March 2015

ALLAWUNA FARM LANDFILL

Construction Quality Assurance Plan for the Construction of Cell 1, Cell 2 and Ancillary Works

Submitted to:
SITA Australia Pty Ltd
116 Kurnall Road
WELSHPOOL WA 6106

REPORT

Report Number. 147645033-018-R-Rev0

Distribution:

1 Electronic Copy – SITA Australia Pty Ltd
1 Electronic Copy – Golder Associates Pty Ltd

Golder Associates

Table of Contents

1.0 INTRODUCTION

SITA Australia Pty Ltd (SITA) (the Principal) will issue a Contract for the construction of Allawuna Farm Landfill (Allawuna Landfill) and ancillary structures; Stormwater Dam, Leachate and Retention Ponds, sediment management structure and stormwater diversion works.

A Technical Specification has been prepared for the works (Golder Ref. 147645033-016-R-Rev0) including the design Drawings. Where the Technical Specification (Specification) is referenced in this document, the reference includes both the Technical Specification and Drawings.

This document presents the Construction Quality Assurance (CQA) Plan for the proposed construction of Cell 1 and 2, the Stormwater Dam, stormwater management measures and Leachate and Retention Ponds.

2.0 OVERVIEW OF THE CQA PLAN

The aims of this CQA Plan are to provide test methods, frequency of testing and quality assurance procedures to construct the following components of the Works:

- Engineered clay subgrade.
- General Fill Embankments.
- Subsurface Drain.
- Geosynthetic Liners.
- Leachate Collection System.

General supervision of the site works will be performed by the Superintendent and fulltime monitoring and inspection will be performed as necessary by the QAI appointed to carry out testing and provide the relevant reports. The monitoring and inspections will be documented for later presentation to third parties if required. A quality assurance program for each construction component that can be used as a checklist has been prepared and is presented in this document.

Any non-conformance to the quality activities listed in the program shall be rectified by the Contractor(s) and documented as soon as practical. The documentation shall include the nature of the non-conformance and the corrective action mechanisms implemented to rectify the issue.

Additional information is contained in the Technical Specification that is not addressed in this CQA Plan.

3.0 STRUCTURE OF THE CQA PLAN

The requirements for these works in terms of the material properties, method of placement and construction and the frequency of testing have been described in the Technical Specification. This CQA Plan describes the quality assurance procedures which must be followed to enable the construction of the various components of the Works to be completed in accordance with the Technical Specification. This CQA plan does not replace the Technical Specification or Drawings and should there be any discrepancy between the CQA Plan and the specification and Drawings, the Technical Specification and Drawings take precedence. Where additional information or clarification of requirements is included in the CQA Plan, they shall form part of the requirements of the Works.

The CQA Plan has been split into construction components of similar work required to construct the Works. The plan includes the procedures required in each component and lists the quality assurance activities to be conducted on site. Performance Indicators that form part of the quality assurance program are listed for each component.

The person responsible for each procedure and activity listed may delegate the on-site activity to inspect or assess the work as required, and report to the party responsible.

4.0 MANAGEMENT FRAMEWORK

The quality assurance plan has the following key components:

- Defined procedures and responsibilities for each construction component.
- Defined quality assurance program activities and responsibilities to implement the CQA Plan.
- Performance Indicators to be applied as part of the quality assurance program.

4.1 Site Management Organisation and Responsibilities

The Contractor(s) will be responsible for the construction of the Works and implementing the CQA procedure. The Contractor(s) will report directly to the Superintendent.

The roles and responsible organisations and persons are as follows:

- The Superintendent will be appointed by the Principal.
- The Contractor(s) will be appointed by the Principal.
- The Quality Assurance Inspector (QAI) will be an Engineer (and supporting technicians), appointed by the Principal. The QAI shall undertake all Level 1 inspection and testing of landfill earthworks in accordance with AS3798 -2007 and inspection and testing of the geosynthetic lining system. The QAI shall maintain a fulltime presence on site for the duration of the Works and shall be independent of the Contractor. The QAI will also be responsible for compiling the Quality Assurance Completion Report. The required geosynthetic laboratory testing will be performed by an independent testing laboratory approved by the Principal.
- The Designer is Golder Associates Pty Ltd (Golder).

