a Regulation 4 permit should be removed and replaced with the following: <ul style="list-style-type: none"> ▪ Regulation 28 – Fauna taking (relocation) licence ▪ Regulation 29 – Fauna causing damage licence ○ It is strongly recommended that all reasonable efforts should be taken to ensure native and introduced species do not become problematic with appropriate site management measures. With appropriate best management practices of the facility it is envisaged that there should not be an increase in feral or pest animal species in the area, nor impact the values of the adjacent proposed conservation areas or Cane River Conservation Park • The proponent is strongly recommended to attempt all non-lethal capture methods in the first instance. If an application is received by DBCA for a Regulation 29 Licence to cause damage under the BC Act, then it will only be considered as a last resort. It would need to be demonstrated that the proponent has exhausted all other management measures prior to the application to damage being sought. The proponent is referred to Schedule 1 and 2 of the BC Regulations regarding prohibited devices and methods of euthanizing; • DBCA is generally supportive of the management actions identified in Section 3, however cannot comment on Section 3.9 including the trigger levels provided in Table 3 as it is not clear where these figures have been sourced 	<p>Additional conditions for the licence may require that green waste on site is pasteurised to prevent weed growth and migration.</p> <p>Clearing Permit 8395/1 specifies specific controls for the protection of native flora and fauna species.</p> <p>Applicant to note DBCA's last two comments regarding priority fauna species and that the permitter fence surrounds access roads.</p>

Date	Entity	Items raised/ referred	Comments	DWER Response
			<p>from. In relation to any requirement to 'damage fauna, DBCA's advice above applied.</p> <ul style="list-style-type: none"> In relation to the use of rodenticides, DBCA concurs with the proponent that it can result in off-target species being impacted. As the short-tailed mouse, <i>Leggadina lakedownensis</i> (P4) and the peeble-mound mouse, <i>Pseudomys chapmani</i> (P4) were identified as 'likely' and 'potentially' occurring within the project area, it is recommended that a soft approach is attempted in the first instance to ensure that the species is protected. One approach may be considered is the use of a dry trapping method whereby a bucket trap is used so that it allows for the identification of the species to be determined, and then the appropriate action is taken; Should one of the priority species with a potential to occur in the area be identified, attempts should be made to encourage dispersal (relocation) by a suitably qualified practitioner and with appropriate approval from DBCA (a fauna taking (relocation) licence); and From Table 2 p.g. 13 it would appear that either of the 'floppy top' fencing options has the potential to be highly effective as a long-term barrier to the movement of feral animals into and out of the facility and would have in-principle support from the DBCA. It is not clear if the whole facility including the access road is proposed to be fenced. It is the DBCA's recommendation that this should occur. 	
4 April 2019	Department of Fire and Emergency Services	Application referral, including fire management	None provided	N/A
4 April 2019	Department of Planning, Lands and Heritage	Application referral, including Aboriginal heritage	<p>Received 2 May 2019 (dated 18 April 2019):</p> <ul style="list-style-type: none"> The DPLH suggests that DWER contacts the Thalanyji Native Title Claim Group who are represented by the 	<p>BTAC were referred the application as a stakeholder.</p> <p>Additional comments noted.</p>

Date	Entity	Items raised/ referred	Comments	DWER Response
			<p>Buurabalayji Thalanyji Aboriginal Corporation (BTAC) to seek their comments on the proposal.</p> <p>Additional comments received 3 May 2019:</p> <ul style="list-style-type: none"> The proposed works to be undertaken are within Lot 550 on DP 414367, which comprises portion of Reserve 53324 for the purpose "Waste Disposal site" with a Management Order in favour of the Shire of Ashburton. Reserve 53324 was created in November 2018 after extensive consultation between the Department of Planning Lands and Heritage (DPLH) and the Department of Jobs, Tourism, Science and Innovation and the Shire in order to facilitate the construction and operation of the Pilbara Regional Waste Management Facility. Based on the information provided, the works are consistent with both the purpose of Reserve 53324 and conditions of its associated Management Order. Further, 53324 lies within an area where there is no current native title claim or determination. A review of the Register of Places and Objects, the DPLH Aboriginal Heritage Database and the information provided by DWER concludes the proposed work area does not intersect with a known Aboriginal heritage site. Therefore based on the information held by DPLH, no approvals under the <i>Aboriginal Heritage Act 1972 (AHA)</i> are required. The DPLH encourages proponents to refer to the State's Aboriginal Heritage Due Diligence Guidelines (Guidelines) which can be found on the DPLH website. The Guidelines allow proponents to undertake their own risk assessment regarding any proposal's potential impact on Aboriginal heritage. 	
4 April 2019	Department of Jobs, Tourism,	Application referral	<p>Received 29 July 2019:</p> <ul style="list-style-type: none"> Through the Ashburton North State Development Agreement (Wheatstone Project), administered by the 	Comments regarding timeframes were considered

Date	Entity	Items raised/ referred	Comments	DWER Response
	Science and Innovation		<p>Department of Jobs, Tourism, Science and Innovation (JTSI), Chevron Australia Pty Ltd has committed around \$2 million to this project. The Shire is also contributing \$2 million to the project and, with JTSI's endorsement, secured a further \$9 million in project funding through the Commonwealth Building Better Regions Fund.</p> <ul style="list-style-type: none"> • To meet the requirements of this Building Better Regions funding, it is vital the Shire's applications for a clearing permit and a works approval under Part V of the <i>Environmental Protection Act 1986</i> are finalized by the end of September 2019. • Officers from the Shire have raised concerns about the project timeframes following a meeting with the Office of the Minister for Environment on 22 July. These concerns seem to stem from issues around the interaction of the proposed waste facility with a sand resource which forms part of the site. • As DWER officers are aware, a reserve has been created for the project with a management order granted in favour of the Shire. The reserve is to be used for the designated purpose of "<i>Waste Disposal Site</i>" and a condition of the management order is that "<i>The Management Body acknowledges a sand resource exists within the Reserve boundary and may be required for extraction in the future, to the extent it is not required for the Management Body's activities under the Reserve Purpose</i>" • This management order condition was developed through consultations between JTSI, the Department of Planning Lands and Heritage and the Department of Mines, Industry Regulation and Safety to enable co-existence of waste management and sand mining activities where possible. Essentially, the requirements of the waste management facility are intended to prevail over any potential future sand mining activities at the site. 	<p>in the assessment of the works approval application.</p> <p>Matters relating to the Management Order are addressed in the Decision Report.</p>

Date	Entity	Items raised/ referred	Comments	DWER Response
4 April 2019	Department of Mines, Industry Regulation and Safety	Application referral, mining applications	<p>Received 5 June 2019:</p> <ul style="list-style-type: none"> DMIRS's Land Use Planning (LUP) advised that as the land tenure has been created through the Management Order, LUP no longer have an approvals role in this matter. The LUP view was that the balance of the sand that is not required for the actual construction and operation of the current and future waste management facility should be considered for potential mining purposes, subject to environmental and other normal approval requirements. There was mention of the need for sand to be retained to provide a visual barrier/screening to the facility. LUP questioned whether this could be achieved in another way e.g. vegetation and/or fencing, noting that due to the potential large volumes involved this could amount to significant lost royalties (opportunity costs) to the State. Resolution of how much (if any) is available for mining needs to be worked out between the Shire and the mining tenement holder. This is subject to the matter before the Warden's Court. 	<p>Matters related to any pending mining applications and the Warden's Court do not impact on DWER's ability to assess and determine the application.</p> <p>DWER will consider the stability requirements in assessing the application and require an understanding of what area of the Pindan Sand Ridge is required to maintain landfill infrastructure integrity, in order to determine appropriate regulatory controls.</p>
4 April 2019	Main Roads Western Australia	Application referral	None provided	N/A
3 May 2019	Buurabalayji Thalanyji Aboriginal Corporation	Application referral following DPLH recommendation	None provided	N/A
12 August 2019	North Rossa Pty Ltd	Application referral	<p>Received 30 August 2019:</p> <ul style="list-style-type: none"> North Rossa Pty Ltd (North Rossa) consider that any steps taken to grant a works order prior to determining of M08/521 by the Perth Mining Warden is premature and may result in a breach of natural justice. 	DWER does not consider that matters related to any pending mining applications and the Warden's Court impact on the Department's

Date	Entity	Items raised/ referred	Comments	DWER Response
			<ul style="list-style-type: none"> • Concerns were raised regarding matters related to mining and the Management Order • The Shire has incorrectly stated that the distance to the nearest sensitive land use (that is, a residence or other land use which may be affected by an emission or discharge associated with the proposed activity) is 20+ kms when in fact the planned Waste Facility is to be located immediately adjacent (i.e. within 100m) of North Rossa's proposed Onslow Sand Project and 15km from the Mt Minnie Station homestead. As such, North Rossa is concerned that its personnel in undertaking the mining operations could have their health detrimentally affected by the planned Waste Facility. • As the Application has failed to identify the nearby sensitive land uses, North Rossa contends that the DWER is unable to comprehensively assess the Works Approval application, particularly in relation to the potential for contamination of nearby sand resources and the likely impact associated with dust, asbestos and Class IV waste. • North Rossa considers that the Shire's Application is fundamentally and critically flawed as the Shire has failed to acknowledge that the proposed Waste Facility is planned to be located within 100m of North Rossa's proposed Onslow Sand Project and 15km from the Mt Minnie homestead. • Contamination – North Rossa's sand product has been tested in Singapore and meets the reclamation sand specification as prescribed by JTC and the Singapore Government. North Rossa considers that there is a significant risk of contamination to the resource via windblown rubbish, dust, liquid or heavy metal run-off from the activities of the planned Waste Facility, should it be constructed adjacent to the Onslow Sand Project. North Rossa is also concerned that its personnel in undertaking 	<p>ability to assess and determine the application.</p> <p>Issues raised in relation to the Pindan Sand Ridge as a financial resource are not within the scope of the work approval.</p> <p>Impacts to offsite receptors, both environmental and human, have been considered as part of this risk assessment using both information provided by the Applicant, and information sourced and confirmed by DWER officers.</p>

Date	Entity	Items raised/ referred	Comments	DWER Response
			<p>the mining operations could have their health detrimentally affected by the planned Waste Facility.</p> <ul style="list-style-type: none"> • North Rossa is also concerned that its personnel in undertaking the mining operations could potentially be exposed to health risks via; <ul style="list-style-type: none"> ○ Dust – crushed building products contain fine respirable crystalline silica dust ○ Asbestos ○ Class IV waste, chemicals etc. ○ Putrescible and hazardous waste 	

Appendix 3: Summary of applicant's comments on risk assessment and draft conditions

Condition/Item No.	Summary of Licence Holder comment	DWER response
Works approval conditions		
Infrastructure and equipment Condition 4 (a)	Request rewording of requirement to: <i>Is written and certified by a geotechnical engineer (or equivalent) that completed the construction quality assurance processes required by in the table in Schedule 4</i>	Reworded as requested
Schedule 3 – item 2 Cell 1 – site preparation	Request rewording of requirement to: <i>Excavation of all unsuitable materials to a minimum depth of -500 mm from final surface level (FSL) to form a suitable subgrade, and replace with engineered fill material, moisture condition and compact to Maximum Modified Dry Density (MMDD) of 95% and Optimum Moisture Content (OMC) of -3% to +3% in layers. Uncompacted lift/layer thickness must not exceed 300mm.</i>	Reworded as requested
Schedule 3 – item 3 Cell 1 – subgrade	Request rewording of requirement to: <i>Moisture content on placement between 3% dry and 3% wet of optimum moisture content under Modified Maximum Dry Density (MMDD)</i>	Reworded as requested
Schedule 3 – item 4 Cell 1 - GCL	<ul style="list-style-type: none"> Request rewording of requirement to: <i>GCL to meet a hydraulic conductivity as per Schedule 5 (MaxARV) / (Typical) 3.0×10^{-11} / 2.4×10^{-11} m/s;</i> 	<ul style="list-style-type: none"> Reworded as requested Not actioned as per request. The GCL is supplied in a hydrated state as per manufacturer's specifications. This requirement has not been

