



Construction Quality Assurance Plan

Tamala Park Waste Management Facility
Southern Piggyback Cell and Leachate Management Area



Prepared for Mindarie Regional Council

18 August 2025

Project Number: TW23015

DOCUMENT CONTROL

Version	Description	Date	Author	Reviewer	Approver
0.1	Internal Review	7/05/2025	SS	CS	
1.0	First Release	7/05/2025	SS	CS	CS
2.0	Updated following client comments	26/05/2025	SS	CS	CS
3.0	Final Release	19/06/2025	SS	CS	CS
4.0	Peer Review Update	18/08/2025	SS	CS	CP

Approval for Release

Name	Position	File Reference
	Waste Discipline Manager (West Coast)	TW23015 - Tamala Park SPC & LMA CQAP_4.0
Signature		
Date: 2025-08-18 09:39:40		

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1 Introduction

The purpose of the Construction Quality Assurance Plan (CQA) Plan is to detail the quality assurance procedures and documentation requirements for the construction of the Southern Piggyback Cell (SPC) and Leachate Management Area (LMA) at the Tamala Park Waste Management Facility (the Site). The CQA plan is to be read in conjunction with the technical specification which details the testing requirements, methods and installation procedures.

The Works comprise:

1. Construction of the Southern Piggyback Cell

- Clearing of vegetation and unsuitable material;
- General earthworks to formation levels including separation and stockpiling of clean cover soils;
- Construction of a sub-cell landfill gas management system comprising:
 - Supply and installation of the Secondary Gas Collection geocomposite strip drains (strip drains) on the formation surface in the base of the cell in a herringbone layout;
 - Supply and installation of the Primary Gas Collection pipes at 25m spacings comprising DN160 perforated HDPE pipework, with perforated end caps, with nominal 40mm diameter low calcareous aggregate and geotextile surround;
 - Supply and installation of solid DN160 HDPE landfill gas well pipework, from the base of the cell to the eastern crest, in trenches backfilled with Engineered Fill to form a hermetic seal; and
 - Supply and install temporary endcaps on the landfill gas well pipework for future connection to the gas main by EDL.
- Construction of 300mm thick granular Regulating Layer from Principal supplied site-won soils;
- Construction of a 500mm thick granular Engineered Fill Layer from Principal supplied site-won soils;
- Supply and installation of a polymeric mesh geogrid installed centrally within the 500mm thick Engineered Fill Layer;
- Supply and installation of the geosynthetic composite lining system comprising:
 - Geosynthetic Clay Liner (GCL);
 - 2mm Linear Low-Density Polyethylene (LLDPE) Double Textured Geomembrane;
 - Protection geotextile layer;
- Supply and installation of the leachate collection system comprising:
 - DN225 HDPE perforated Primary Leachate Collection pipework;
 - DN160 HDPE perforated Secondary Leachate Collection pipework;
 - 300mm thick low calcareous nominal 40mm aggregate Leachate Collection Layer; and
 - Separation Geotextile Layer.
- Installation of leachate extraction infrastructure comprising:
 - Construction of 15m long by 5m wide by 250mm thick reinforced concrete sump slab;

- Installation of the Principal supplied DN1000 HDPE telescopic leachate riser shafts (Primary Extraction) including base plate and first two sections.
- Supply and installation of two DN450 HDPE side riser pipes (Secondary Extraction) one fully perforated from the sump to the toe of the side slope to also act as a primary leachate collector and one perforated 2m from its base in the sump;
- Supply and installation of a DN160 HDPE monitoring probe sleeve
- Supply and installation of the reinforced concrete headwall; and
- Electrical Leak detection survey.

2. Construction of the Leachate Management Area

- Clearing of vegetation and unsuitable material;
- General earthworks to formation levels including separation and stockpiling of clean cover soils;
- Compaction of in-situ soils to form lower 250mm of the 500mm Engineered Fill Layer;
- Construction of a 250mm thick granular Engineered Fill Layer from Principal supplied site-won soils;
- Supply and installation of the geosynthetic composite lining system comprising:
 - Geosynthetic Clay Liner (GCL); and
 - 2mm Linear Low-Density Polyethylene (LLDPE) Double Textured Geomembrane.
- Construction of stormwater drainage swales;
- Supply and installation of a 1.8m high chain link security fence with 3 strand barbed wire top;
- Supply and installation of 4m wide access gate;
- Supply and installation of four cargo nets and two SOLAS approved life rings per pond;
- Leak detection survey of both ponds by water lance or arc testing method.

