

CONSTRUCTION SPECIFICATION – FOR TENDER

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Document Review

Description/Revision	Date	Author	Approver
Draft	17 Apr 2025	IW	IW
Final	7 May 2025	IW	IW
Final Rev 1 – For Approval	8 May 2025	IW	IW
Final Rev 2 – For Tender	18 July 2025	IW	IW



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1 Specification

1.1 Description of Works

The Contract includes all management, operations, labour, plant, materials, supervision, survey and all else required for the construction and completion of the whole of the Works described in these Specifications and shown on the Drawings, and for complying with the Conditions of Contract, together with any additional Works or variations ordered by the Superintendent. The Contract also includes a Defects Liability Period as stated in the Annexure to the General Conditions of Contract.

The scope of Works includes:

- Survey and setting out;
- Excavation to suit design layout, including stockpiling of spoil materials (large items, soft material, unsuitable material) as instructed by the Superintendent;
- Fill placement to achieve design profile levels;
- Construction of reinforced concrete slabs and bund wall;
- Installation of leachate and wastewater delivery pipelines;
- Installation of equipment, fittings, telemetry and alarm safety systems;
- Such other Works as shown on the Drawings or as described in this Specification;
- Construction Quality Control testing; and,
- Provision of "As Constructed" documentation.

The Contract Works includes the ongoing maintenance of the new and some of the existing leachate and wastewater management infrastructures. These maintenance activities are not construction related and hence, are not included in this Specification.

1.2 Works Not Included

The scope of the Works does not include:

- Dust suppression (Principal activity);
- The supply of some soil materials;
- The supply of the particulate filter;
- Tie-in of the works into the existing site leachate extraction system; and,
- Downstream leachate and wastewater processing.

1.3 Principal

The Principal for the project will be the Mindarie Regional Council.

1.4 Principal Supply Items

The Principal shall supply the following items:

- Dust suppression via water cart – on request by the Contractor;
- Soil fill materials for the Works. This excludes crushed limestone for below the concrete tank farm and the reinstatement of the limestone access road and adjacent hardstand area, and the low-permeable soil backfill for the pipeline/conduit trenches, which will be Contractor supply items;
- Particulate filter at the vehicle washdown facility wastewater tank; and,
- 2 x 75 mm diameter flowmeters for the wastewater pipelines within the tank farm.



1.5 Contract Limits

The Works limits shall be in accordance with the Drawings.

1.6 Areas Available to the Contractor

On written request, the Superintendent will allocate work, storage and laydown areas for use by the Contractor.

1.7 Contractor's Facilities

The Contractor shall be responsible for the supply of its own Site services, including power, potable water, wastewater and communications. The proposed details of the Contractor's power, potable water and sanitation arrangements shall be submitted to the Superintendent for approval and shall be maintained throughout the Works.

The Contractor shall be responsible for the maintenance and watering of the access roads within the Works area as defined by the Drawings and workplaces.

Waste and refuse of all sorts will be regularly and satisfactorily removed. On completion of the Works all sanitary facilities will be removed, the ground thoroughly disinfected and the Site restored to its original condition.

1.8 Pollution and Spillage

Without limiting the Contractor's obligations under the Contract, it shall be the Contractor's responsibility to:

- Investigate and comply with all applicable laws;
- Investigate and comply with Regulations and Rules relating to pollution and contamination with particular regard to the water discharging off the Site; and,
- Limit airborne dust and noise, which could cause a hazard or nuisance to other persons or property. The Superintendent may require the Contractor to take additional steps to reduce the dust hazard and any steps taken shall be at the Contractor's cost.

During construction and commissioning, spillage of any type whatsoever, including fabricating and hydraulic oils, fuel and any other material, shall be immediately removed and disposed of, and the area cleaned as directed by the Superintendent.

1.9 Hours of Site Work

The Superintendent's hours of work on the project will normally be:

- Monday to Friday (inclusive) 0700 to 1700.

Should the Contractor require to work outside these hours, the Contractor shall submit a request in writing to the Superintendent, stating the reason and working hours required, 24 hours in advance and, in any event, not later than noon. The Superintendent will not refuse a reasonable request.

For the purpose of variations and extensions of time to Contract shall consist of 10 hours per working day. The Contract Price shall be deemed to include all additional costs incurred resulting from compliance with industrial awards.



The Contractor will be required to work outside normal working hours to attend to emergency situations or as directed by the Superintendent to attend to items within the scope of Works.

Any variation to the above will be at the discretion of the Superintendent and subject to prior written approval. Refusal to vary or extend the hours of work will not be grounds for an extension of time or a direction to accelerate the Works.

For the purpose of Liquidated Damages assessment, a day will mean any 24 consecutive hour day including Saturdays, Sundays and statutory holidays.

1.10 Site Meetings/Briefings

The Contractor must attend Site meetings/briefings with the Principal and/or Superintendent at times which will be notified to the Contractor. The Contractor must ensure the attendance of all sub-contractors directly concerned with the Works in progress at the time. The Superintendent will keep records of these meetings, and these records will form part of the Contract Documentation. No claims for costs borne by the Contractor in attending Site meetings will be accepted.

1.11 Remedial Work During Defects Liability Period

The Contractor shall be responsible to perform work during the Defects Liability Period in accordance with the General Conditions of Contract.

1.12 Water for use in the Works

Water for moisture conditioning of compacted fill and dust suppression will be provided by the Principal, including a water cart and operator for distributing the water.

The Contractor is to liaise with the Principal in a timely manner to ensure that the Principal's water cart is available when required by the Contractor.

The Principal may request that the Contractor provide its own water cart. In this event, the associated costs would be dealt with as a variation to the Contract, which is to be finalised prior to the activity being undertaken.

1.13 Setting Out and Measurement of Quantities

The Contractor shall be responsible for setting out the Works and to confirm survey control to the Superintendent to the grades and levels shown on the Drawings.