Condition/Item No.	Summary of Licence Holder comment	DWER response
	<ul style="list-style-type: none"> Remove requirement for GCL to be hydrated with non-leachate water prior to installation. 	<p>removed as requested. The requirement has been reworded to require that hydration is maintained in accordance with manufacturer's specifications</p>
<p>Schedule 3 – Item 7 Primary lining system, Cell 1 – GCL</p>	<ul style="list-style-type: none"> Request rewording of requirement to: <i>GCL to meet a hydraulic conductivity as per Schedule 5 (MaxARV) / (Typical) 3.0 x 10⁻¹¹ / 2.4 x 10⁻¹¹ m/s;</i> <p>Remove requirement for GCL to be hydrated with non-leachate water prior to installation.</p>	<ul style="list-style-type: none"> Reworded as requested <p>Not actioned as per request. The GCL is supplied in a hydrated state as per manufacturer's specifications. This requirement has not been removed as requested. The requirement has been reworded to require that hydration is maintained in accordance with manufacturer's specifications</p>
<p>Schedule 3 – item 9 Cell 1 – non woven cushion/protection geotextile</p>	<ul style="list-style-type: none"> Request rewording of requirement to: <i>Geotextile panel overlap must be a minimum of 300 mm</i> Remove duplicate text of this requirement 	<p>Reworded and duplicate text removed as requested</p>
<p>Schedule 3 – item 11 Cell 1 – leachate collection system pipework</p>	<p>Request rewording of requirement to: <i>A central leachate pipeline (primary pipe) with a diameter of 225 mm OD</i></p>	<p>Reworded as requested</p>
<p>Schedule 3 – item 13 Cell 1 – leachate collection system sump</p>	<p>Rewording of requirement to: <i>The sump must have an extraction point and leachate extraction pump.</i></p>	<p>Reworded as requested</p>
<p>Schedule 3 – item 14 Cell 1 – leachate leakage detection system</p>	<p>Rewording of requirement to: The leachate leakage detection system must be capable of directing leachate leakage from the entire area of the Cell 1</p>	<p>Reworded as requested</p>

Condition/Item No.	Summary of Licence Holder comment	DWER response
	footprint, to the monitoring point where it can be extracted	
Schedule 3 – item 18 Surface water management	<ul style="list-style-type: none"> • Surface water attenuation ponds: Confirmation that only one surface water attenuation pond would be constructed under the works approval. • Drainage swales: rewording of requirement to: (M) <i>Constructed on the internal side of the levee embankment;</i> <i>Swale 4 to direct surface water through the attenuation pond connected to the one infiltration/evaporation pond (initially).</i> 	<ul style="list-style-type: none"> • Requirements reworded to reflect that only one pond is to be constructed. • Reworded as requested
Schedule 3 – item 20 Green waste facility	<p>Rewording of requirement to: Construction of a hardstand meeting a permeability of not less than 1.6339×10^{-7} m/s</p>	<p>Not actioned as per request. Based on information provided with the application, the Applicant advised that this hardstand would be of a 'low permeability' which was also confirmed in documentation to be 1×10^{-9} m/s. The risk assessment was undertaken based on this specification. Any alteration to this would require a re-assessment. The existing requirement of 1×10^{-9} m/s has been retained.</p>
Schedule 3 – item 21 C&D recycling facility	<p>Rewording of requirement to: Construction of a hardstand meeting a permeability of not less than 1.6339×10^{-7} m/s</p>	<p>Not actioned as per request. Based on information provided with the application, the Applicant advised that this hardstand would be of a 'low permeability' which was also confirmed in documentation to be 1×10^{-9} m/s. The risk assessment was undertaken based on this specification. Any alteration to this would require a re-assessment. The existing requirement of 1×10^{-9} m/s has been retained.</p>

Condition/Item No.	Summary of Licence Holder comment	DWER response
Schedule 3 – item 22 Scrap metal stockpiling area	<p>Rewording of requirement to:</p> <p>Construction of a hardstand meeting a permeability of not less than 1.6339×10^{-7} m/s</p>	<p>Not actioned as per request. Based on information provided with the application, the Applicant advised that this hardstand would be of a 'low permeability' which was also confirmed in documentation to be 1×10^{-9} m/s. The risk assessment was undertaken based on this specification. Any alteration to this would require a re-assessment. The existing requirement of 1×10^{-9} m/s has been retained.</p>
Schedule 3 – item 23 Tyre monocell	<p>Removal of the following requirements on basis that tyre monocells would only be constructed when waste is received onsite and is therefore not a condition required to be undertaken through a works approval:</p> <p><i>Excavation of monocell (as required) to a maximum size of 20,000 m²;</i></p> <p><i>Excavation of cell must maintain a minimum 2 m separation between the base of the cell and the highest recorded groundwater level based on onsite monitoring wells.</i></p>	<p>Removed as requested. This may become a requirement of any subsequent licence.</p>
Schedule 3- item 24 Asbestos monocell	<p>Remove requirement to construct asbestos monocell on the basis that asbestos monocells would only be constructed when waste is received onsite and is therefore not a condition required to be undertaken through a works approval.</p>	<p>Removed as requested. This may become a requirement of any subsequent licence.</p>
Schedule 3 – item 26 Firefighting water storage tank	<p>Remove the following requirement as the condition is more appropriate for a licence requirement:</p> <p><i>Dedicated 10,000 L capacity all-wheel drive water cart</i></p>	<p>Removed as requested. Will be included as a licence requirement.</p>
Decision report		
Table 4 - item 5 General infrastructure and	<p>Shire confirmed:</p> <p><i>Equipment and vehicle maintenance and equipment shed with perimeter drain all on concrete hardstands, meeting a</i></p>	<p>N/A</p>

Condition/Item No.	Summary of Licence Holder comment	DWER response
equipment	<i>permeability of not greater than 1×10^{-9} m/s, with perimeter bund, sumps and oily water separators</i>	
Table 4 - item 6 General infrastructure and equipment	Shire confirmed: <i>Vehicle wash down and tyre wash facilities, each with a separate wash down pad sump (element 7), a separate refuelling pad, all concrete hardstands, meeting a permeability of not greater than 1×10^{-9} m/s, with perimeter bunds.</i>	N/A
Table 4 - item 7 General infrastructure and equipment	Shire confirmed that waste conveyance infrastructure (tanks and containers) are to be washed out through the wash down pad infrastructure	This has been reflected in the wording of this item
Table 4 – item 8 Construction & demolition waste: Categories 13 and 61A	Requested rewording of text to state: <i>Only occurring on a C&D hardstand, meeting a permeability of not greater than 1.6339×10^{-7} m/s, will grade a minimum 1:200 gradient onto adjacent land or into the storm water management system.</i>	Not actioned as per request. Based on information provided with the application, the Applicant advised that this hardstand would be of a 'low permeability' which was also confirmed in documentation to be 1×10^{-9} m/s. The risk assessment was undertaken based on this specification. Any alteration to this would require a re-assessment. The existing requirement of 1×10^{-9} m/s has been retained.
Table 4 – item 16 Green waste: Category 61A	Applicant confirmed that the green waste runoff collection pond would be constructed as follows: <i>The green waste hardstand will be constructed as a 200 mm thick hardstand, grading a minimum 1:200 gradient into a low permeability compacted soil pond meeting a permeability of not greater than 1.6339×10^{-7} m/s to cater for a 72 hour, 1 in 10-year rainfall event.</i>	Minor rewording in regards to the pond however the wording was not updated as requested. Based on information provided with the application, the Applicant advised that this hardstand would be of a 'low permeability' which was also confirmed in documentation to be 1×10^{-9} m/s. The risk assessment was undertaken based on this specification. Any alteration to this would require a re-assessment. The existing requirement of 1×10^{-9} m/s has been retained.
Table 4 – item 19 Scrap Metal: Category 62	Requested rewording of text to state:	Not actioned as per request. Based on information provided with the application, the Applicant advised that this hardstand would be of a 'low permeability'

Condition/Item No.	Summary of Licence Holder comment	DWER response
	<i>A designated scrap metal hardstand will be constructed measuring 50 m x 100 m, meeting a permeability of not greater than 1.6339×10^{-7} m/s, grading a minimum 1:200 gradient onto adjacent land or into the storm water management system.</i>	which was also confirmed in documentation to be 1×10^{-9} m/s. The risk assessment was undertaken based on this specification. Any alteration to this would require a re-assessment. The existing requirement of 1×10^{-9} m/s has been retained.
Table 4 – item 24 Class IV landfill: Category 65	Requested rewording of text to state: <i>There will be an ongoing automated monitoring of leachate levels in the sump which will trigger the pump for extraction to maintain leachate levels as low as reasonably practicable between 0.3 and 1.0m maximum level. Additional operational controls for leachate management will be considered as part of the licence application.</i>	Reworded as requested
Section 4 – legislative context	There is no ‘status of approvals’ under the <i>Environmental Protection (Controlled Waste) Regulations 2004</i> , to confirm. Any appropriate Licences for the carrier/ transportation or management of controlled waste at the site will be the responsibility of the appointed operational contractor.	The facility will need to be listed as a waste disposal facility under the <i>Environmental Protection (Controlled Waste) Regulations 2004</i> prior to the acceptance of controlled wastes. This section has been updated to state that.
Table 9 – Footprint	Applicant confirmed Cell 1 footprint area	Updated with supplied information
Table 9 – Capacity	Applicant confirmed Cell 1 capacity	Updated with supplied information
Table 11 – item 8	Applicant confirmed liner material of surface water attenuation pond	Updated with supplied information
Table 14 – fuel storage and chemical use	Applicant advised that it was anticipated that no more than 3,000L of fuel would be stored onsite at any one time.	Updated with supplied information and included information to advise that the specific quantities of fuel and other hydrocarbons should be provided with the licence application.