This plan shall be read in conjunction with the Southern Piggyback Liner Technical Specification and Drawings for the Works (the Specification). Further detailed and specific construction procedures and requirements are outlined in the Specification and Drawings. This document does not replace the Specification or Drawings.

2 Definitions

For the purposes of the CQA Plan guidelines, the following terms are defined below:

'Construction Quality Assurance' (CQA) – A planned system of activities that provide assurance that materials or construction activities are undertaken and installed as specified in the design.

'Construction Quality Control' (CQC) - The process of measuring and controlling the characteristics of the item/product in order to meet the manufacturers or project specifications.

'The Principal' shall be as defined in the Conditions of Contract and for this Project will be the Mindarie Regional Council.

'The Contractor' shall mean the future company contracted by the Principal to execute the Works and complete the project; and

'The Superintendent' shall be as defined in the Conditions of Contract and for this Project will be the Principal's appointed representative.

'The Landfill Gas Contractor' responsible for disconnection and reconnection of landfill gas infrastructure during the works will be EDL Pty Ltd.

2.1 Material Definitions

'Subgrade': In-situ soils with suitable geophysical characteristics to form a firm and unyielding surface for engineering purposes.

'Engineered Fill': Suitable site-won material that when compacted has a density of 95% of its modified maximum dry density (MMDD) and a moisture content $\pm 3\%$ of its optimum moisture content (OMC).

'Geosynthetic Clay Liner': A factory-manufactured hydraulic barrier consisting of sodium bentonite clay supported by geotextiles held together by needling, stitching, or adhesives.

'Geomembrane'. A geomembrane is very low permeability synthetic membrane liner or barrier used with any geotechnical engineering related material so as to control fluid (or gas) migration in a human-made project, structure, or system.

'Protection Geotextile'. Any permeable textile woven or non-woven, used with foundation, soil, rock, earth, or any geotechnical engineering related material as an integral part of a human-made project, structure, or system.

'Leachate Collection Pipe': 160mm and 225mm HDPE perforated SDR17 solid wall pipe.

'Leachate Drainage Aggregate': Nominal 20-40mm washed aggregate.

'Separation Geotextile': Any permeable textile woven or non-woven, used with foundation, soil, rock, earth, or any geotechnical engineering related material as an integral part of a human-made project, structure, or system.

'Minimum Average Roll Value' (MARV). The minimum average value of a particular physical property of a material, for 95 percent of all of the material in the lot.

'Overlap'. Where two adjacent geosynthetic panels contact, the distance measuring perpendicular from the overlying edge of one panel to the underlying edge of the other.

3 Role of Participants

The participants and/or parties that have been identified as key personnel in the delivery of this Project include, but are not necessarily limited to Principal and Superintendent; Design Engineer; CQA Consultant; Contractor; Resin Supplier; and Soils Testing Laboratory. The roles and responsibilities of the participants and/or parties are detailed below.

3.1 Superintendent

During the construction, the Superintendent acting on behalf of the Principal will serve as a single point of contact for the design engineer, Contractor and CQA Consultant during construction.

3.2 Design Engineer

The design engineering services for the Scope of Works will be provided by Talis. The design engineer reviews and approves any proposed changes in design during construction.

3.3 CQA Consultant

The CQA Consultant is an independent party not affiliated with the contractor, subcontractors, suppliers or manufacturers. The CQA Consultant may be the design engineer. The CQA Consultant has the overall responsibility for managing, coordinating and implementing the CQA activities and confirming that the Contractor's construction quality control activities are performed in accordance with the CQA Plan, construction drawings and technical specifications. Critical activities related to the construction, manufacture and installation of the earthwork, civil improvements and other project components will be monitored and documented by the CQA Consultant. The CQA Consultant will be responsible for issuing a Final Certification Report containing CQA documentation sufficient to satisfy regulatory requirements and the requirements of this CQA Plan.