The Contractor shall be responsible for the measurement of quantities under the Contract. Quantities shall be determined by a competent person by field survey, and outcomes of the survey and quantity calculations shall be forwarded to the Superintendent for verification.

The Contractor is to use a suitably qualified surveyor for all survey work. A suitably qualified surveyor includes:

- A qualified and experienced surveyor able to be a fulltime member of the Institution of Mining and Engineering Surveyors Australia; or,
- A surveyor licensed under the WA Licensing Board; or,
- A surveyor that has undertaken similar works and at the same level of responsibility for a minimum of five years and has a proven track-record of reliable survey works.

Quantities to be measured for variations must be measured in accordance with AS 1181.



1.14 Weather

The Contractor takes all risk associated with delays related to bad weather. The Contractor is to allow within its program of Works for anticipated delays as a result of bad weather. There will be no extension of time or cost variation as a result of bad weather.

This Clause does not release the Contractor from any obligation to weatherproof and protect the Works, and to remove water from the Works as soon as is practical during and after inclement weather.

1.15 Protection from Weather

The Contractor must, at the Contractor's own expense, provide all plant, materials and labour necessary to protect the Works from damage by inclement weather.

The Contractor must prevent, insofar as is reasonably possible any materials entering any gully, manhole or pipe, and must remove from the drainage system any materials from any source which may be deposited in the drainage system by any agency up to the date of Practical Completion.

1.16 Protection of Existing Infrastructure

The Contractor is to be aware that there is extensive existing infrastructure in the Works area. The Contractor is to liaise closely with the Principal about the presence of all existing infrastructure and to ensure that the existing infrastructure is adequately protected during the Works.

In the event that the existing infrastructure is damaged by the Contractor, the Contractor will be responsible for all costs associated with the repair or replacement of the existing infrastructure. The Principal will determine how the existing infrastructure will be repaired or replaced, by either the Contractor or an alternative contractor.

1.17 Dust and Wind-Blown Materials Control

Dust management is a critical environmental emissions aspect on site. The Contractor is to ensure that all construction related activities are carried out in order to minimise dust generation.

When required, the Contractor is to make arrangements with the Principal, for the Principal to wet down all haulage roads to limit dust generation.

1.18 Reversing Beacons

The Contractor is to ensure that all vehicles that have reversing beacons utilise low-frequency beacons.

High-frequency beacons are not allowed on site.

1.19 Liaison with Others

During the course of the Works, the Contractor will need to interact with other works being carried out on Site. It shall be the Contractor's responsibility to closely liaise with others on Site to ensure Works are completed in accordance with the requirements of the Specification, Drawings and the Superintendent's directions and instructions.

1.20 Provision for Traffic

When Works are proceeding adjacent to or on any existing access track or haul road, the Contractor shall notify the Superintendent and any other company using that access track or haul road seven days in advance of the date that such Works are due to commence and the proposed duration of such Works and take all steps necessary during the execution of such Works to ensure that disruption to normal traffic is minimised.

The Contractor is responsible for the provision of adequate traffic management controls to ensure a safe work environment for all Site users.

1.21 Demobilisation

Prior to the issue of a Certificate of Practical Completion, the Contractor shall, unless otherwise agreed in writing by the Superintendent, have removed all goods and temporary Works from the Site.

All Contractor lay down areas shall be cleaned and graded by the Contractor to the satisfaction of the Superintendent.

1.22 Vegetation and Site Clearing

The Site is an existing waste management facility.

There is no native vegetation clearing associated with the construction works. There is however, minor vegetation (weeds and small shrubs) clearing associated with the preparation of the Works area.

There is to be no clearing of any vegetation around the landfill as part of the ring main pipeline installation. The pipeline is to be located away from the existing site vegetation.

1.23 Earthworks

1.23.1 Introduction

The Works covered by this Section include, but are not necessarily limited to, the following:

- The setting out of the Works to the lines and levels shown on the Drawings;
- Minor vegetation clearing (weeds and small shrubs);
- Excavation within the Works area;
- Possible removal of unsuitable subgrade material and disposal to spoil;
- Excavation and backfill of a limestone road crossing and adjacent hardstand area;
- Supply of crushed limestone and low-permeability (max. 1×10^{-6} m/s) trench back-fill material;
- Grading and compaction of tank farm footprint and wastewater tank filter stand concrete slab;
- Excavation and haulage of fill, moisture conditioning, placement and compaction to the required grades and levels, including backfill around the tank farm concrete bund wall;
- Construction Quality Control testing and sampling; and,
- Control and diversion of surface water and run-off from within the Works area.



1.23.2 Earthworks Inspection

Due to the minor nature of the earthworks involved, the Superintendent will advise of the earthworks inspection requirements.

As a minimum, earthworks inspections will occur at the following stages of the Works:

- Completion of excavation to design levels; and,
- Completion of the earthworks compaction prior to commencement of concrete Works.

1.23.3 Applicable Documents

All Works shall be carried out in accordance with the latest editions of all and any specifications, guidelines and standards referenced with the Contract.

1.23.4 Definitions

For all purposes of this Section, the words and phrases listed below shall have the meanings herein ascribed to them:

- "Modified Maximum Dry Density" (MMDD) As determined in accordance with AS 1289.5.2.1-2003.

1.23.5 Handover

On handover of the Site to the Contractor, the Contractor is to undertake a detailed baseline survey of the tank farm and wastewater tank area. As a minimum, the surface shall be surveyed about the perimeter of the relevant Works area and on a maximum 5 m grid and include all changes in grade within the perimeter. The survey is to identify all necessary details to accurately determine the surface topography for the purposes of measuring construction qualities. The results of the survey shall be provided to the Superintendent prior to any Works commencing. This baseline survey will be compared to the Principal's baseline survey (which may have been undertaken prior to Site handover) and the handover baseline survey profile will be agreed between the Parties.