Appendix 4: Site Plans and Diagrams

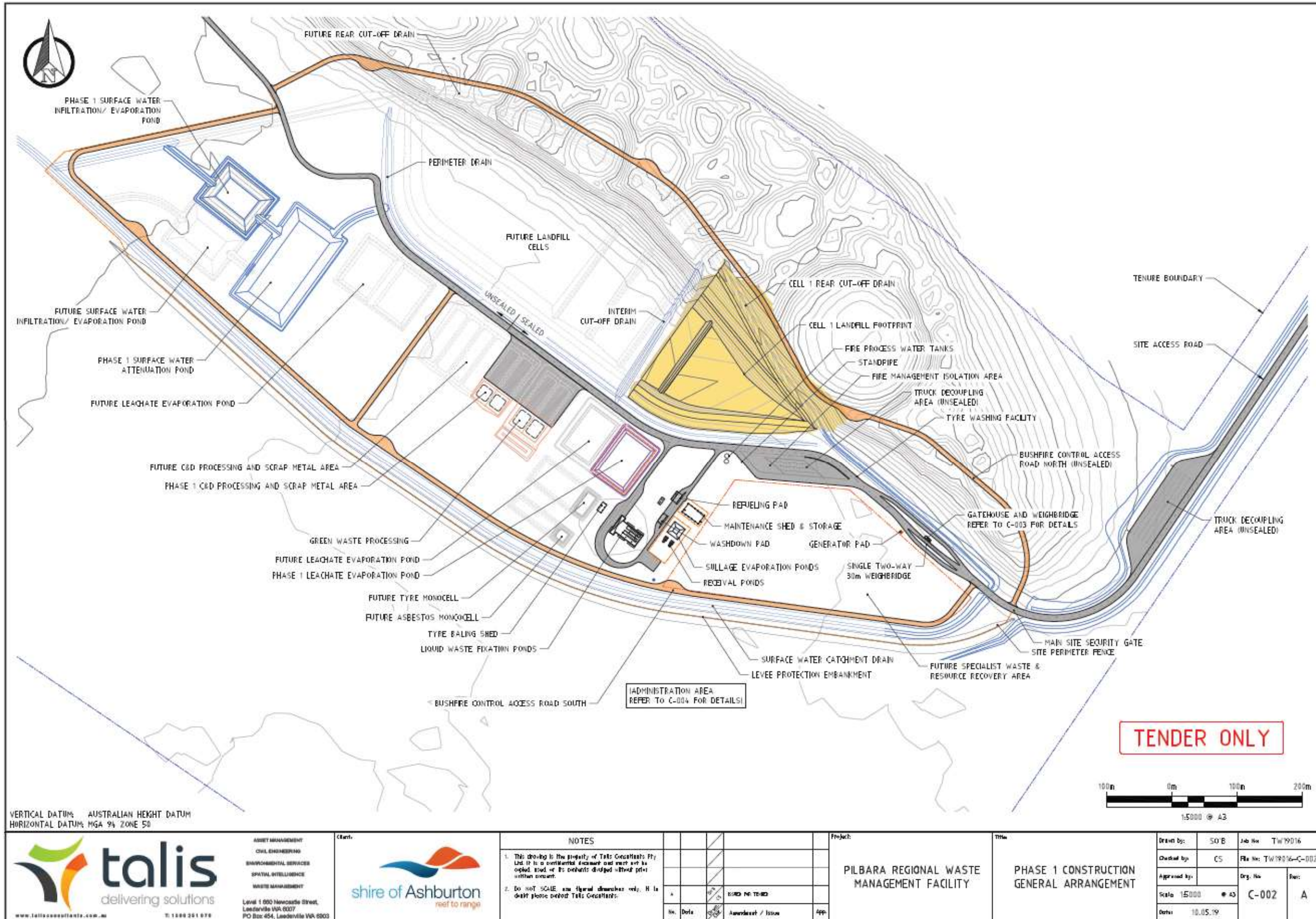


Figure A4.1 Infrastructure plan

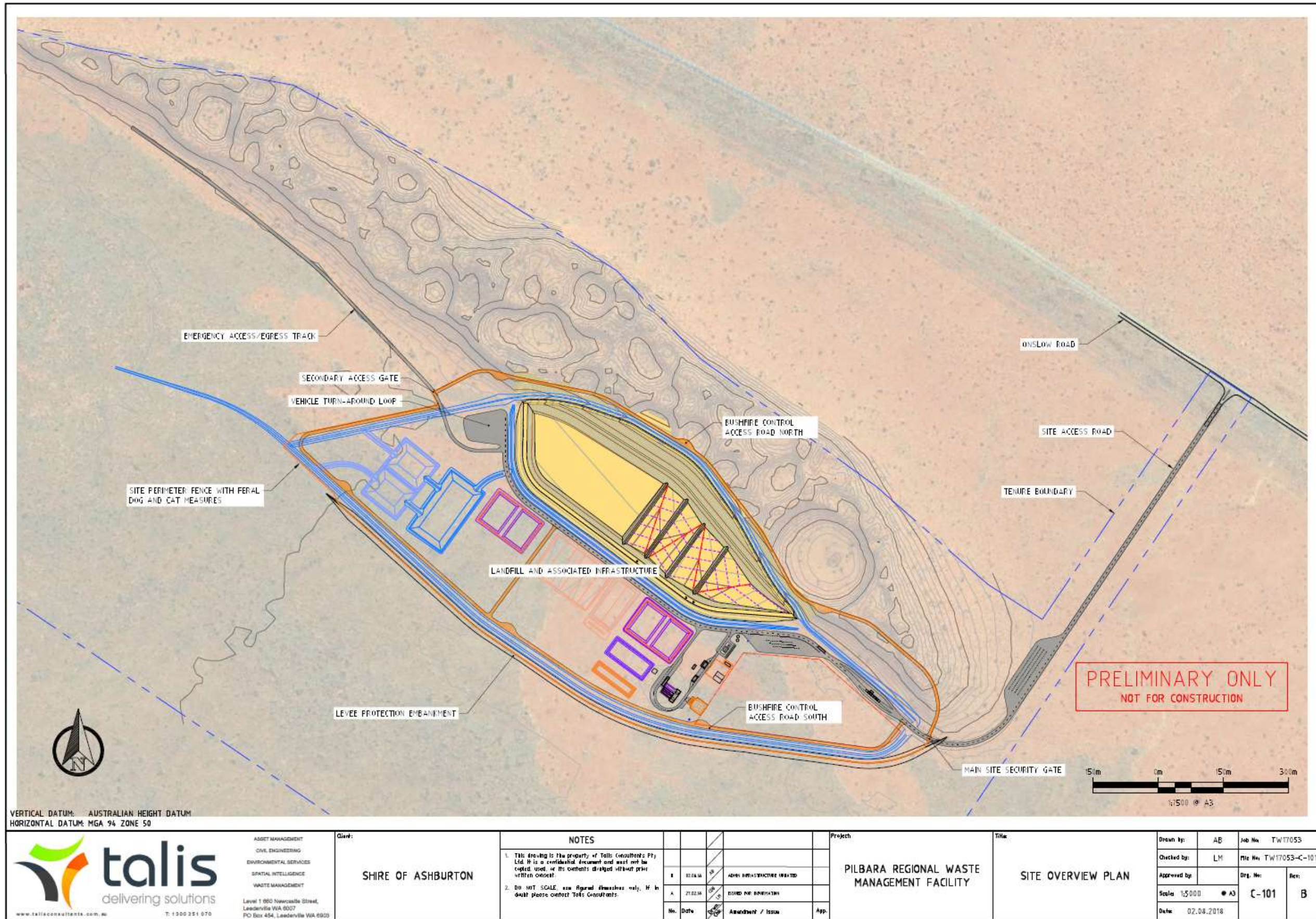


Figure A4.2 Site overview plan

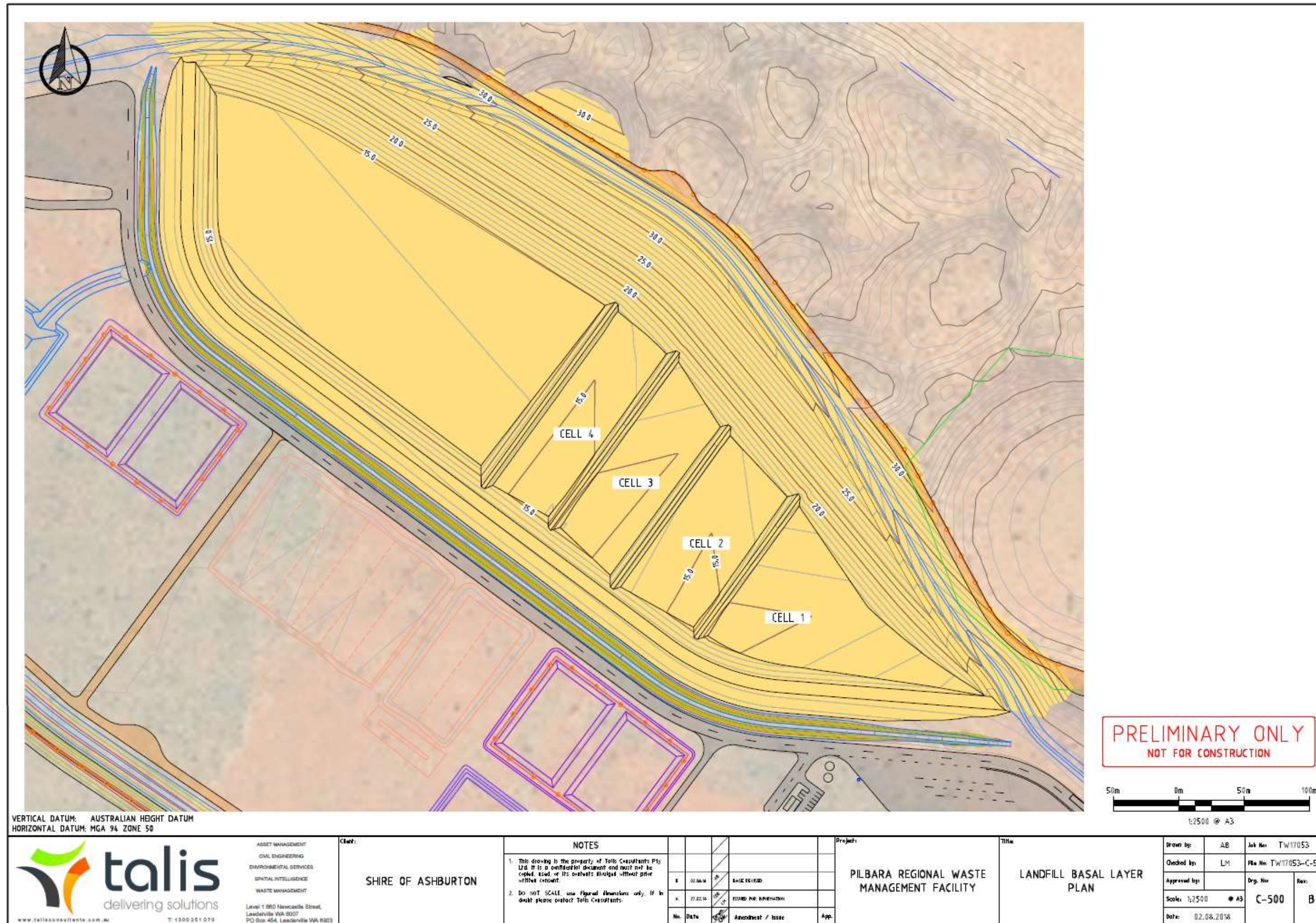


Figure A4.3 Proposed landfill cell layout