It is the Contractor(s)'s responsibility to request inspections by the Superintendent and QAI, as required. The Contractor(s) shall keep the Superintendent and QAI informed (by e-mail or telephone) of the required inspections. The QAI, Superintendent and the Designer shall perform their respective roles in the capacity of Principal's Representative, and will report directly to the Principal as required. Meetings will be as required by any organisations or persons.

4.2 Monitoring, Testing and Inspection

General supervision of the site will be carried out by the Superintendent, their staff and monitoring and inspection of the Works, as outlined in the Specification, as well as testing and completion of relevant documentation and reports shall be conducted by the QAI. This document contains a quality assurance program for each construction component that can be used as a checklist.

4.3 Non-conformance Rectification

Any non-conformance to the quality assurance activities and performance indicators listed will be rectified and documented as soon as is practical.

4.4 Documentation and Reporting Framework

4.4.1 Documentation

The following documents concerning Quality Assurance performance will be produced for the Works:

- The CQA Plan and any revisions.
- Monitoring, testing and inspection records and reports sufficient to demonstrate compliance with the Technical Specification. These records or a summary of them will be submitted to the Principal.
- The Quality Assurance Completion report shall be produced by the QAI for submission to the Principal.

The documentation related to the quality control of materials supplied by the Contractor(s) shall be provided to the Principal by the QAI. Documentation related to the quality control of the earthworks and the installed geosynthetics shall also be prepared and provided to the Principal by the QAI. Survey of completed works shall be arranged and provided to the Superintendent and QAI by the Contractor(s). The Superintendent shall forward the survey information to the Principal.

4.4.2 Non-Conformance/Rectification Report

Any non-conformance will be documented including the nature of the non-conformance and the mechanisms implemented to rectify the issue. The Contractor(s) shall develop a Corrective Action Report, which will be used to document any non-conformances. As a minimum the Corrective Action Report shall report the type and extent of the non-conformance, the proposed method of rectification of the non-conformance, the date of rectification and suggested measures to avoid a similar non-conformance in the future.

The Contractor(s) shall forward a summary of any non-conformance and the proposed method of rectification to the Superintendent within 3 days of occurrence.

4.4.3 Proposed Changes to Approved Documents

If a modification is proposed which affects the design intent reflected in the Technical Specifications or Drawings the Superintendent shall contact the Designer and the Principal. The Designer shall assess whether the proposed change in consultation with the Department of Environment Regulation (DER). No change shall be implemented without the assessment of the Designer or the DER.

Any proposed change shall be documented with the appropriate justification by the Designer or the Principal, as decided by the Principal, for inclusion in the Quality Assurance Completion report for the Works.

4.4.4 Daily Reporting

The QAI shall issue a daily report of construction activities. These reports shall contain, at a minimum, the following information:

- Date, project name, location, weather and other information as appropriate.
- Description and locations of on-going construction.
- Equipment used.
- CQA Testing performed.
- Description of materials received, areas tested and sampled.
- Description of areas requiring reconditioning, retesting and procedures followed.
- Summary of Work area locations and conditions.
- Summary of site meetings held.
- Description of non-conformances with Specifications or Drawings.
- Signature of QAI.

Photographs shall be taken with a date back camera to document observations, and provide representation of all elements of construction. The photographs will be captioned and compiled in a photograph album in chronological order by the QAI. Copies of the album shall be kept in the Superintendent's project file.

5.0 COMPONENT 1: SUBGRADE CONSTRUCTION

***Aim**: To ensure that the subgrade material (Unit 3 Engineered Clayey Material) meets the construction requirements specified in the Technical Specification.*

Procedures

The following includes a list of procedures that require quality assurance measures for the construction of the subgrade surface of the Works and includes the party responsible for performing each procedure.