This agreed handover baseline survey will then, if required, be used for calculating quantities of Works undertaken throughout the project.

No Works shall be undertaken in any area until the handover baseline survey has been agreed between the Parties and without the written confirmation of the Superintendent.

1.23.6 Excavation

1.23.6.1 General

The Contractor shall carry out all earthworks excavation to the extent shown on the Drawings or directed by the Superintendent. The Contractor is responsible for assessing the soil/rock types on Site and selecting suitable plant and equipment for undertaking excavation Works.

If encountered, the Contractor is to remove all soft or unsuitable material from the base of the tank farm footprint.

All completed earthworks are to be inspected and approved by the Superintendent.



The Principal has undertaken a geotechnical assessment of the ground conditions in the vicinity of the tank farm. This geotechnical survey has been provided to assist the Contractor in determining the belowground conditions. The Principal takes no responsibility for the accuracy of the geotechnical assessment, and it is for the Contractor to undertake all necessary investigations as applicable to the Works.

Appendix No. 1 – Geotechnical Investigation provides information on the ground conditions in the vicinity of the tank farm.

1.23.6.2 *Hard Limestone*

In the event that hard limestone is encountered, the Contractor is to immediately advise the Superintendent, who, in discussion with the facility designer, will determine if the tank farm design level can be increased in height to eliminate the need to excavate some or all hard rock.

In the event that there is a requirement to excavate hard limestone, this will be dealt with as a Variation under the Contract.

Hard limestone is defined as being limestone that cannot be excavated at a rate of $>5 \text{ m}^3/\text{hour}$ by a minimum 30-tonne excavator, that is in good working order and being operated by a competent operator, using a narrow rock bucket.

1.23.6.3 *Excavated Material*

Suitable excavated material is to be used as fill material.

The Superintendent will determine the suitability of the excavated material for use as fill.

Excess excavated material not used as fill material will be stockpiled separately in a location as directed by the Superintendent, within 200 m of the Works area.

All excavated material that is deemed, by the Superintendent, to be unsuitable to be used as fill, will be stockpiled separately in a location as directed by the Superintendent, within 200 m of the Works area.



1.23.7 Fill Materials

1.23.7.1 General

The Contractor shall carry out all earthworks fill to the extent shown on the Drawings or as directed by the Superintendent. The Contractor is responsible for assessing the fill requirements and selecting suitable plant and equipment for undertaking the required Works.

All fill material must be approved for use by the Superintendent, who may reject unsuitable material.

1.23.7.2 Material

Select fill material shall comprise naturally occurring sandy soil sourced on-site from the excavation Works or within 1 km of the Works area. The material is to be free of debris and deleterious material and with a maximum particle dimension no larger than 50 mm. The suitability of the fill material will be determined by the Superintendent prior to incorporation into the Works.

The 0.5 m lower portion of the electrical conduit and pipe services trenches are to be backfilled with low-permeability material (to limit the possible flow of landfill gas along the pipe trench). This material is not available on site and is to be supplied by the Contractor.

The low-permeable material is to be fine grained, with maximum permeability of 1×10^{-6} m/s and a maximum particle size of 10 mm, so as not to damage the pipes and conduits during compaction.

1.23.7.3 Unsuitable Material

The term "unsuitable material" shall apply to large items and weak deposits and organic material, which, because of its inherent nature, cannot be satisfactorily reconditioned and is not suitable as a foundation, bedding or backfill material. Unsuitable material shall be removed within the limits specified by the Superintendent using whatever equipment is required.

All material that is deemed unsuitable by the Superintendent to be used as fill will be stockpiled, as directed by the Superintendent, within 200 m of the Works area.

1.23.8 Sub-Grade Preparation

On completion of excavation, all standing water shall be drained or pumped away before sub-grade preparation can commence.

The sub-grade area shall be thoroughly wetted and rolled with a minimum four passes of a smooth drum vibrating roller.



1.23.9 Fill Placement and Compaction

1.23.9.1 Inspection

Before fill is placed in any area, the Superintendent shall be notified in writing 24 hours prior to Works commencing. The Superintendent may inspect the area to confirm the Works conforms to the Specifications.

1.23.9.2 General Placement and Compaction Standards

Fill shall be placed, levelled, moisture conditioned to +/- 2 % of optimum, and compacted to not less than 95% of the Modified Maximum Dry Density (MMDD) determined in accordance with AS 1289.5.2.1. As a minimum standard, all areas of fill are to be compacted in layers of no greater than 300 mm or less than 100 mm. Where less than 100 mm is required to be worked, the underlying material shall be scarified to such a depth that the resulting thickness of the layer to the Works is greater than 100 mm.

Each layer worked shall be generally parallel to the finished surface and shall extend to the full width of the fill in that particular level. The Contractor shall at all times prevent ponding of water on the fill.

The Contractor may propose an alternative fill placement and compaction methodology to the Superintendent for review and acceptance; however, the Contractor is to ensure that any proposed methodology is able to achieve a minimum compaction density of 95% of the Modified Maximum Dry Density (MMDD) determined in accordance with AS 1289.5.2.1.

1.23.9.3 Electrical Conduit and Pipe Services Trenches

The Contractor is to backfill the electrical conduit and pipe services trenches with two separate material types. The 0.5 m lower portion of the trenches are required to be backfilled with low-permeability material (to limit the possible flow of landfill gas along the pipe trench). This material is not available on site and is to be supplied and installed by the Contractor. The low-permeable material is to be fine grained, with maximum permeability of 1×10^{-6} m/s and a maximum particle size of 10 mm, so as not to damage the pipes and conduits during compaction. Prior to the supply of the material, the Contractor is to provide the Superintendent with suitable testing certificates (PSD and permeability) to demonstrate that the nominated material achieves the Specification requirement.