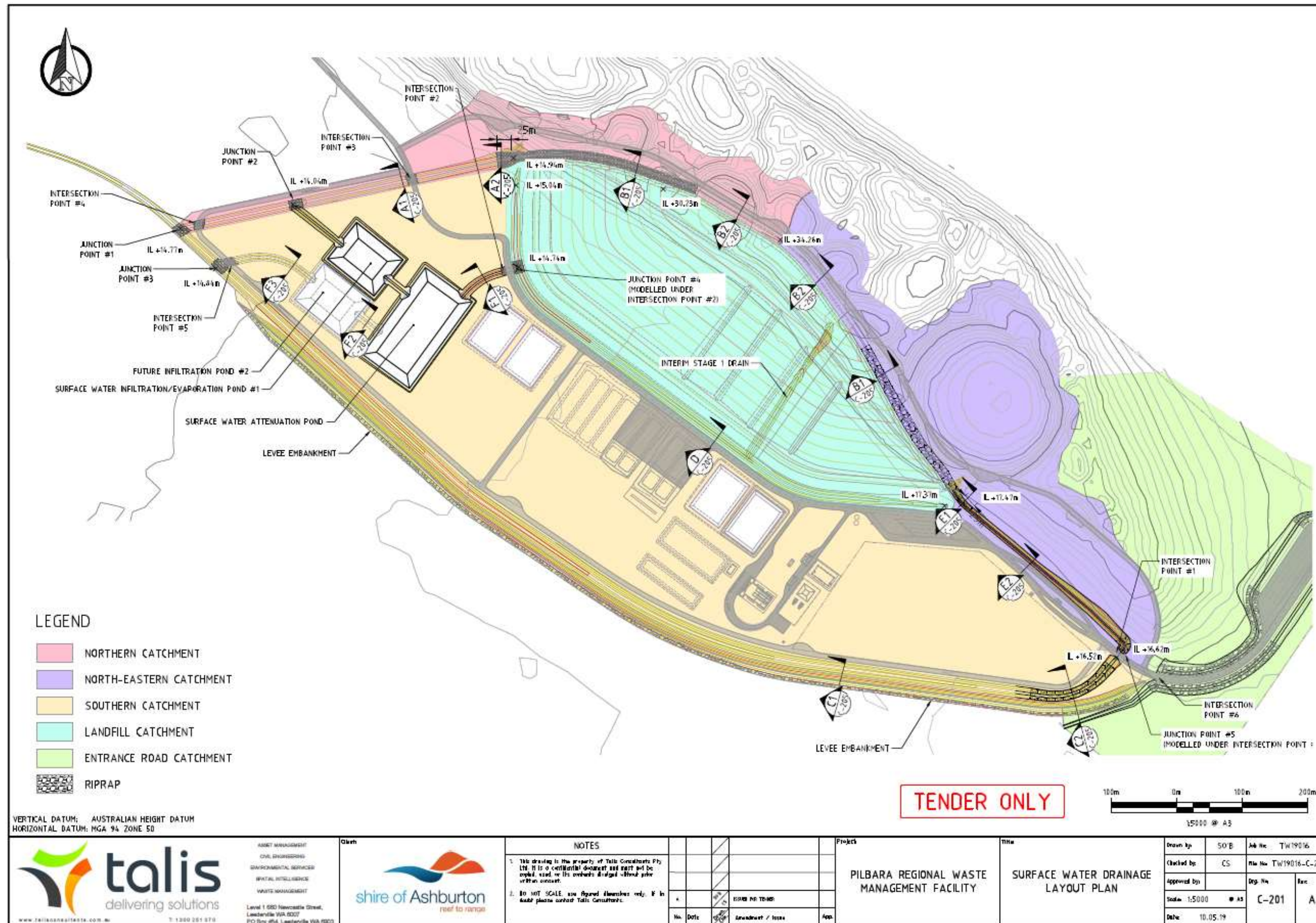


Figure A4.4 Surface water drainage layout plan 1

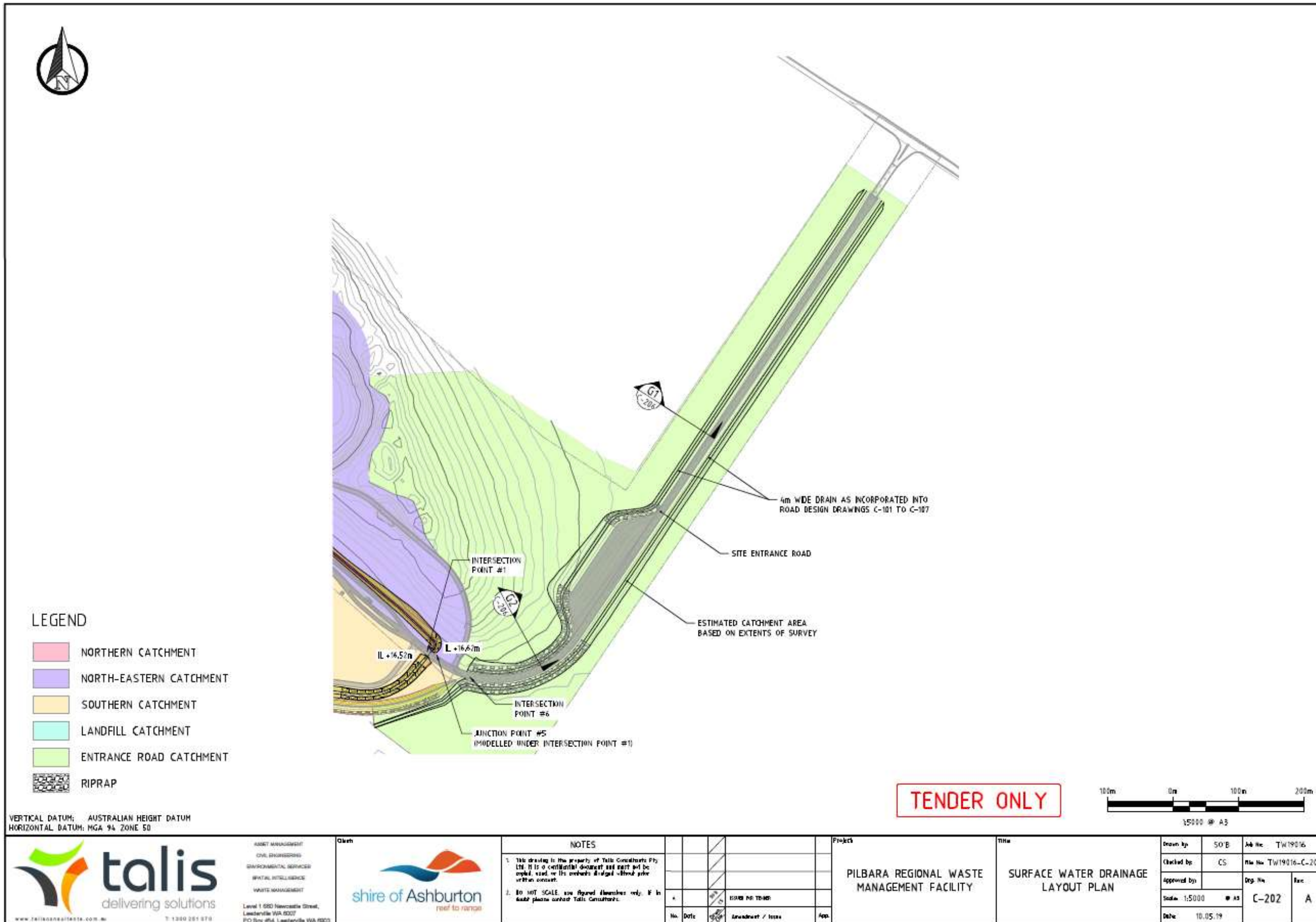


Figure A4.5 Surface water drainage layout plan 2

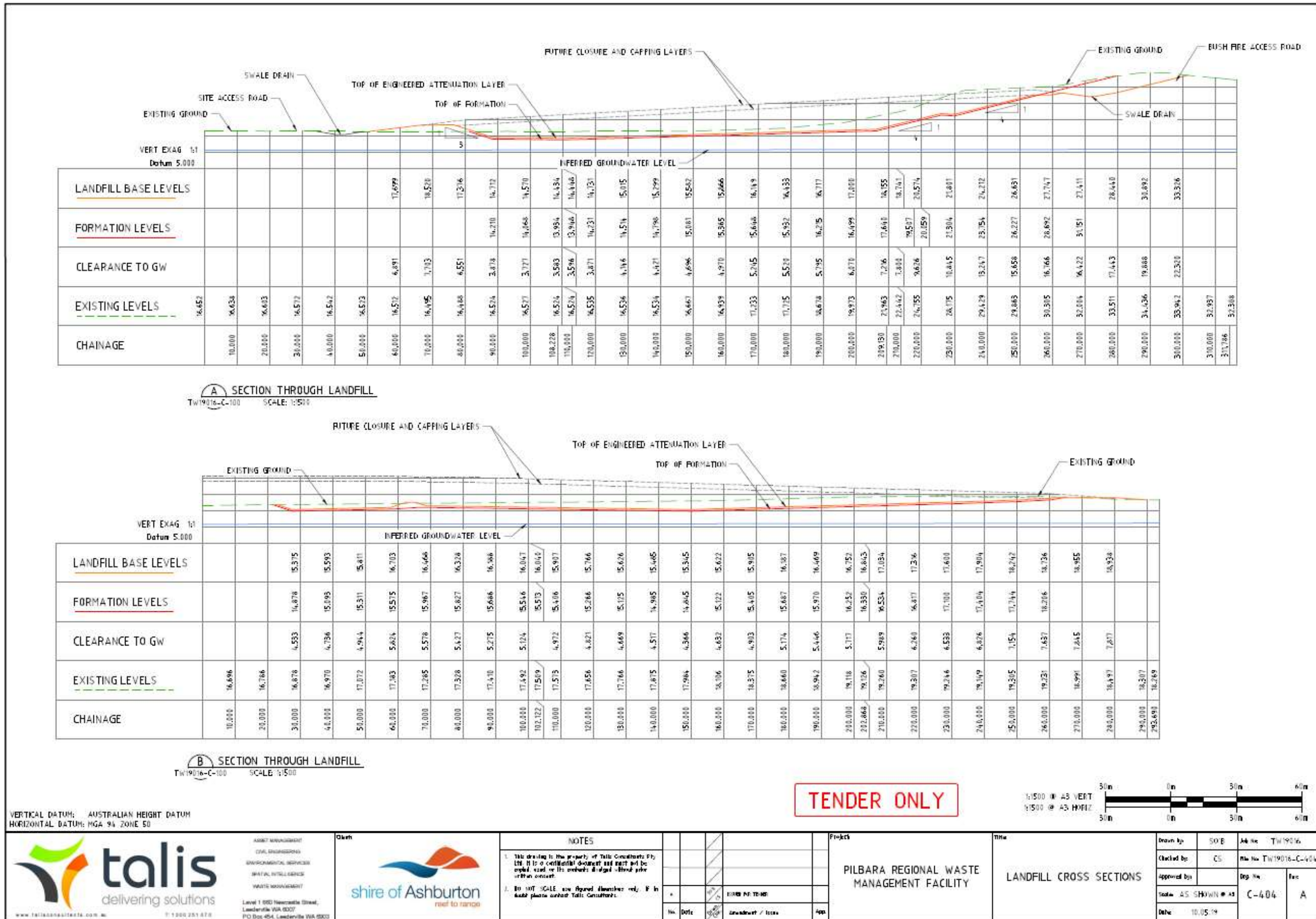


Figure A4.6 Landfill cross sections