3.4 Contractor

The Contractor is responsible for the timely construction of the project, as delineated in the Drawings and Technical Specifications and in accordance with this CQA Plan. The Contractor is also responsible for the CQC. In particular, the Contractor shall ensure that:

- Only materials meeting the requirements set forth in the Technical Specifications and Drawings are used; and
- The materials are installed in full conformance with the Technical Specifications and Design Drawings.

3.5 Resin Supplier

The resin supplier produces and delivers the resin to the geosynthetics manufacturer. Qualifications of the resin supplier are specific to the manufacturer's requirements.

3.6 Geosynthetic Manufacturer

The geosynthetic manufacturer is responsible for the production of finished material from appropriate raw materials. The geosynthetic manufacturer reports to the geosynthetics installer.

3.7 Geosynthetic Installer

The geosynthetics installer is the Contractor. The geosynthetics installer is responsible for field handling, storage, placement, seaming, loading, or anchoring against wind uplift and other aspects of the geosynthetic material installation. The geosynthetic installer will be trained and qualified to install geosynthetic materials of the type specified for this Project.

3.8 Materials Testing Laboratory

In the performance of the CQA activities, the CQA Consultant may engage a materials testing laboratory independent from the Contractor, subcontractors, or any material supplier or manufacturer. The testing laboratory will conduct tests on representative samples to evaluate their properties and compliance with the technical specifications.

3.9 Landfill Gas Contractor

The Landfill Gas Contractor, EDL Pty Ltd. is responsible for disconnection and reconnection of all landfill gas mains and associated infrastructure, as necessary, during the works. The Superintendent shall provide the Landfill Gas Contractor with the Contractor's Construction Programme and the Contractor shall provide at least 7 days' notice of any works which may require work to be undertaken by the Landfill Gas Contractor.

3.10 Soil Testing Laboratory

In the performance of the CQA activities, the CQA Consultant may engage a geotechnical testing laboratory, independent from the Contractor, subcontractors, or any material supplier or manufacturer. The testing laboratory will conduct tests on representative samples to evaluate their properties and compliance with the technical specifications.

4 Description of Works

The works to be carried out include, but are not limited to, the following:

1. Construction of the Southern Piggyback Cell

- Clearing of vegetation and unsuitable material;
- General earthworks to formation levels including separation and stockpiling of clean cover soils;
- Construction of a sub-cell landfill gas management system comprising:
 - Supply and installation of the Secondary Gas Collection geocomposite strip drains (strip drains) on the formation surface in the base of the cell in a herringbone layout;
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 - Supply and installation of solid DN160 HDPE landfill gas well pipework, from the base of the cell to the eastern crest, in trenches backfilled with Engineered Fill to form a hermetic seal; and
 - Supply and install temporary endcaps on the landfill gas well pipework for future connection to the gas main by EDL.
- Construction of 300mm thick granular Regulating Layer from Principal supplied site-won soils;
- Construction of a 500mm thick granular Engineered Fill Layer from Principal supplied site-won soils;
- Supply and installation of a polymeric mesh geogrid installed centrally within the 500mm thick Engineered Fill Layer;
- Supply and installation of the geosynthetic composite lining system comprising:
 - Geosynthetic Clay Liner (GCL);
 - 2mm Linear Low-Density Polyethylene (LLDPE) Double Textured Geomembrane;
 - Protection geotextile layer;
- Supply and installation of the leachate collection system comprising:
 - DN225 HDPE perforated Primary Leachate Collection pipework;
 - DN160 HDPE perforated Secondary Leachate Collection pipework;
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 - Installation of the Principal supplied DN1000 HDPE telescopic leachate riser shafts (Primary Extraction) including base plate and first two sections.
 - Supply and installation of two DN450 HDPE side riser pipes (Secondary Extraction) one fully perforated from the sump to the toe of the side slope to also act as a primary leachate collector and one perforated 2m from its base in the sump;

- Supply and installation of a DN160 HDPE monitoring probe sleeve
 - Supply and installation of the reinforced concrete headwall; and
- Electrical Leak detection survey.

