



CONSTRUCTION QUALITY ASSURANCE PLAN (CQA)

Sarasota County CCSWDC Phase II Landfill LFGCCS Design

Presented to:



Sarasota County Solid Waste
4000 Knights Trail Road
Nokomis, FL 34275

Presented by:

SCS ENGINEERS
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Tampa, Florida 33610
(813) 621-0080

March 6, 2017
File No. 09216163.00

Offices Nationwide
www.scsengineers.com

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1 INTRODUCTION

1.1 GENERAL

This Construction Quality Assurance (CQA) Plan addresses the construction quality assurance and quality control procedures for geomembrane repairs and installation for Sarasota County Central County Solid Waste Disposal Complex (CCSWDC) Phase II Landfill LFGCCS Design at the Sarasota County CCSWDC, Sarasota County, Florida. Construction activities include earthwork, well installation, piping, installation of geosynthetic materials for the containment lining system and surveying. The CQA plan supplements the Drawings and Technical Specifications prepared for this project and has been prepared to meet requirements set forth in the Florida Administrative Code (FAC), Chapter 62-701.400.

2 DEFINITIONS

2.1 CONSTRUCTION QUALITY CONTROL (CQC)

A planned system of inspections that is used to directly monitor and control the quality of a construction project. CQC is normally performed by the geosynthetic installer, or for natural soil materials by the CONTRACTOR and is necessary to achieve quality in the constructed or installed system. CQC refers to measures taken by the installer or contractor to determine compliance with the requirements for materials and workmanship as stated in the Drawings and Specifications for the project.

2.2 CONSTRUCTION QUALITY ASSURANCE (CQA)

A planned system of activities that provides the OWNER/COUNTY and permitting agency assurance that the facility was constructed as specified in the design. CQA refers to measures taken by the ENGINEER or OWNER/COUNTY to determine compliance with the requirements for materials and workmanship as stated in the Drawings and Specifications for the project. CQA includes construction observation and monitoring, materials testing, verifications, audits and evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility. CQA refers to measures taken by the CQA organization to assess if the installer or CONTRACTOR is in compliance with the Drawings and Specifications for a project.

2.3 MANUFACTURING QUALITY CONTROL (MQC)

A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in the Contract Documents.

2.4 CONTRACT DOCUMENTS

The Contract documents include the Specifications, Drawings, Agreement, CQA Plan, Permits and any other referenced reports or exhibits that were used to bid and contract the work between the OWNER/COUNTY and the CONTRACTOR.

2.5 GEOMEMBRANE

For the purpose of this project the term geomembrane applies to the Thermoplastic Polyolefin (TPO) and the 60 mil HDPE over liner between phases I and II. See section 02 77 10 for further TPO specifications.

2.6 GEOSYNTHETICS

For the purpose of this project, the term geosynthetic applies to geocomposites, geosynthetic clay liners (GCL) and geotextiles.

3 QUALIFIED PARTIES AND RESPONSIBILITIES

The principal parties involved in the CQA and CQC of the facility include the OWNER/COUNTY, ENGINEER, CQA Consultant, CONTRACTOR, Geosynthetics Manufacturer, Geosynthetics Installer and Geosynthetics CQA Laboratory. The general responsibilities of each of these parties are described in the following subsections. The responsibility and/or authority of a given party may be modified or expanded as dictated by specific needs as construction progresses.

3.1 OWNER/COUNTY

The OWNER/COUNTY is responsible for the facility, including coordinating the design and construction of the landfill features. This responsibility includes compliance with the permit and the submission of CQA documentation demonstrating that the facility was constructed in accordance with the permit documents and the design Drawings and Specifications.

The OWNER/COUNTY has the authority to contract and manage parties charged with design, CQA and construction activities. The OWNER/COUNTY also has the authority to accept or reject design Drawings and Specifications, CQA plans, reports and recommendations of the CQA Consultant and the materials and workmanship of Contractors.