Procedure	Responsibility
1) The subgrade surface shall be constructed by methods of cut and fill, to the grades and elevations on the Drawings.	Contractor(s)
2) Soft spots and Unit 2 materials shall be excavated and backfilled with Unit 3.	Contractor(s)
3) Unit 3 shall be sourced from cut and fill activities, on-site borrow pits or from nominated stockpiles.	Contractor(s)
4) Test samples from Unit 3 sources for compliance with the Specification	QAI
5) Undertake all Unit 3 testing and provide a report of all testing undertaken on the Unit 3 material. This includes density, moisture, Atterberg Limits and particle size distribution.	QAI
6) The subgrade must have no jointing or laminations between layers of Unit 3. Unit 3 will be moisture conditioned, loaded, transported and placed in a manner such that the distribution and graduation of materials in the subgrade are free from lenses, pockets, streaks or layers and do not differ substantially in texture and graduation from the surrounding material within that zone.	Contractor(s)
7) Unit 3 will be compacted in layers to the compaction standard and moisture content, as defined in the Technical Specification.	QAI
8) The integrity and moisture content of the subgrade shall be maintained until such time as it is covered with Unit 9 Geocomposite Clay Liner (GCL).	Contractor(s)

Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) View proof rolling and replace soft spots	As required	QAI
2) Unit 3 will be moisture conditioned, loaded, transported and placed in a manner such that the distribution and graduation of Unit 3 is free from lenses, pockets, streaks or layers and does not differ substantially in texture and graduation from the surrounding material within that zone.	Continuous during construction.	Contractor(s)
3) Monitor placement of Unit 3.	During Construction	QAI
4) Inspect Unit 3 to check for laminations or defects between layers.	Continuous during construction.	Contractor(s) and QAI
5) Test samples from Unit 3 sources for compliance with the Specification	Prior to use	QAI
6) Undertake all Unit 3 testing and provide a report of all testing undertaken. This includes density, moisture, Atterberg Limits and particle size distribution.	Frequency as defined in the Technical Specification.	QAI

Activity	Frequency	Responsibility
7) The subgrade must have no jointing or laminations between layers of Unit 3.	After sections of the construction are completed.	Contractor(s) and QAI
8) Unit 3 will be compacted in layers to the compaction standard and moisture content, as defined in the Technical Specification.	Frequency as defined in the Technical Specification.	QAI
9) The integrity and moisture content of Unit 3 shall be maintained until such time as it is covered with Unit 9 Geosynthetic Clay Liner (GCL).	Continuous during construction.	Contractor(s) and QAI
10) Monitor the proof rolling of the top of the in completed subgrade surface.	Upon Completion	QAI
11) Survey of top of subgrade by licensed surveyor	Upon Completion	Contractor(s)
12) Survey crown of installed subsurface drain pipe.	Before backfill of trench	Contractor(s)

Hold Points

The following Hold points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

Component	Consideration
Submittal of a Work Method Statement (WMS) for subgrade construction.	WMS includes acceptable methods for cutting, filling as per the Specification.
Subgrade surface	Geometry within tolerance and competent foundation for GCL.

Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Subgrade surface	Firm and clean subgrade surface observed. All soft spots excavated and backfilled.
2) Subgrade shape	Elevations, grades and slopes meet tolerances, and no significant ponding of stormwater.
3) Subgrade	Moist and competent support to GCL.
4) Unit 3 Material	Unit 3 material meets Technical Specification
5) Subgrade Construction	Subgrade construction approved by QAI.
6) Subgrade Compaction	Field moisture and density tests meet criteria of specification.
7) Subgrade thickness	As-built survey records of subgrade and top of Unit 3 material to confirm minimum 500 mm thickness
8) Top of Subgrade grades	As-built survey records of top of Unit 3 confirm grades have been achieved as per specification.

6.0 COMPONENT 2: SUBSURFACE DRAIN

***Aim**: To ensure that the subsurface drain meets the drainage and construction requirements specified in the Technical Specification.*

Procedures

The following includes a list of procedures that require quality assurance measures for the construction of the subsurface drain. The list includes the party responsible for performing each procedure.