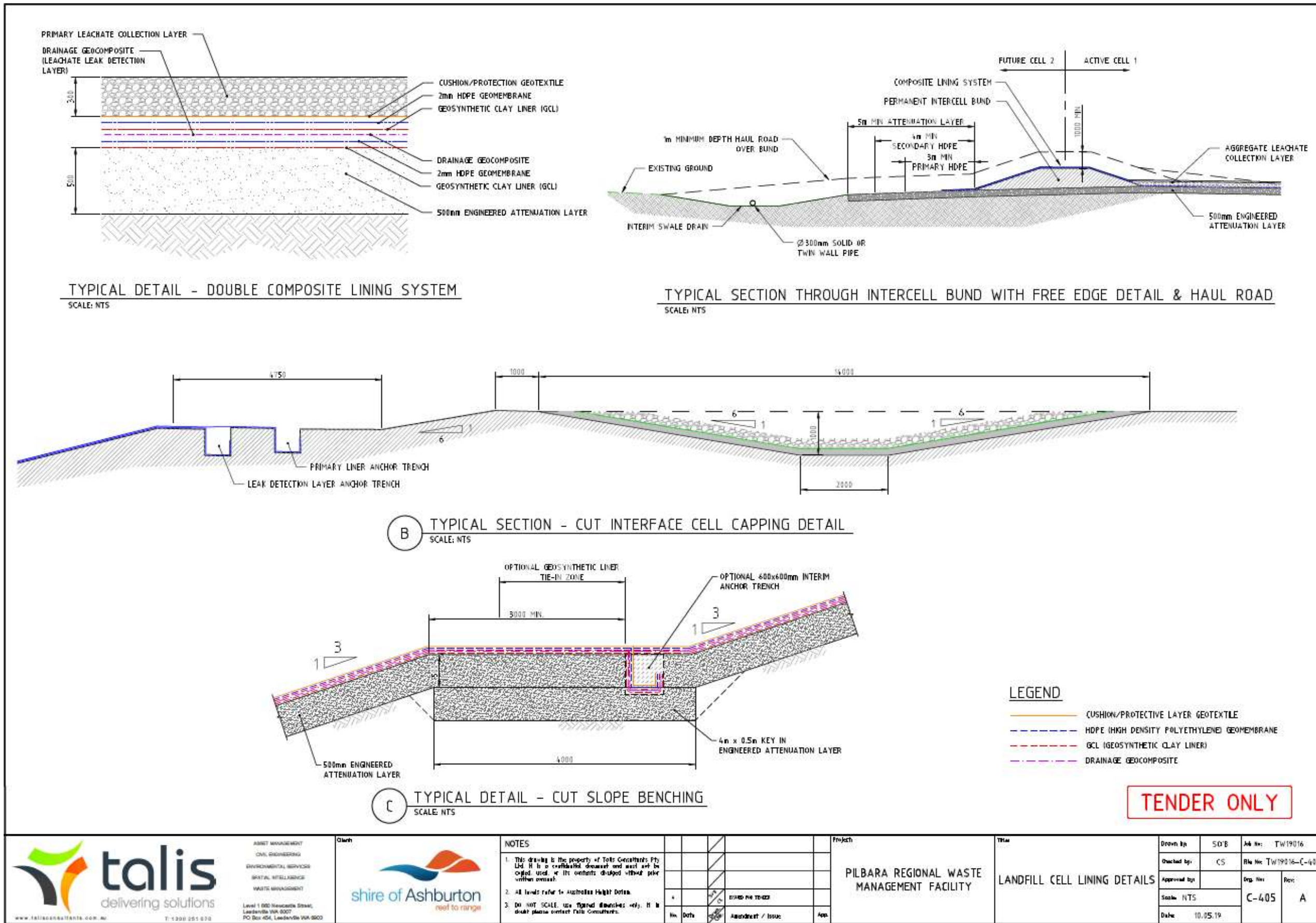


Figure A4.7 Landfill cell lining details

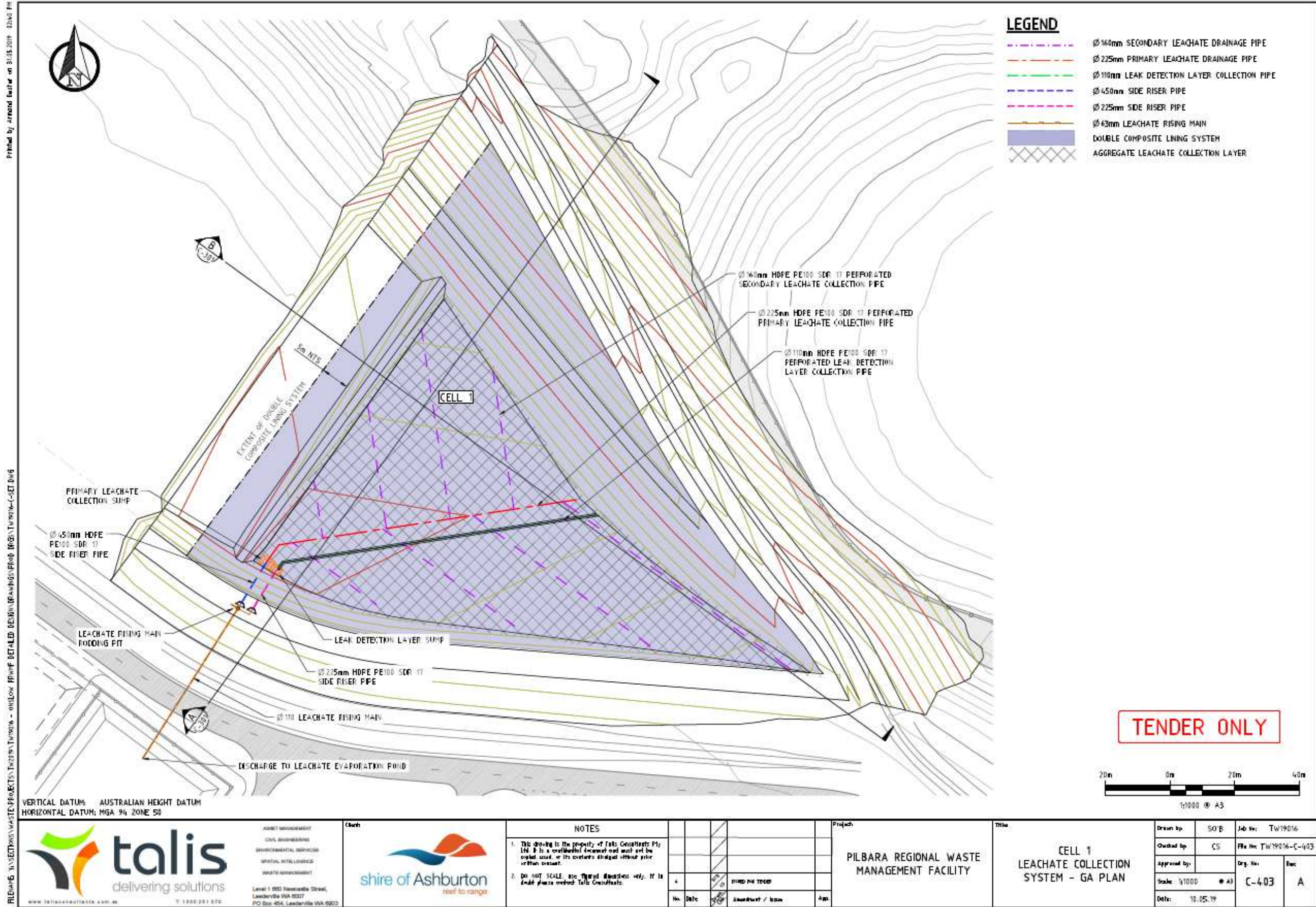


Figure A4.8 Cell 1 leachate collection system layout

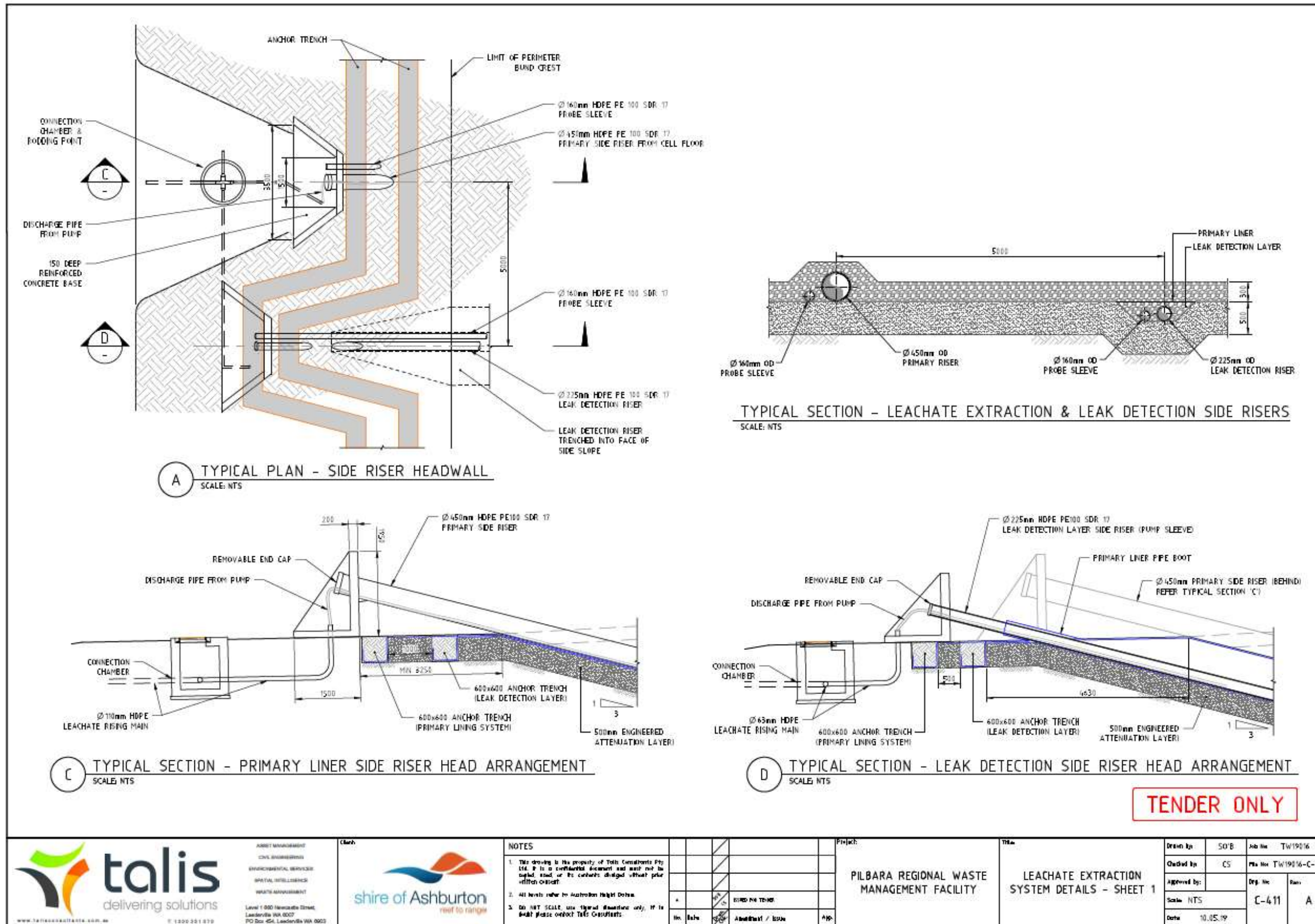
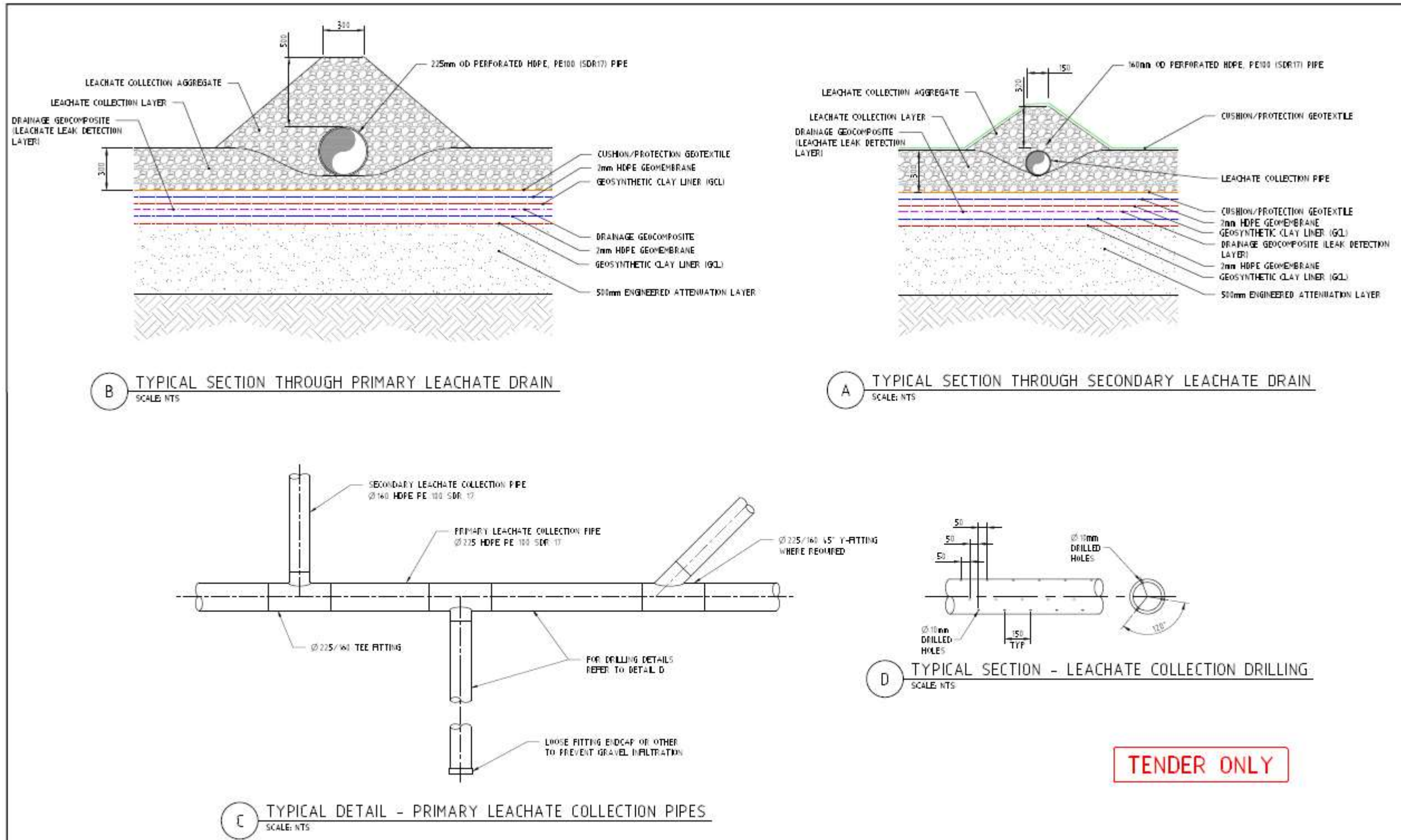