The OWNER/COUNTY may be represented as OWNER or COUNTY and shall be considered the same entity.

3.2 ENGINEER

The ENGINEER is responsible for the preparation of the design including: Drawings, project Specifications for construction and this CQA plan.

The ENGINEER is responsible for performing the engineering design, preparing the associated Drawings and Specifications, approving all design and Specification changes and making design clarifications necessitated during construction. The ENGINEER shall be a professional skilled in the appropriate discipline, licensed as required by regulation. The ENGINEER shall be familiar with the construction details and applicable regulatory requirements.

3.3 CQA CONSULTANT

The CQA Consultant is a party independent of the CONTRACTOR(s), Geosynthetic Manufacturer or Installer and is responsible for field testing, observing and documenting activities related to the construction and/or permit documents and the CQA Plan. The CQA Consultant is represented on-site by the CQA monitoring personnel and supporting on-site CQA monitoring personnel as appropriate. The CQA Consultant may be the same organization as the ENGINEER. In general, the responsibilities and authorities of the CQA Consultant include:

- Understanding the permit documents, design Drawings and Specifications in relation to all aspects of the CQA Plan.
- Scheduling, coordinating and performing CQA activities.
- Performing independent on-site observation of the work in progress to assess compliance with the CQA Plan, permit documents, design Drawings and Specifications.
- Reporting deviations from the CQA Plan, permit documents, design Drawings and/or Specifications to the OWNER/COUNTY. Secure documents from the OWNER/COUNTY which approves the changes.
- Verifying that the Installer's test equipment meets testing and calibration requirements and that test are conducted according to procedures defined in the CQA Plan.
- Recording and maintaining test data.
- Verifying that corrective measures are implemented.
- Documenting and reporting CQA activities daily and collecting data needed for record documentation, including photographs.
- Maintaining open lines of communication with other parties involved in the construction.
- Preparing the Construction Completion Certification Report, complete with certification statements.

3.4 CONTRACTOR

The CONTRACTOR is responsible for all aspects of constructing the project in accordance with the Contract Documents. The CONTRACTOR typically performs excavation of soil and rock and placement and compaction of the soil and aggregate materials using procedures and equipment necessary to produce the results in conformance with the Contract Documents. The CONTRACTOR may also prepare and complete anchor trenches, dewatering and other site-specific responsibilities as required by the Contract Documents. The CONTRACTOR will typically subcontract the manufacturing of geosynthetic products and the installation of such products; however, the CONTRACTOR is responsible to ensure these activities are completed in accordance with the Contract Documents. The CONTRACTOR is responsible for all CQC activities.

3.5 GEOSYNTHETICS MANUFACTURER

The Geosynthetics Manufacturer(s) is responsible for the production of geosynthetic products including geomembranes, geotextiles, geocomposites, GCL and geogrids, which meet the requirements in the Specifications. The Geosynthetics Manufacturer is responsible for providing adequate documentation regarding the characteristics of the raw material, final product, the testing performed to verify the characteristics and the MQC measures taken during manufacturing.

The Geosynthetics Manufacturer(s) is responsible for the transportation of the geosynthetics from the manufacturing plant to the site. The Geosynthetics Manufacturer(s) is responsible for loading and transporting geosynthetics and damage to the geosynthetics which may occur during these operations.

3.6 GEOSYNTHETICS INSTALLER

The Geosynthetics Installer is responsible for unloading, field handling, storing, deploying seaming, temporarily loading against wind and other aspects of the geosynthetics installation in accordance with this CQA plan and the Specifications.

The Geosynthetics Installer is responsible for the preparation of the panel layout drawing including dimensions and details and for providing the installation schedule and a list of proposed field personnel and their qualifications. During installation, the Geosynthetics Installer is responsible for providing CQC documentation and subbase acceptance certificates. Upon completion of the installation, the Geosynthetics Installer shall provide the geomembrane certification, the Manufacturer's warranty and the installation warranty.