During the installation and compaction of the first layer (max. 300 mm) of low-permeability material, care is to be taken to ensure soil material fully surrounds the pipe and conduit wall, to provide adequate structural support. The compaction of the first layer is to be gradually achieved so as not to damage the larger diameter pipes, which will have fusion coupling joints that increase the pipe diameter. In addition, the fusion coupling electrode connections are to be installed on the side of the pipe and not on the crown of the pipe.

The upper 0.5 m of the pipe services trench and the upper 0.3 m of the enviro shed electrical conduit trench is to be backfilled with compacted limestone, supplied and installed by the Contractor.

The electrical conduit trench from the tank farm to the wastewater tank does not require the specialised backfill, as it is unlikely that there will be significant landfill gas in this area (if any). This trench can simply be backfilled with suitable trench excavated material over its full depth. There is no requirement for a 0.3 m upper layer of limestone in this trench.

1.23.9.4 *Compaction Testing*

The Contractor shall arrange for the testing and sampling of compacted fill. Fill operations shall be interrupted as necessary to allow the recovery of samples or to carry out control tests on the fill.

All materials testing and density testing shall be undertaken by a laboratory that is NATA accredited for those tests being undertaken. Testing will be used to confirm specified moisture conditions and standards of compaction are achieved. All testing shall be undertaken in accordance with the appropriate sections of AS1289 – Methods for Testing Soils for Engineering Purposes.

The construction programming and Contract Sum shall include allowances for taking and testing samples and time delays while samples are being collected and tested.

No additional payment will be made for any completed Works requiring removal and/or repair as a result of any tests organised by the Superintendent.

Inspection and testing shall be carried out in accordance with the requirements of this Specification.

A minimum of three tests are to be carried out on each of the following:

- Tank farm foundation; and,
- The road/hardstand service crossing.

Field density tests shall be determined by Nuclear Densometer methods (AS1289.5.8.1) in association with modified compaction (AS1289.5.2.1).

Compaction shall be carried out in accordance with the Assigned Values Method, as defined by AS1289.5.4.2.

If any areas of the Works are found to be non-compliant with the compaction requirements of this Specification, they shall be re-worked (if necessary), re-compacted and re-tested for compliance.

1.23.9.5 *Dimensions and Tolerances*

The finished levels of fill shall be within -0 mm and +25 mm of the design levels along the road/hardstand crossing and within -25 mm and +0 mm of the design levels in the tank farm base.

1.23.9.6 *Control of Water*

During excavation and construction, all areas of earthworks shall be kept free of water by temporary drains or other means. Surface water shall be prevented from flowing onto the excavations or fill areas by the construction of diversion drains or other suitable mechanisms before any other excavation commences. Excavation and fill areas shall always be graded to facilitate surface drainage and any loose material compacted to prevent absorption. Particular care shall be taken to ensure that surface water does not reach fill material that has yet to be compacted.

1.23.9.7 *Surface Confirmation*

The completed surface of the tank farm shall be surveyed by the Contractor on a maximum 2 m grid to confirm the accuracy of the constructed earthworks by a comparison against the design levels.

The results of the survey shall be provided to the Superintendent prior to inspecting the completed surface to confirm the Works meets the specified requirements.

1.23.9.8 *Clean-up*

On completion of the Works the Site shall be cleared of all materials and debris. Any damage shall be made good, and the Site restored to a neat and tidy condition. All Works areas shall be smoothed and graded conforming to the natural appearance of the landscape.



2 Pipelines

2.1 General

There are two pipelines associated with the Works, the ring main leachate pipeline around the landfill, including connection to the tank farm and a smaller wastewater pipeline from the vehicle washdown facility wastewater tank.

2.2 Leachate Pipeline

The leachate ring main pipeline is a combination of approximately 1,200 m DN110 mm pipe and approximately 750 m of DN160 mm pipe that is installed aboveground around the Stage 2 landfill development and underground from the landfill to the tank farm.

The pipeline includes a number of fittings including the following:

- Isolation valves and air controls; and,
- Scour points/Hi-Flo pump connections.

The leachate pumping and connection to the pipeline does not form part of these Contract Works and will be carried out by the Principal's leachate management contractor after Practical Completion.

2.3 Wastewater Pipeline

The wastewater pipeline is approximately 260 m of DN50 mm pipe from vehicle washdown facility wastewater tank and is connected to the tank farm. There is also a duty and standby bypass pipeline from the tank farm to the landfill.

The pipeline is to be installed aboveground between the wastewater tank and the tank farm, belowground between the tank farm and the landfill and to extend at least 10 m aboveground onto the landfill surface.

The Works also includes the installation of a pumping system in the wastewater tank.

2.4 Pipeline Locations

The typical location of the pipelines has been indicated in the Drawings.

The final location of the pipelines is to be determined on site to accommodate existing infrastructure around the landfill, facilitate ease of construction, the shortest practical pipe length, to prevent vegetation removal and to enable easy pipeline inspection during infrastructure operation.

The final location of the pipelines is to be agreed with the Superintendent.

2.5 Ring Main Pipe Services Tie-in

The tie-in point between the ring main pipe and the pipe connection to and from the tank farm is to be an aboveground connection as described in the Drawings.

The tie-in point includes two 150 mm diameter concrete filled galvanised steel pipe bollards, and min. 500 mm diameter x 700 mm deep concrete foundations at the ring main pipeline tie-in point (T pieces).

The pipe tie-in junctions are to be securely strapped to the bollards, using thick stainless-steel straps, to resist horizontal pipe movement when the pipeline expands and contracts during heating and cooling cycles.

The pipes are to remain aboveground for a minimum of 1 m from the tie-in point before they transition into the pipe trench.