Procedure	Responsibility
1) Supply of subsurface drain pipes	Contractor(s)
2) Approval of subsurface drain pipes	Superintendent
3) Supply of drainage aggregate	Contractor(s)
4) Approval of subsurface drainage aggregate and drainage sand	QAI
5) Excavation of subsurface drainage trench	Contractor(s)
6) Installation and alignment of subsurface drain pipes and associated works	Contractor(s)
7) Placement of drainage aggregate and sand	Contractor(s)
8) Excavation and construction of subsurface drain sump	Contractor(s)

Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) Inspection of excavated subsurface drain trench.	As works are completed	Superintendent
2) Inspection of installed subsurface drain pipes including inspection of drilling detail and absence of 'swarf'.	Continuous during construction	Superintendent
3) Inspect join of pipes.	All joins	Superintendent
4) Inspection of subsurface drainage aggregate and sand material.	Continuous during construction	QAI
5) Monitoring of drainage aggregate and sand installation.	Continuous during construction	QAI
6) Survey of top of subsurface drain pipes and top of drainage sand	As works are completed	Contractor(s)
7) Inspection of excavated subsurface sump.	As works are completed	Superintendent
8) Monitoring and inspection of surface sump installation.	Continuous during construction As works are completed	Superintendent

Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Subsurface drain collection pipes	Superintendent confirms pipes meet Specification based on documentation and 'swarf' has been removed.
2) Drainage aggregate and drainage sand	QAI approves material based on grading curve provided by the Supplier. QAI confirms consistency of material by continuous monitoring and inspections on site.
3) Subsurface drain collection pipes installation	Superintendent confirms subsurface drain pipe installed as per Technical Specification.
4) Drainage aggregate and drainage sand installation	QAI confirms installation as per Technical Specification, with appropriate control over construction equipment during placement
5) Subsurface sump installation	Superintendent monitors installation and confirms and records that sump has been installed in accordance with the Technical Specification requirements.

7.0 COMPONENT 3: EMBANKMENT CONSTRUCTION

***Aim**: To ensure that the embankment fill material (Unit 3 Engineered Clayey Material and Unit 4 General Fill) meets construction requirements specified in the Technical Specification.*

Procedures

The following includes a list of procedures that require quality assurance measures for the construction of the embankments of the Works and includes the party responsible for performing each procedure.

Procedure	Responsibility
1) The embankment shall be constructed in 250 mm compacted lifts and compacted, to the lines and levels on the Drawings.	Contractor(s)
2) Embankment fill material shall be sourced from on-site borrow pits or from nominated stockpiles.	Contractor(s)
3) Test samples from embankment fill sources for compliance with the Specification	QAI
4) Undertake all embankment fill material testing and provide a report of all testing undertaken. This includes density, moisture, Atterberg Limits and particle size distribution	QAI
5) The embankment must have no jointing or laminations between layers of fill. Embankment fill material will be moisture conditioned, loaded, transported and placed in a manner such that the distribution and graduation of materials in the embankment are free from lenses, pockets, streaks or layers and do not differ substantially in texture and graduation from the surrounding material within that zone.	Contractor(s)
6) Embankment fill will be compacted in layers to the compaction standard and moisture content, as defined in the Technical Specification.	QAI

Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) Embankment fill material will be moisture conditioned, loaded, transported and placed in a manner such that the distribution and graduation of the embankment fill material is free from lenses, pockets, streaks or layers and does not differ substantially in texture and graduation from the surrounding material within that zone.	Continuous during construction	Contractor(s)
2) Monitor placement of embankment fill material.	During Construction	QAI
3) Inspect embankment fill material to check for laminations or defects between layers.	Continuous during construction	Contractor(s) and QAI
4) Test samples from embankment fill material sources for compliance with the Specification	Prior to use	QAI
5) Undertake all testing of embankment fill material and provide a report of all testing undertaken. This includes density, moisture, Atterberg Limits and particle size distribution.	Frequency as defined in the Technical Specification	QAI

Activity	Frequency	Responsibility
6) The embankment must have no jointing or laminations between layers of fill material.	After sections of the construction are completed	Contractor(s)
7) Embankment fill will be compacted in layers to the compaction standard and moisture content, as defined in the Technical Specification.	Frequency as defined in the Technical Specification	Contractor(s) and QAI
8) Monitor the proof rolling of the top of the in completed embankment surface.	Upon Completion	QAI
9) Survey of the embankment crest elevations and alignments by licensed surveyor	Upon Completion	Contractor(s)