2. Construction of the Leachate Management Area

- Clearing of vegetation and unsuitable material;
- General earthworks to formation levels including separation and stockpiling of clean cover soils;
- Compaction of in-situ soils to form lower 250mm of the 500mm Engineered Fill Layer;
- Construction of a 250mm thick granular Engineered Fill Layer from Principal supplied site-won soils;
- Supply and installation of the geosynthetic composite lining system comprising:
 - Geosynthetic Clay Liner (GCL); and
 - 2mm Linear Low-Density Polyethylene (LLDPE) Double Textured Geomembrane.
- Construction of stormwater drainage swales;
- Supply and installation of a 1.8m high chain link security fence with 3 strand barbed wire top;
- Supply and installation of 4m wide access gate;
- Supply and installation of four cargo nets and two SOLAS approved life rings per pond; and
- Leak detection survey of both ponds by water lance or arc testing method.

5 Reporting and Documentation

5.1 General

An effective CQA Plan recognises all construction activities that should be monitored and assigns responsibilities for the monitoring of each activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The CQA Consultant will document that all quality assurance requirements have been satisfied. The CQA Consultant will also maintain at the job site a complete file of Construction Drawings, Technical Specifications, CQA Plan, test procedures, daily logs, and other pertinent documents.

5.2 Record Keeping

Standard reporting procedures will include preparation of CQA documentation which, at a minimum, will consist of:

- Field notes, including memoranda of meetings and/or discussions with the design engineer or construction manager;
- CQA consulting logs and testing data sheets; and
- Construction problems and solution summary sheets.

This information will be reviewed by the CQA Consultant, signed, and transmitted to the construction manager daily.

Monitoring logs and testing data sheets will be prepared for each inspection. At a minimum, these logs and data sheets will include the following information:

- An identifying sheet number for cross referencing and document control;
- Date, project name, location and other identification;
- Data on weather conditions;
- A site plan showing work areas and locations selected for random CQA testing;
- Descriptions and locations of ongoing construction;
- Equipment and personnel in each work area;
- Location where in-site CQA tests and samples were taken;
- A summary of test results;
- Calibration of test equipment;
- Decisions made regarding acceptance of units of work and/or corrective actions to be taken; and
- Signature of CQA Consultant representative.

5.3 Construction Issues

The Installer will be informed by the CQA Consultant about any significant recurring non-conformance with the Construction Drawings, Technical Specifications, or CQA Plan. The cause of the non-conformance will be determined and appropriate changes in procedures of Specifications may be

recommended. These changes will be submitted to the design engineer for approval. When changes are made, they will become part of the construction documents.

5.4 Photographic Records

Photographs will be taken by the CQA Consultant and documented in order to serve as a pictorial record of work progress, problems and mitigation activities. The basic file will contain colour prints and they will be identified with the date, time, and location of the photograph.

5.5 Design and/or Specification Change

Design and/or specification changes may be required during construction. In such cases, the CQA Consultant will notify the design engineer and Construction Manager.

6 Requirements of the CQA Validation Report

At the completion of the work, the CQA Consultant will submit to the Superintendent a signed final certification report. This report will document that:

- Work has been performed in compliance with the construction documents;
- Physical sampling and testing have been conducted at the appropriate frequencies specified in the CQA Plan; and
- The required CQA documentation has been completed.

At a minimum, this report will include:

- A summary describing the CQA activities and indicating compliance with the Drawings and Technical Specifications;
- A summary of CQA testing, including failures, corrective measures and retest results;
- Geosynthetic panel layout drawings with test locations (where applicable);
- Roll numbers deployed; and
- Repairs.
- Records of sample and resample locations, the name of the individual conducting the tests, and the results of the tests;
- Daily inspection reports;
- Plant and labour;
- Records of site meetings;
- Progress photographs;
- Any other relevant information; and
- As built drawings (see below)

The as-built drawings must detail the following:

- Formation levels;
- Primary and Secondary Landfill Gas Collection system layout including solid and perforated pipe joints;
- Regulating Layer levels and thickness;
- Engineered Fill levels and thickness;
- Locations and identification marks of each geosynthetic panel, including anchor trenches and patch repair;
- Location of leachate collection and extraction pipework including connections of primary pipework to secondary pipework;
- Top of aggregate Leachate Drainage Layer levels and thickness including mounding of material over pipework (top of bank and bottom of bank each side of mound); and
- Any fabrication or shop drawings.

The validation report must contain a statement by the CQA Consultant that the works have been carried out in accordance with the CQA Plan (and specifications attached to it) and that the validation report (including the drawings and appendices) represent a fair and accurate record of the works.



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