Figure A4.9 Leachate extraction system



<p>www.talysolutions.com.au 1-1800-251-070</p>	<p>ASSET MANAGEMENT CIVIL ENGINEERING ENVIRONMENTAL SERVICES INFRASTRUCTURE WASTE MANAGEMENT</p> <p>Level 1 680 Newcastle Street, Lakeland WA 6007 PO Box 454, Lakeland WA 6002</p>	<p>shire of Ashburton net to range</p>	<p>NOTES</p> <ol style="list-style-type: none"> This drawing is the property of Talis Consultants Pty Ltd. It is a confidential document and must not be copied, used or its contents disclosed without prior written consent. All levels refer to Australian Height Datum. Do NOT SCALE, use agreed dimensions only. If in doubt please contact Talis Consultants. 	<p>Project:</p> <p>PILBARA REGIONAL WASTE MANAGEMENT FACILITY</p>	<p>Title:</p> <p>LEACHATE COLLECTION PIPEWORK DETAILS</p>	<p>Drawn by: SOE</p> <p>Checked by: CS</p> <p>Approved by:</p> <p>Scale: NTS</p> <p>Date: 10.05.19</p>	<p>Job No: TW19016</p> <p>File No: TW19016-C-409</p> <p>Org. No: C-409</p> <p>Rev: A</p>
	<p>Project:</p> <p>PILBARA REGIONAL WASTE MANAGEMENT FACILITY</p>		<p>Title:</p> <p>LEACHATE COLLECTION PIPEWORK DETAILS</p>	<p>Drawn by: SOE</p> <p>Checked by: CS</p> <p>Approved by:</p> <p>Scale: NTS</p> <p>Date: 10.05.19</p>	<p>Job No: TW19016</p> <p>File No: TW19016-C-409</p> <p>Org. No: C-409</p> <p>Rev: A</p>		
	<p>Project:</p> <p>PILBARA REGIONAL WASTE MANAGEMENT FACILITY</p>		<p>Title:</p> <p>LEACHATE COLLECTION PIPEWORK DETAILS</p>	<p>Drawn by: SOE</p> <p>Checked by: CS</p> <p>Approved by:</p> <p>Scale: NTS</p> <p>Date: 10.05.19</p>	<p>Job No: TW19016</p> <p>File No: TW19016-C-409</p> <p>Org. No: C-409</p> <p>Rev: A</p>		
	<p>Project:</p> <p>PILBARA REGIONAL WASTE MANAGEMENT FACILITY</p>		<p>Title:</p> <p>LEACHATE COLLECTION PIPEWORK DETAILS</p>	<p>Drawn by: SOE</p> <p>Checked by: CS</p> <p>Approved by:</p> <p>Scale: NTS</p> <p>Date: 10.05.19</p>	<p>Job No: TW19016</p> <p>File No: TW19016-C-409</p> <p>Org. No: C-409</p> <p>Rev: A</p>		
	<p>Project:</p> <p>PILBARA REGIONAL WASTE MANAGEMENT FACILITY</p>		<p>Title:</p> <p>LEACHATE COLLECTION PIPEWORK DETAILS</p>	<p>Drawn by: SOE</p> <p>Checked by: CS</p> <p>Approved by:</p> <p>Scale: NTS</p> <p>Date: 10.05.19</p>	<p>Job No: TW19016</p> <p>File No: TW19016-C-409</p> <p>Org. No: C-409</p> <p>Rev: A</p>		