Hold Points

The following Hold points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

Component	Consideration
Submittal of a Work Method Statement (WMS) for embankment construction.	WMS includes acceptable methods for placing and compacting the embankment fill per the Specification.
Inspection and acceptance of lines, levels and grades of the key-in trench.	Superintendent confirms that trench has been constructed in accordance with Technical Specification and Drawing requirements.
Embankment surface	Geometry within tolerance and competent foundation for GCL.

Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Embankment surface	Firm and clean subgrade surface observed. All soft spots excavated and backfilled. Suitable for placement of GCL.
2) Embankment shape	Elevations, grades and slopes meet tolerances.
3) Embankment fill material	Material meets Technical Specification requirements.
4) Embankment Compaction	Field moisture and density tests meet criteria of specification.

8.0 COMPONENT 4: GEOSYNTHETICS SUPPLY AND INSTALLATION

***Aim**: To install the geosynthetic layers above the completed subgrade and embankments in accordance with the Technical Specification*.

Procedures

The following includes a list of procedures that require quality assurance measures for the supply and installation of the various geosynthetic components. The list identifies the party responsible for performing each procedure. The geosynthetic components include Geosynthetic Clay Liner (GCL), 2 mm HDPE Geomembrane Liner (both textured and smooth), Cushion Geotextile and Separation Geotextiles.

Procedure	Responsibility
1) Supply of Geosynthetics and un-loading containers	Contractor(s)
2) Approval of supplied geosynthetics	QAI
3) Receipt, handling and storage of geosynthetics	Contractor(s)
4) Preparation of surface for installation	Contractor(s)
5) Installation, anchorage, joins and field testing of geosynthetics	Contractor(s)

Quality Assurance Measures – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be reviewed and recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) Inspect storage conditions of geosynthetic materials	Daily	Superintendent
2) Inspect geosynthetic materials for damage or manufacturing defects.	Continuous during and after installation, until covered by following material	Contractor(s) and QAI
3) Monitor installation of geosynthetics (See table below for detailed Inspection and Monitoring requirements)	Continuous during installation	QAI
4) Monitor testing of geosynthetic joins	Continuous during installation	QAI
5) Independent Laboratory testing	In accordance with Technical Specification	QAI
6) Inspection of overlying protective layers (gravel and geotextile).	Continuous during installation	QAI

Geosynthetics Inspection and Monitoring

The following quality assurance program will be conducted for the installation of the various geosynthetic components. The results of these activities will be recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) GCL covered without hydrating	Continuous	Contractor(s) and QAI
2) GCL panels overlap as required by Technical Specification	All panels	Contractor(s) and QAI
3) GCL defects patched as required by Technical Specification	Continuous during installation	Contractor(s) and QAI
4) GCL anchored as required by the Technical Specification	Continuous during installation	Contractor(s) and QAI
5) Geomembrane panels installed in accordance with approved Panel Layout Drawing	All panels	Contractor(s) and QAI
6) Geomembrane panels installed with no cross seams	All panels	Contractor(s) and QAI
7) Geomembrane seams and welds are tested in accordance with the Technical Specification	All seams (Continuous)	Contractor(s) and QAI
8) Results of seam and weld testing meet the Technical Specification requirements	As seams are tested	Contractor(s) and QAI
9) Geomembrane defects are patched	All defects	Contractor(s) and QAI
10) Geomembrane panels anchored as required by the Technical Specification	Continuous during installation	Contractor(s) and QAI
11) Cushion geotextile panels overlap as required by the Technical Specification	Continuous during installation	Contractor(s) and QAI
12) Cushion geotextile panels are joined as required by the Technical Specification	All joins	Contractor(s) and QAI
13) Defects in the cushion geotextile are patched	All defects	Contractor(s) and QAI
14) Cushion geotextile panels anchored as required by the Technical Specification	Continuous during installation	Contractor(s) and QAI
15) Separation geotextile panels overlaps as required by the Technical Specification	All panels	Contractor(s) and QAI

Hold Points

The following Hold points shall apply. The work related to the Hold Point shall not be covered until the Superintendent in conjunction with the QAI has agreed in writing the work has met the requirements of the Technical Specification.