2.6 Pipe Services Trench

The Contractor is to construct the pipe services trench, starting approximately 1 m (to be determined on site) from the tie-in point to the leachate ring main pipeline at the edge of the landfill, across the limestone hardstand and access road through to the edge of the tank farm.

The pipe services trench is to be backfilled with 0.5 m of low-permeability material and then 0.5 m of compacted limestone, both material types being supplied by the Contractor.

The Contractor is to also supply and install three lines of detectable warning marker tape within the pipe trench, installed between the two material layers. There is to be a line of marker tape installed directly above the outside pipe or conduit and the third line of marker tape is to be installed in the middle of the service trench.

2.7 Pipe Joins

Both pipelines are specified as PE100, PN12.5 SDR 13.6 (HDPE pipes). All pipe length joins are to utilise electrofusion couplings and not butt welds.

In the pipe services trench, the 160 mm diameter fusion coupling electrode connections are to be installed on the side of the pipe and not on the crown of the pipe. This is to prevent the coupling being damaged during trench backfill and compaction.

Connections to pipeline equipment and fittings can be via flanges or threaded couplings.

2.8 Pipe Labelling

Labels are to be provided to clearly identify the type of pipeline.

Labels are to be weather and UV resistant, plastic engraved labels. Printed labels may be acceptable if of suitable quality and demonstrated longevity. The Contractor is to provide details on the nominated label type, size, font, colour and fixing method to the Superintendent for review and approval, prior to installation.

Each pipeline is to be labelled accordingly:

- Leachate Pipeline:
 - o At ring main tie-in to road crossing, before the pipe goes underground (2 off “Leachate Pipeline – Duty” & “Leachate Pipeline – Spare”);
 - o At entrance to tank farm (2 off “Leachate Pipeline – Duty” & “Leachate Pipeline – Spare”);
 - o At entrance/exit from each tank (6 off “Leachate Pipeline - In” & “Leachate Pipeline – Out”); and,
 - o Additional labels in locations as determined by the Superintendent (4 off – text to be determined).

- Wastewater Pipeline:
 - o At exit from the wastewater tank (1 off “Wastewater Pipeline”);
 - o At entrance to tank farm (1 off “Wastewater Pipeline”);
 - o At entrance to each tank (3 off “Wastewater Pipeline”);
 - o At exit from tank farm (2 off “Wastewater Pipeline - Duty” and “Wastewater Pipeline – Spare”);
 - o On emerging aboveground after the road crossing, adjacent to the leachate pipeline labelling location (2 off “Wastewater Pipeline - Duty” and “Wastewater Pipeline – Spare”); and,
 - o Additional labels in locations as determined by the Superintendent (2 off – text to be determined).

2.9 Pressure Testing

The leachate pipeline is to be pressure tested.

Field pressure testing HDPE pipelines requires consideration due to the creep response and stress relaxation of the material. When a HDPE pipe is sealed at test pressure, there may be a pressure decay, even in a leak free system due to the continued expansion of the pipe through the test period. See AS/NZS 2033 and AS/NZS 2566.2 for more information.

Pressure testing is a potentially dangerous operation, and all hazards are to be addressed, including the establishment of exclusion zones where necessary.

The pressure test of the leachate pipeline is to be undertaken once the pipeline and all fittings have been installed.

Ideally the pressure test is to be undertaken prior to the conduit and pipe services trenches being backfilled, so that any possible leaks can be observed; however, due to the need to maintain access along the road, this is unlikely to be possible for the pipe services trench under the road. If there is need to immediately backfill the pipe services trench to maintain access, then only the road width portion of the trench is to be backfilled. The remaining length of the pipe services trench across the limestone hardstand area and between the road edge and the tank farm is to be left open during pressure testing.

The pressure test is to include the following requirements:

- Ensure that the pipeline is clear of all debris and obstructions;
- Fresh water is to be used for the pressure test;
- The whole pipeline is to be tested in a single test;
- All valves are to be open during pressure test;
- Blanked flanges are to be fitted to all pipe/valve ends;
- Test valves (not the installed valves) are to be provided at the highest end of the pipeline (at tank inlet) to allow air to be vented from the line during filling;
- No pressure testing is to take place until the fusion coupling joints have completely cooled to ambient temperature;
- There is no requirement to include the short pipe lengths flowing out of each tank in the pressure test;
- Testing pressure 125 m head of water (1,250 kPa) at the lowest point on the pipeline;



- Test water shall be slowly introduced into the pipeline until all air is purged from the line and water flows freely from the ends of the pipeline. The water should preferably be introduced into the pipeline at the lowest point to assist the removal of air;
- It is essential that all air is removed from the line prior to commencing the test procedure. Entrapped air can result in erroneous pressure/time recordings;
- After filling the pipe, pressurise the pipe and allow a settlement period of minimum 12 hours for the pipeline to stabilise. The pressure will drop during this period as a result of pipe expansion;
- Once the pipe is initially filled and pressurised, inspect the pipeline for any leaks, if none are observed and the pressure is being maintained (not dropping off rapidly), wait the required 12 hours. If a leak is observed, repair leak and then repressurize the pipe;
- After the 12-hour stabilisation period, inspect the pipeline for any leaks, if none are observed, top up the pipe pressure to the required test pressure, if a leak is observed, repair the leak and then repressurize the pipe;
- Maintain the test pressure for a minimum duration of 5 hours and monitor the test pressure;
- Record the test pressure at the commencement of the test, every hour and at the end of the test and inspect the pipeline for leaks at the same intervals;
- If there are no leaks observed and the pressure is maintained within 15% of the initial test pressure, then the test is a pass;
- If there are no leaks observed and the pressure cannot be maintained within 15% of the initial test pressure, then the pressure is to be increased back to the initial test pressure and the 3-hour test re-commenced;
- If there is a leak observed during the 3-hour test, the test is a failure and the leak is to be repaired, and the 3-hour pressure test repeated until there is a passing result; and,
- On conclusion of the test, the test water is to be discharge to the environment and not into the leachate tanks.