Figure A4.10 Leachate collection pipework details

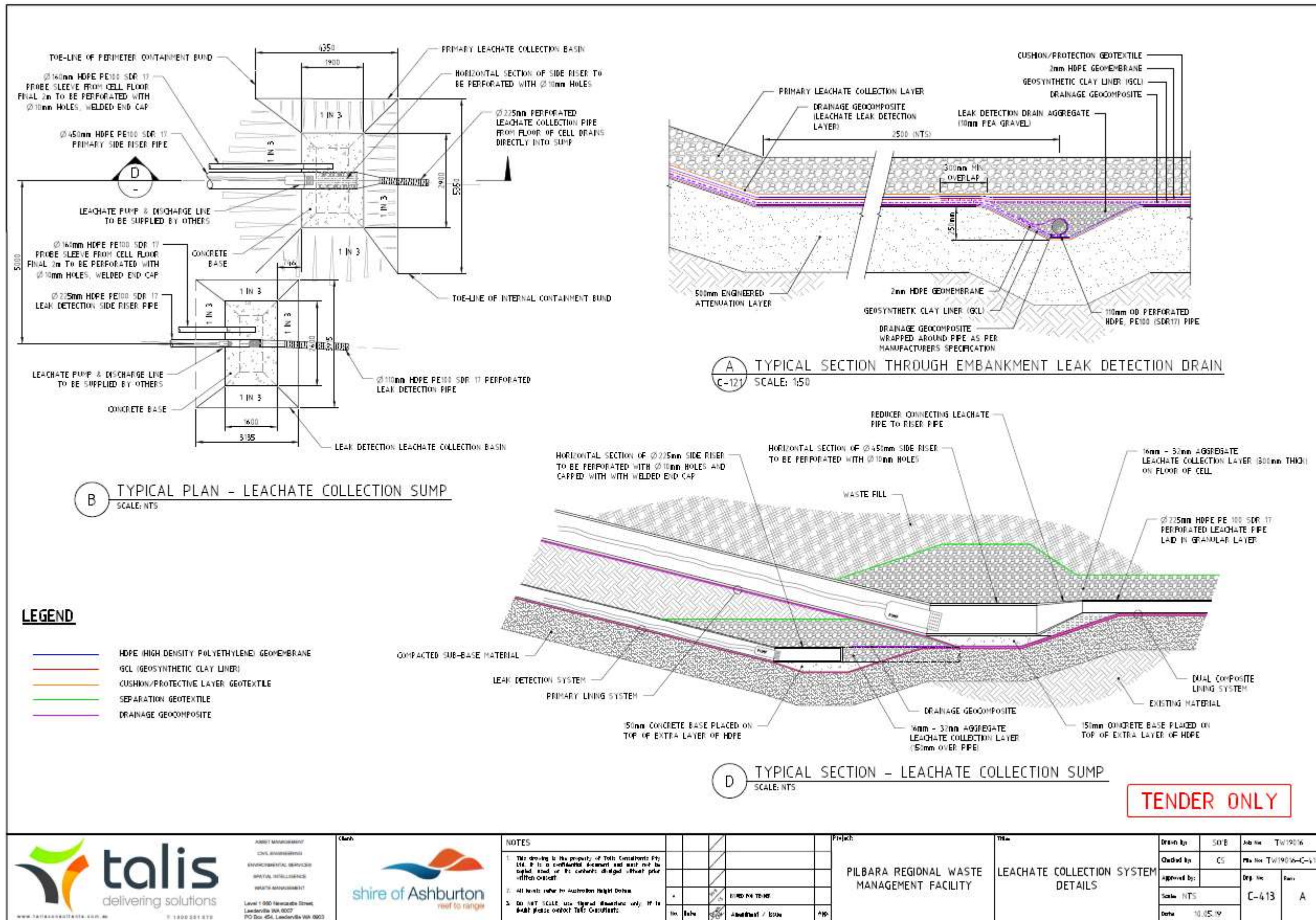


Figure A4.11 Leachate collection sump

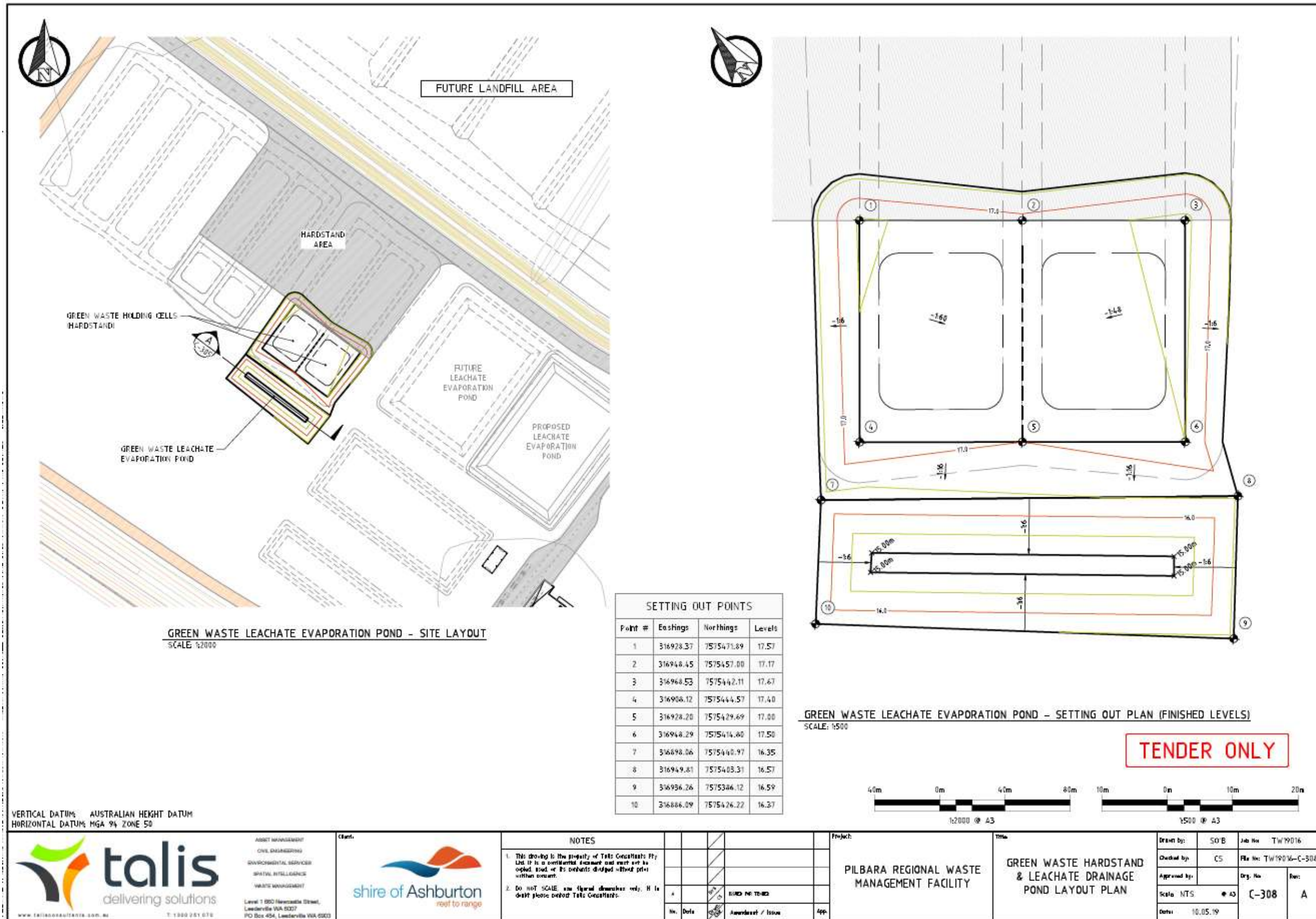


Figure A4.12 Green waste hardstand and leachate drainage pond layout plan

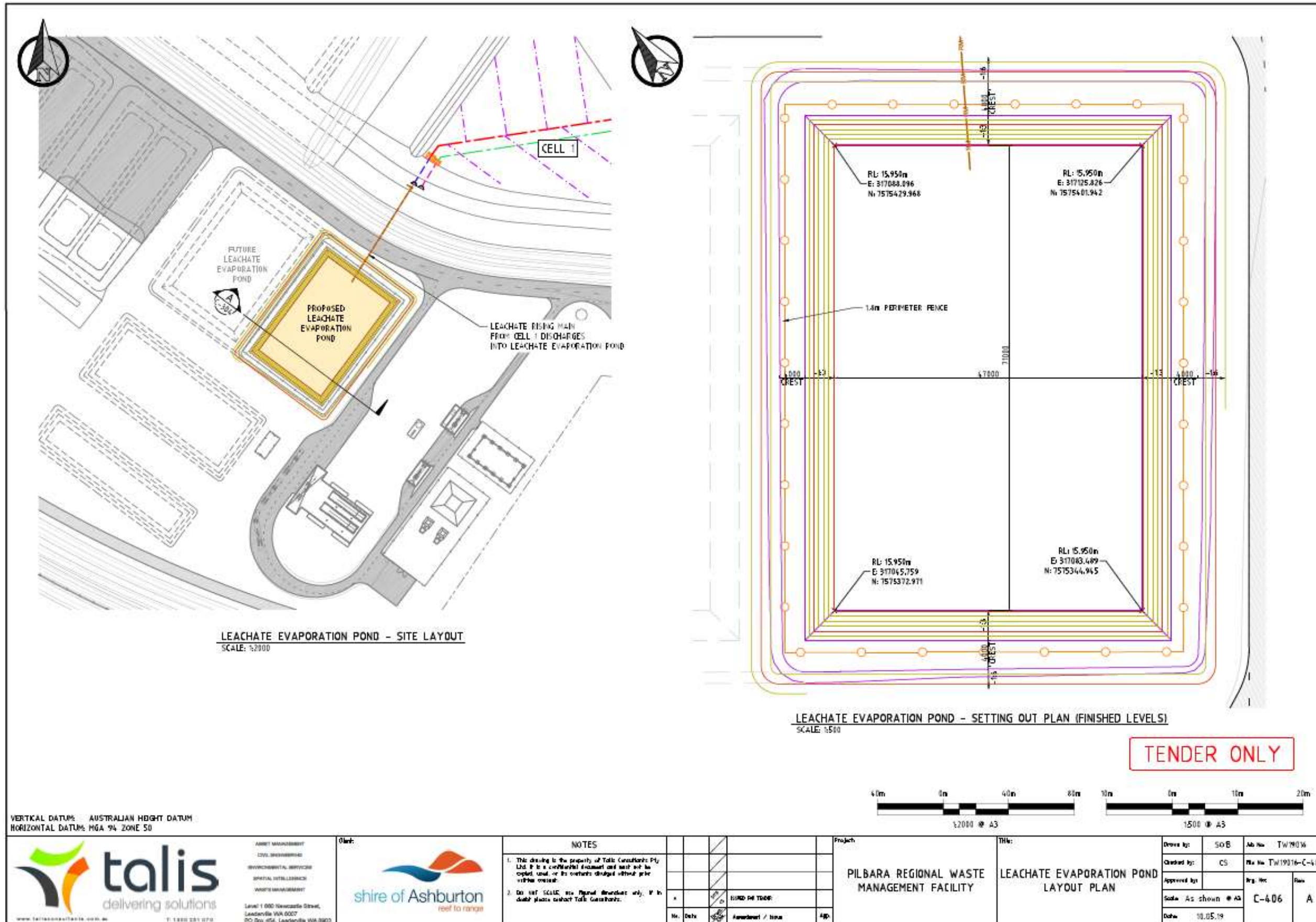


Figure A4.13 Leachate evaporation pond layout plan

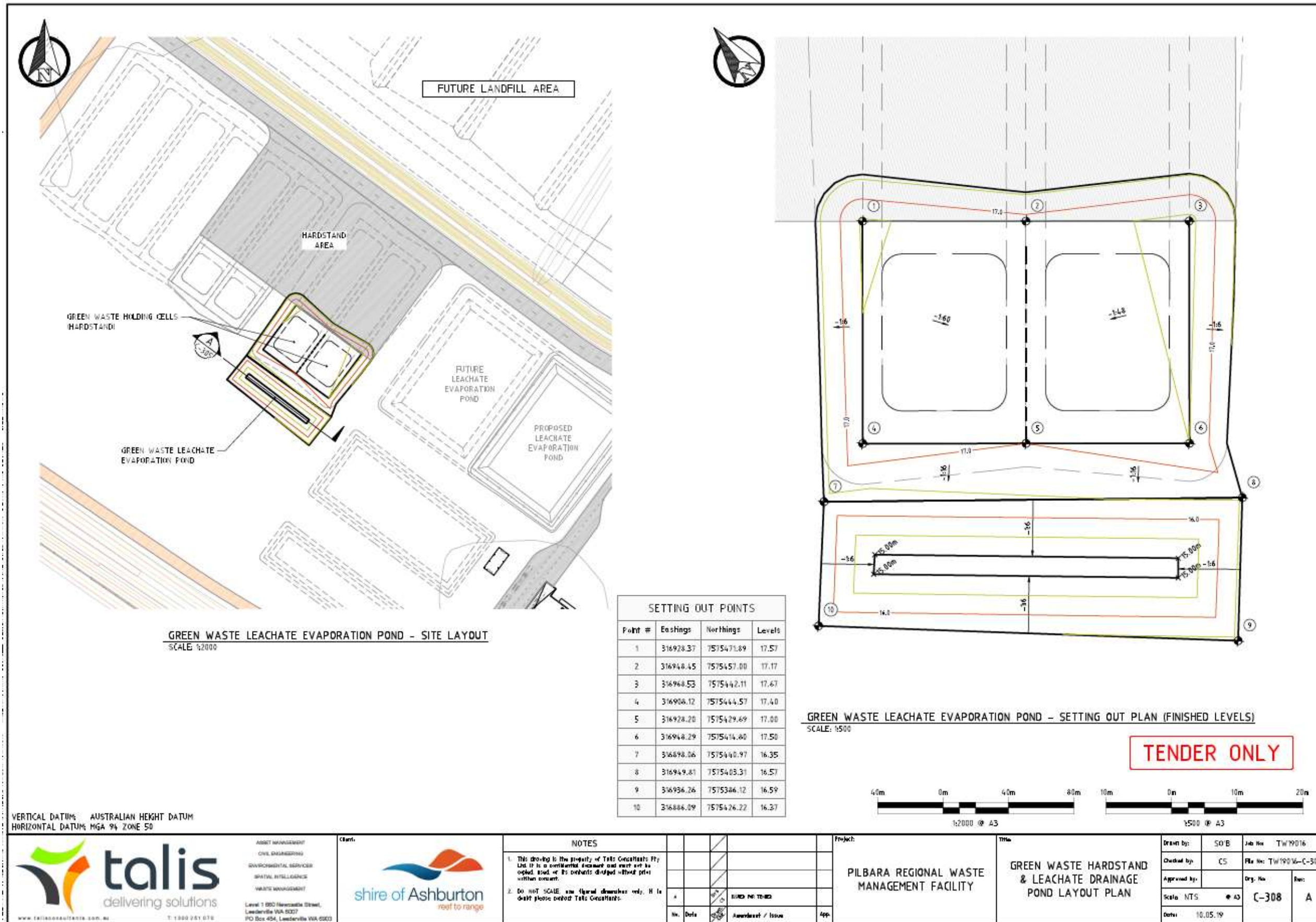