Component	Consideration
Geosynthetic materials supplied	MQA and independent quality control tests results meet the Technical Specification
Subgrade condition	Subgrade progressively prepared and approved by QAI before placement of geosynthetics
Submission of Panel Layout Drawings	Submission of panel layout drawings for the GCL and geomembrane to the Superintendent and approval by the QAI.
Submission of Quality Control Procedures Manual	Submission of Quality Control Procedures Manual to the Superintendent.
Geomembrane installed	Inspection of the surface of the geomembrane shall be inspected and signed off by the QAI prior to installation of the cushion geotextile. Seam and Repair QC data reviewed and approved by QAI.
Installation of geomembrane in anchor trench	Inspection and approval of the surface of the prepared anchor trench excavation by the Superintendent.
Anchor trench backfilled	Anchor trench inspected and approved by the Superintendent prior to being backfilled
Geosynthetics covered	QAI confirm the installed geosynthetics covered under full time supervision with any observed damage repaired.

Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Geosynthetic material	QAI confirms all testing and testing results conform to the Technical Specification requirements.
2) Geosynthetic material storage	Superintendent confirms that material is stored in accordance with Technical Specification requirements.
3) Geosynthetic installation and anchorage	QAI monitors installation and anchorage, and confirms and records that geosynthetic materials have been installed and covered in accordance with the Technical Specification requirements.
4) Geosynthetic installation testing	QAI monitor on-site testing and confirm that testing methods and testing results are in accordance with the Technical Specification requirements
5) Independent Laboratory testing of geosynthetic materials	QAI approves laboratory results with respect to the Technical Specification criteria.

9.0 COMPONENT 5: LEACHATE COLLECTION SYSTEM

***Aim**: To install the leachate collection system to meet the requirements of the Technical Specification and without damage to underlying layers.*

Procedures

The following includes a list of procedures that require quality assurance measures for the placement and installation of the various components of the leachate collection system of Cell 1 and 2. The list includes the party responsible for performing each procedure.

Procedure	Responsibility
1) Supply of leachate collection pipes	Contractor(s)
2) Approval of leachate collection pipes	Superintendent
3) Supply of drainage aggregate	Contractor(s)
4) Approval of drainage aggregate	Superintendent
5) Installation and alignment of leachate collection pipes and associated works	Contractor(s)
6) Placement and spreading of leachate drainage aggregate	Contractor(s)
7) Excavation and construction of leachate sump	Contractor(s)

Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) Inspection of installed leachate collection pipes ,including inspection of drilling detail and absence of 'swarf', and leachate sump outlet pipe	Continuous during construction	Superintendent
2) Monitoring of leachate collection pipe installations.	Continuous during construction	Superintendent
3) Inspect joins of pipes	All joins	Superintendent
4) Inspection of leachate drainage aggregate material.	Continuous during construction	Superintendent and QAI
5) Monitoring of leachate drainage aggregate installation.	Continuous during construction.	Superintendent
6) Survey of top of leachate collection pipes and top of leachate collection aggregate	As works are completed	Contractor(s)
7) Inspection of the geosynthetic lining system within the sump in accordance with Component 4.	Continuous during construction.	QAI
8) Inspection and monitoring of construction of Unit 14.1 Reinforced Concrete Slab.	Continuous during construction.	Superintendent
9) Inspection and monitoring of installation of Unit 14.2 Leachate Sump Outlet Sleeves and Unit 14.3 Transducer Riser Pipe	Continuous during construction.	Superintendent

Hold Points

The following Hold points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

Component	Consideration
Drainage aggregate particles	PSD tests meets specification
Submission of Work Method statement for installation of the leachate collection pipes	Submission of WMS for installation of leachate collection pipes by the Contractor(s) to the Superintendent and approval by the Superintendent and Designer.
Submission of Work Method statement for placement of drainage aggregate	Submission of WMS for placement of drainage aggregate by the Contractor(s) to the Superintendent and approval by the Superintendent and Designer.
Submission of Work Method statement for construction of the leachate sump	Submission of WMS for construction of the leachate sump by the Contractor(s) to the Superintendent and approval by the Superintendent and Designer.
Top of Leachate drainage aggregate layer	Meets minimum thickness Confirmation placed under full time supervision Survey data of leachate pipe locations No fines contamination on surface
Separation Geotextile	View placed layer (secured by mounds of drainage aggregate).

Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Leachate collection pipes	Superintendent confirms pipes meet specification based on documentation. Superintendent confirms leachate collection pipes are perforated as required by Technical Specification and 'swarf' has been removed.
2) Leachate drainage aggregate	Superintendent approves material based on grading curve provided by the Supplier. QAI and Superintendent confirm consistency of material by continuous monitoring and inspections on site.
3) Leachate collection pipe installation	Superintendent confirms leachate collection pipes installed as per Technical Specification.
4) Leachate drainage aggregate layer installation	Superintendent confirms installation as per Technical Specification, with appropriate control over construction equipment during placement
5) Leachate drainage aggregate layer thickness	Superintendent reviews survey information provided by Contractor(s) and confirms thickness requirements of the Technical Specification have been met.

10.0 COMPONENT 6: STORMWATER DAM SPILLWAY

***Aim**: To ensure that the stormwater dam meets the construction requirements specified in the Technical Specification.*

Procedures

The following includes a list of procedures that require quality assurance measures for the construction of the Stormwater Dam. The list includes the party responsible for performing each procedure.

Procedure	Responsibility
1) Excavate and construct the key-in trench to the grades and elevations on the Drawings.	Contractor(s)
2) Construct the subgrade in accordance with Component 1 requirements.	Contractor(s)
3) Construct the embankment with Unit 3 Engineering Clayey Material in accordance with Component 3 requirements.	Contractor(s)
4) Installation of Unit 12 Separation Geotextile in accordance with Component 4 requirements.	Contractor(s)
5) Construct stormwater dam spillway	Contractor(s)
6) Construct stormwater dam channel	Contractor(s)

Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

The Quality Assurance program for subgrade and embankment construction shall be as required by Component 1 and Component 3 respectively. The Quality Assurance program for installation of the separation geotextile shall be as required by Component 4.

Activity	Frequency	Responsibility
1) Survey of the spillway crest elevation and alignments by licensed surveyor	Upon Completion	Contractor(s)
2) Inspection and monitoring of installation of the Unit 12 Separation Geotextile	Upon Completion	QAI
3) Inspection and monitoring of Unit 14 Reinforced Concrete Slab construction	Continuous during construction.	Superintendent
4) Inspection and monitoring of Unit 19, including dissipator blocks, loosely placed rock and erosion protection mat.	Continuous during construction and as Works are completed	Superintendent

Hold Points

The following Hold points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

The hold points for subgrade and embankment construction and geotextile installation shall be as required by Component 1, Component 3 and Component 4, respectively.

Component	Consideration
Inspection and acceptance of lines and levels of spillway crest	Superintendent confirms that spillway has been constructed in accordance with Technical Specification and Drawing requirements.

Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Subgrade and embankment construction and geotextile installation shall be as required by Component 1, Component 3 and Component 4, respectively

Item	Performance Indicator
1) Spillway shape	Elevations, grades and slopes meet tolerances.
2) Stormwater channel	Superintendent monitors installation and confirms and records that the spillway channel has been constructed in accordance with the Technical Specification requirements.

GOLDER ASSOCIATES PTY LTD

Amy Smyth
Civil Engineer

Liza du Preez
Associate/ Principal Landfill Engineer

AS/LdP/hsl

A.B.N. 64 006 107 857

https://aupws.golder.com/sites/147645033alluwunafarmpeerreview/correspondence out/147645033-018 cqa plan/147645033-018-r-rev0.docx

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Pty Ltd
Level 3, 1 Havelock Street
West Perth, Western Australia 6005
Australia
T: +61 8 9213 7600

Golder Associates