There are other test methods for pressure testing pipelines. The Contractor may propose an alternative pressure testing methodology; however, this alternative methodology is to be reviewed and accepted by the Superintendent prior to the pressure test commencing. Refer to AS/NZS 2566.2 for details of other acceptable methods for field testing HDPE pressure pipelines.

The wastewater pipeline is not required to be pressure tested.



3 Wastewater Tank and Pump

3.1 Wastewater Tank

The existing belowground wastewater tank associated with the vehicle washdown facility has a volume of approximately 50 kL (6 m diameter x 1.8m deep). The Contractor is to empty out tank, with the wastewater being pumped into the adjacent biofilter (where it currently flows). Once empty, the tank is to be cleaned out of all solids that have built up in the bottom of the tank. This can be achieved by the use of a vacuum truck and the removed solids and residual wastewater discharged onto the landfill surface.

3.2 Pump

The Contractor is to supply and install a submersible macerator pump and associated float switch in the base of the wastewater tank. The float switch is to be set to optimise the pump cycling (based on manufacturer advice); however, the tank is not to fill to less than 500 mm from the overflow level before the pump switches on.

3.3 Particulate Filter

The pump discharge pipe is to be connected to a Principal Supply particulate filter, that is to be bolted to a cast reinforced concrete slab (1.5 m x 1.5 m x 0.1 m, WPM, SL62, 30 mm cover).

The filter has 100 mm diameter fittings, a flanged, horizontal inlet fitting and a horizontal HDPE threaded discharge fitting. The discharge fitting can be removed to leave a vertical flanged fitting.

3.4 Level Sensor

The wastewater tank is to be fitted with a liquid level sensor that enable the live monitoring of the tank liquid level. The sensor signal is to be integrated into the SCADA system to enable live monitoring via desktop computer and mobile phones.

The Principal will provide the Contractor with the nominated mobile phone numbers that are to receive the tank level data.

3.5 Alarm Notification

The wastewater tank is also to be fitted with a float switch system (separate to the pump float switch) that sets off an alarm in the event that the wastewater tank level rises to within 300 mm of the tank overflow level. The float switch signal is to be integrated into the SCADA system to enable monitoring via desktop computer and mobile phones. The alarm is to activate a flashing light located at the tank farm and also send a notification to nominated mobile phone numbers identifying that the wastewater tank has overfilled. Once the wastewater tank level has been reduced to below 400 mm from the overflow level, the flashing light is to be switched off and a further message is to be sent to the nominated mobile phones identifying that the tank liquid level is back within the acceptable range.

The Principal will provide the Contractor with the nominated mobile phone numbers that are to receive the alarm message, and the message text is to be agreed with the Superintendent.



4 Tank Farm

4.1 General Arrangement

The tank farm consists of three large volume leachate/wastewater storage tanks that are connected to the leachate pipeline and the wastewater pipeline. There is also a pipe arrangement to enable a future downstream leachate/wastewater processing facility to extract liquid from the three tanks. The tank farm also includes a bypass pipeline for the wastewater to be discharged from the belowground wastewater tank directly to the landfill and bypassing the three storage tanks.

There is also an arrangement of manual and electrically actuated isolation valves, flowmeters, alarms and associated fittings within the tank farm to provide operational functionality and overfill alarm warning.

4.2 Tank Farm Bunding

The Contractor is to supply and install a 23.5 m x 10 m (internal dimensions) reinforced concrete floor and a 1.4 m high concrete perimeter bund wall around the tank farm. The concrete structure includes a 0.5 m x 0.5 m x 0.5 m sump with removable grate and external drain.

The structural detail of the tank farm floor, bunding and sump has been provided in the Drawings.

4.3 Tank Lining and Warranty

The Contractor is to supply and install three large volume tanks within the tank farm.

The tanks are to be fixed to the floor of the concrete tank farm in accordance with the tank manufacturer's recommendations.

The Contractor is to provide the Superintendent with written confirmation from the tank manufacturer that the tank lining or tank wall construction material is compatible with the chemical composition of the site landfill leachate. The Contractor is to also provide a warranty from the tank manufacturer guaranteeing a minimum of 20-years tank operating life compatibility with the landfill leachate.

The design has been based on Colorbond steel, bolted XL13, 92 kL, 6.02 m diameter Pioneer tanks, with Industratex lining. The Contractor is to nominate the tank type, dimensions and confirmation that the specified tank requirements have been provided.

Tank specification requirements include:

- Lidded tanks with access manhole and vent pipe;
- Tank-top safe access ladder;
- Minimum operational storage capacity of 83.4 kL (tank High level);
- Minimum High level to High/High level volume of 3 kL;
- Minimum High/High level to overflow volume of 3 kL;
- 20-year life compatibility with landfill leachate; and,
- Pale Eucalypt colour (or similar).



Note: The tank farm bunding capacity has been designed for a maximum tank storage capacity to overflow of $3 \times 95 \text{ kL} = 285 \text{ kL}$. If the total tank volume to overflow is greater than 285 kL, then the tank farm bund capacity needs to be increased by a minimum of 110% of the increased capacity of the storage tanks.

Appendix No. 2 – Leachate Analysis provides the typical chemical composition of the landfill leachate.

4.4 Pipe Fixing

All pipelines within the tank farm are to be fixed to the concrete floor using pipe clamps, with a minimum 20 mm clearance between the pipe and the concrete floor. The pipe clamps are to be spaced at a maximum of 1 m apart.

4.5 Flowmeters

The Contractor is to supply and install two 150 mm diameter digital flowmeters within the tanks farm, including weather covers over the meters to protect them from rainfall and UV impact.