Figure A4.1415 Green waste hardstand and leachate drainage pond layout plan

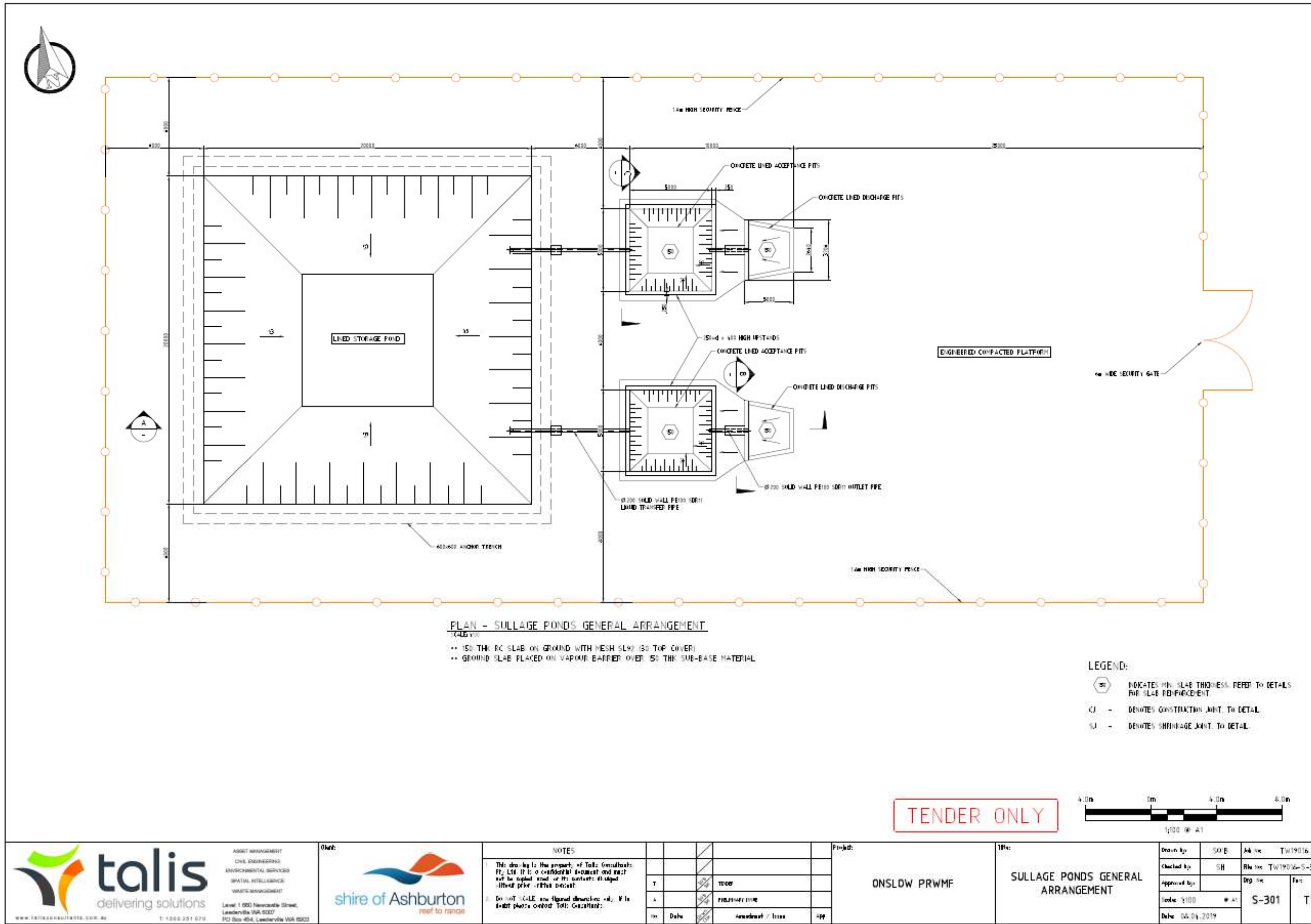


Figure A4.16 Sewage treatment facility layout

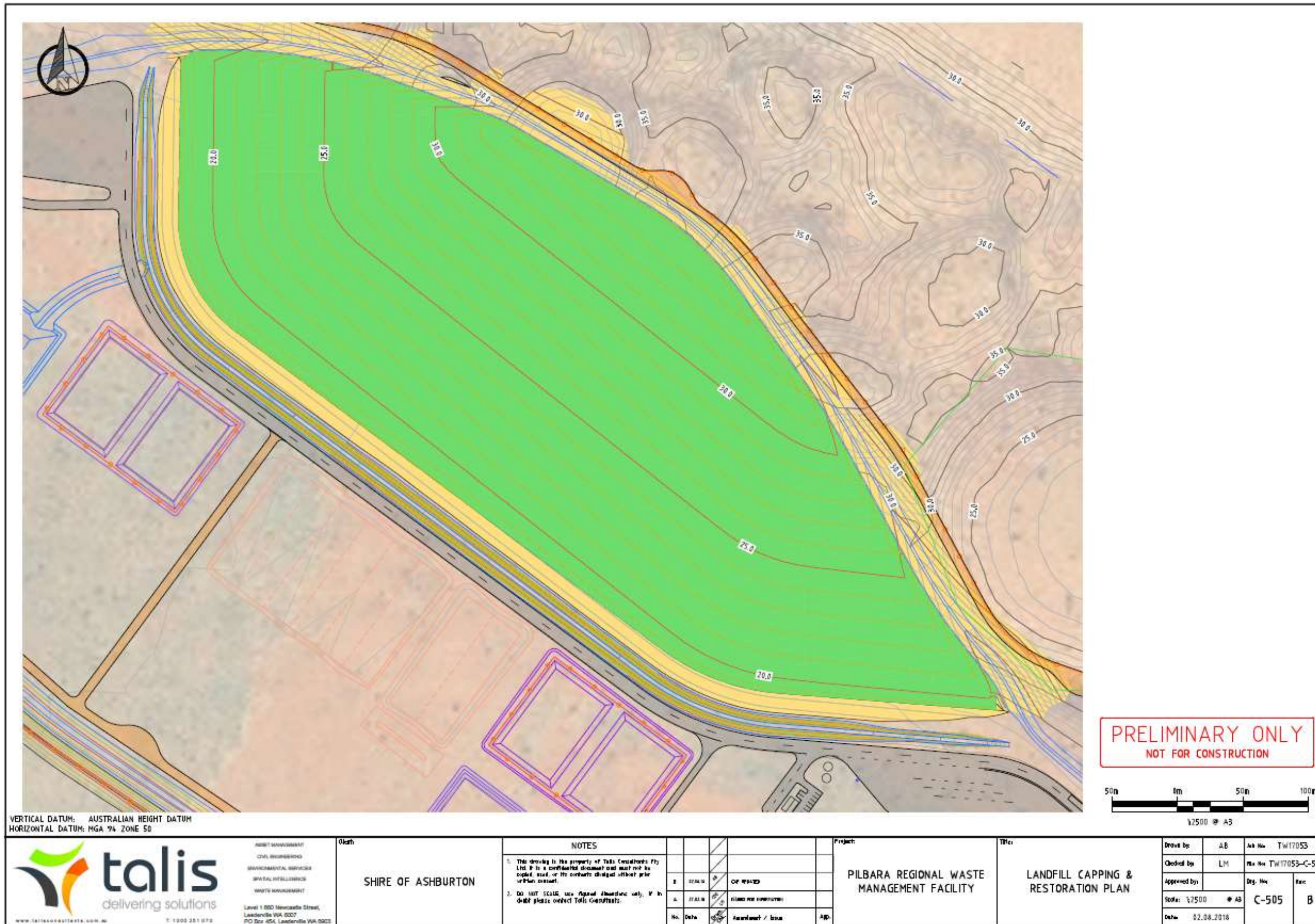


Figure A4.17 Landfill capping and restoration plan

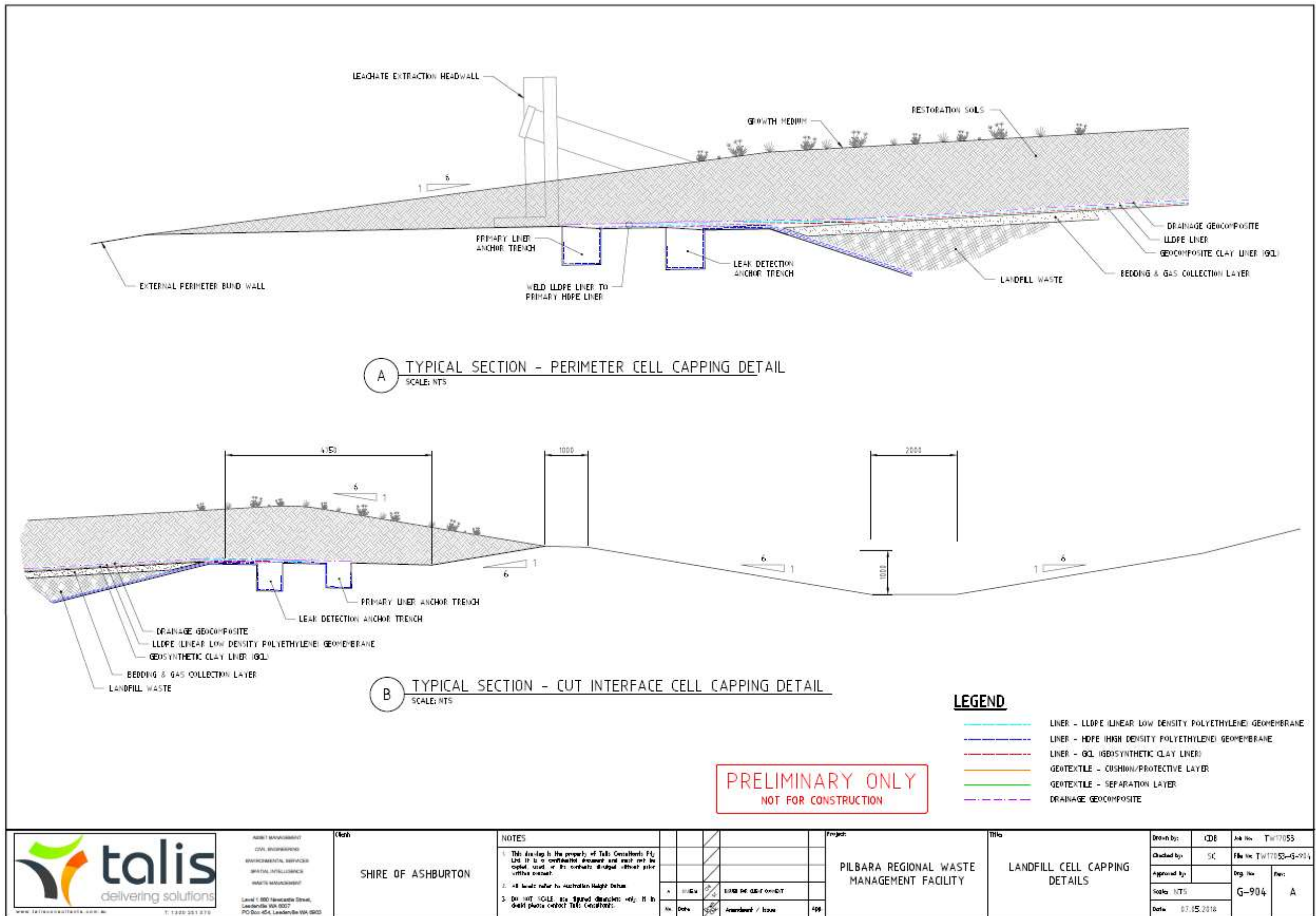


Figure A4.18 Landfill cell capping details