The Contractor is to also install two Principal Supply flow meters in the 50 mm diameter wastewater pipeline. The Principal Supply flowmeters have 75 mm diameter connections; hence, 75/50 reducers will be required to facilitate the connection of the flowmeters. The Principal Supply flowmeters also have weather covers.

All flow meters are to be set to zero.

4.6 Safe Access – Over Bund Wall

The Contractor is to supply and install safe access steps over the 1.4 m high bund wall and into the tank farm bund area. This is to include steps, platform, handrail, concrete foundations on the outside of the tank farm and bolted fixings on the inside of the tank farm.

The safe access steps are to be in accordance with AS 1657 (2018), 1 m wide, 1 m landing on top of the wall, 1 m high handrail with intermediate rail on both sides, riser $130 \text{ mm} < R < 225 \text{ mm}$ and tread minimum 185 mm, with non-slip edging.

The steps are to be galvanised, and green epoxy coated, or equivalent two-pack painted coating as approved by the Superintendent.

4.7 Safe Access - Tanks

The Contractor is to supply and install permanent, fixed safe access ladders to the top of all three storage tank. The ladders are to be designed and installed in accordance with AS 1657 (2018).

The ladders are to be located and configured to enable safe access to the top of the tanks for the operation, monitoring and maintenance of all equipment and fittings mounted on top of the tanks.

4.8 Guardrail

The Contractor is to supply and install a 1 m high galvanised steel guardrail with intermediate rail along the top of three sides of the concrete bund wall. The guardrail is to be designed and installed in accordance with AS 1657 (2018).



4.9 Level Sensor

Each storage tank is to be fitted with a liquid level sensor that enable the live monitoring of the tank liquid level. The sensor signal is to be integrated into the SCADA system to enable live monitoring via desktop computer and mobile phones.

The Principal will provide the Contractor with the nominated mobile phone numbers that are to receive the tank level data.

4.10 Alarm Notification

Each storage tank is to be fitted with a float switch system that sets off an alarm in the event that the liquid level in the tank rises to 150 mm above the tank High level (84.3 kL or 100%), that is 105% of the tank operating volume. The float switch signal is to be integrated into the SCADA system to enable monitoring via desktop computer and mobile phones. The alarm is to activate a flashing light located at the tank farm and also send a notification to nominated mobile phone numbers identifying that the storage tank has overfilled. Once the storage tank level has been reduced to below 150 mm of the tank High level, the flashing light is to be switched off and a further message is to be sent to the nominated mobile phones identifying that the tank liquid level is back within the acceptable range.

The Principal will provide the Contractor with the mobile phone numbers that are to receive the alarm message, and the message text is to be agreed with the Superintendent.

In addition to the alarm activation, when the float switch activates the alarm message, it is to also close the two electric actuator isolation valves that shut off the inflow to all tanks and then open the wastewater bypass electric actuator isolation valve. Once the storage tank level has been reduced to below 150 mm of the tank High level, the actuator valves are to reverse (two inflow pipes open and then the wastewater bypass close).

The incoming electrically actuated valves are to close or open fully before the outgoing actuator valve is opened or closed.

4.11 Alarm Flashing Lights

Alarm flashing lights are to be provided for each of the three storage tanks and also the wastewater tank. The lights are to be mounted in a corrosion-resistant frame and prominently displayed on the tank farm bund perimeter wall, typically 500 mm above the wall, in a location that is easily visible for traffic driving past the tank farm.



5 Power Supply

The Contractor is to supply and install the power supply to the tank farm and wastewater tank.

The power supply will be sourced from the adjacent enviro sheds.

The power supply is for the electrically actuated isolation valves and the washdown facility wastewater pump.

Two 63 mm diameter electrical cable conduits and pits are to be installed between the enviro sheds and the tank farm (one as a spare), with the cable sized to suit the electrical requirements within the tank farm and for the wastewater tank pump. The conduits have been over-sized to allow for future (unknown) possible power supply requirements.

The conduit and cable from the tank farm to the wastewater tank is to be sized to suit the pump requirements only, with no spare conduit provided.

The conduits are to be co-located in the pipe services trench, and beyond the pipe service trench, in a separate trench that is a minimum 0.8 m deep.

All trenches are to include detectable warning marker tape at 500 mm above the trench invert.

Electrical pits and distribution boards are to be provided as required.

There is a 10-amp power supply available at the enviro sheds. The assumption is that this is adequate power supply for the project requirements. If there is insufficient power available in the enviro sheds, the Principal will make arrangements for the upgrade of the power supply to the enviro sheds or the Contractor will be requested to undertake the upgrade as a Variation to the Contract.

There is the option to provide a solar and battery power system for the tank farm and wastewater tank. The selection of the preferred option will be determined prior to Contract award.

In the event that the solar and battery powered option is selected, the Contractor is still required to install the electrical conduits from the enviro sheds to the tank farm, but not the electrical cable.



6 SCADA and Telemetry System

The Contractor is to supply and install a comprehensive SCADA and telemetry system to enable the monitoring and operation of the following equipment:

- Tank farm incoming flow meters – ND150 and ND50;
- Tank farm outgoing flow meters – ND150 and ND50 (wastewater bypass);
- Wastewater tank level measurement;
- Wastewater tank level alarm;
- Storage tank level measurement;
- Storage tank level alarm and electrically actuated valve operation;
- Electrically actuated valve remote operation – 2 x ND150 and 2 x ND50;
- Air compressor ON/OFF;
- Air compressor running YES/NO;
- Air pipeline pressure monitoring (at compressor outlet);
- SCADA system; and,
- All telemetry is to enable the real-time monitoring, and in some cases, operation of the interconnected equipment.



7 Equipment List

Table No. 1 – Equipment List provides information on all pipework and equipment incorporated into the works, including a list of spares that the Contractor is to provide.

Table No. 1 – Equipment List

Item	Description	Specification	Quantity	Location
1	50 mm diameter HDPE pipe	PE100 DN50 PN12.5 SDR13.6 1.4 L/s @ 1 m/s	260 m	Wastewater Pipeline and tank farm
2	110 mm diameter HDPE pipe	PE100 DN110 PN12.5 SDR13.6 6.8 L/s @ 1 m/s	1,200 m	Leachate Pipeline - north
3	160 mm diameter HDPE pipe	PE100 DN160 PN12.5 SDR13.6 14.5 L/s @ 1 m/s	750 m	Leachate Pipeline – south and tank farm
4	Air Release Valve	Vent-O-Mat 050RGX16 flanged or BSP connection, 50 mm diameter, 316 SS, PN16	4	Leachate Pipeline
5	Air Release Valve	Vent-O-Mat 050RGX16 flanged or BSP connection, 50 mm diameter, 316 SS, PN16	2	Tank Farm
6	Water Hammer Arrestor	No product nominated DN50, PN10, BSP connection	3	Tank Farm
7	Float Valve	Flowjack 3" High Pressure Float Clapper Valve, 316 SS or similar	3	Tank Farm
8	Float Valve	Flowjack 2" High Pressure Float Clapper Valve, 316 SS or similar	3	Tank Farm
9	Float Switch	Strongman Pumps Kelco Q Series Float Switches or similar	3	Tank Farm
10	Float Switch	Strongman Pumps Kelco Q Series Float Switches or similar	1	Wastewater Sump Tank
11	Float Switch telemetry: - To electric actuator valves - To alarm flashing light - To mobile phone signal - To SCADA system	No product nominated Compatible with electric actuator valves and mobile phone signal requirements	3	Tank Farm



Item	Description	Specification	Quantity	Location
12	Float Switch telemetry: - To alarm flashing light - To mobile phone signal - To SCADA system	No product nominated Compatible with mobile phone signal requirements	1	Wastewater Sump Tank
13	Level Sensor	Gallagher Wireless Water Monitoring System Series 2 or similar	3	Tank Farm
14	Level Sensor	Gallagher Wireless Water Monitoring System Series 2 or similar	1	Wastewater Sump Tank
15	Level Sensor telemetry: To SCADA system	No product nominated Compatible with mobile phone signal requirements	3	Tank Farm
16	Level Sensor telemetry: To SCADA system	No product nominated Compatible with mobile phone signal requirements	1	Wastewater Sump Tank
17	100 mm diameter Particulate Filter	Principal Supply – Contractor will need to provide 100/50 reducers to connect to the 50 mm pipe diameter	1	Wastewater Sump Tank
18	50 mm diameter Isolation Valve	John Valves FIG 801, 802, 803 or 804 isolation valve, 2"/50 mm, 316 SS	1	Wastewater Pipeline
19	50 mm diameter Isolation Valve	John Valves FIG 801, 802, 803 or 804 isolation valve, 2"/50 mm, 316 SS	6	Leachate Pipeline
20	50 mm diameter Isolation Valve	John Valves FIG 801, 802, 803 or 804 isolation valve, 2"/50 mm, 316 SS	7	Tank Farm
21	100 mm diameter Isolation Valve	John Valves FIG 802, 803 or 804 isolation valve, 100 mm, 316 SS	7	Leachate Pipeline
22	150 mm diameter Isolation Valve	John Valves FIG 804 isolation valve, 150 mm, 316 SS	2	Leachate Pipeline
23	150 mm diameter Isolation Valve	John Valves FIG 804 isolation valve, 150 mm, 316 SS	10	Tank Farm
24	50 mm diameter Electrically Actuated Valve (valve and actuator)	John Valves FIG 801, 802, 803 or 804 isolation valve, 2"/50 mm, 316 SS, with John Valves electric actuator	2	Tank Farm
25	150 mm diameter Electrically Actuated Valve (valve and actuator)	John Valves FIG 804 isolation valve, 150 mm, 316 SS, with John Valves electric actuator	1	Tank Farm



Item	Description	Specification	Quantity	Location
26	150 mm diameter Digital Flowmeter with weather cover	Euromag MUT2300 DN150 or Similar	2	Tank Farm
27	75 mm diameter Digital Flowmeter with weather cover	Principal Supply item, includes weather cover – Contractor will need to provide 75/50 reducers to connect to the 50 mm pipe diameter	2	Tank Farm
28	Submersible Macerator Pump	ASC - DSK-10A, 1 HP, 0.75 kW, 5L/s @ 6 m head, 304 SS, 2-year warranty or Similar	1	Wastewater Sump Tank

8 System Commissioning

On completion of construction, the pipeline and tank farm infrastructure is to be commissioned to confirm functionality.

The commissioning is to test the individual components of each portion of the Works. Due to this being a sub-project and yet to be connected to the landfill leachate sump extraction pumps and also there being no downstream leachate processing system, the commissioning will be undertaken in stages and using fresh water, not leachate.

Appendix No. 3 – Commissioning Plan sets out the stages and activities associated with the commissioning of the pipeline and tank farm infrastructure.

9 As-Constructed Documentation

The Contractor is to provide a set of As-Constructed documentation and drawings in AutoCAD and PDF format and A3 size hard copy and all equipment operating manuals and tank warranty.

The As-Constructed documentation and drawings are to show the following minimum detail:

- All above and belowground pipeline and power cable routes;
- All equipment locations;
- Tank Farm Layout; and,
- Telemetry and SCADA system diagrams.

Appendices

Appendix No. 1 – Geotechnical Investigation

Appendix No. 2 – Leachate Analysis

Appendix No. 3 – Commissioning Plan

Appendix No. 1 – Geotechnical Investigation

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Appendix No. 2 – Leachate Analysis

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Appendix No. 3 – Commissioning Plan

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