3.7 CQA GEOSYNTHETICS LABORATORY

The CQA Geosynthetics Laboratory is responsible for performing the laboratory tests on geosynthetic materials as required by the Specifications. The CQA Geosynthetics Laboratory is also responsible for providing documentation of testing equipment used, analytical results and test methods followed. All results should be reported to the CQA Consultant.

4 GEOSYNTHETIC MATERIAL QUALITY ASSURANCE

4.1 GEOMEMBRANES

This quality assurance testing program has been established to verify that specified geomembranes are manufactured, installed and tested according to the project Specifications.

4.1.1 **Manufacturer Quality Control Documentation**

The Geomembrane Manufacturer shall provide documentation and certification that the material meets the requirements outlined in the Specifications and that adequate quality control measures have been implemented during the manufacturing process.

The following should be provided prior to shipment of the geomembrane:

- A properties value certification including at a minimum, guaranteed values for all geomembrane properties required by the Specifications.
- An inventory list of quantities with descriptions of materials which comprise the geomembrane shipment(s).

The CQA Consultant shall verify that the property values certified by the Geomembrane Manufacturer meet the test methods listed in the Specifications and Manufacturer's guaranteed minimum values.

4.1.2 **Manufacturer's Quality Control Certificates**

Prior to shipment, the Geomembrane Manufacturer shall also provide the CQA Consultant with quality control certificates for the geomembrane, signed by a responsible party employed by the Geomembrane Manufacturer. The Manufacturer shall be required to perform, at a minimum, the tests listed in the Specifications.

The CQA Consultant shall review the certificates and verify that the quality control certificates have been provided at the specified frequencies for all materials and rolls. The CQA Consultant shall also review the quality control certificates and verify that the test methods meet the requirements included in the Specifications and the Manufacturer's guaranteed minimum values which were provided prior to shipment.

4.1.2.1 **Delivery and Storage**

Upon delivery to the site, visual inspection by the Installer and the CQA Consultant shall be conducted on all rolls for evidence of defects or damage. This inspection shall be done without unrolling the rolls unless damage or defects are detected.

During or following this visual inspection, the CQA Consultant, with the assistance of the Installer or CONTRACTOR, shall remove samples to be tested for conformance with the Specifications.

The Installer shall be responsible for the storage of the geomembranes on-site. The storage space shall provide protection from theft, vandalism and traffic. The storage location shall be such that exposure to environmental factors, construction activities and handling are minimized.

4.1.2.2 Conformance Sampling and Testing

The CQA Consultant shall obtain the required number of conformance test samples from the geomembrane upon delivery to the site. These samples shall be sent to the CQA Geosynthetics Laboratory for testing to verify conformance to the values listed in the Specifications. These tests shall be performed prior to installation.

Samples shall be selected by the CQA Consultant and shall not include the first complete revolution. The sample shall be a minimum four feet, as measured along the width of the roll and extend three feet along the roll. Samples shall be taken at a rate of one per lot, but at a rate not less than one conformance test per 100,000 square feet or portion thereof.

Prior to the deployment of the geomembrane, the CQA Consultant shall review all conformance test results and report any nonconformance to the OWNER/COUNTY. The CQA Consultant shall be responsible for verifying that all the test results meet or exceed the property values listed in the Specifications.

If failing test results may be the result of the sampling process or due to the CQA Geosynthetics Laboratory incorrectly conducting the test, the Manufacturer may request a retest to be conducted at the CQA Geosynthetics Laboratory in the presence of a representative of the Manufacturer.

All material from a lot represented by a failing test result shall be rejected, or additional conformance test samples may be taken to isolate the portion of the lot not meeting Specifications (this procedure is valid only when rolls in a lot are consecutively produced and numbered from one manufacturing line). Additional samples shall be taken from rolls either side of the failing roll, until passing test results are achieved, to establish the range of failure within the lot. All rolls lying within this range of failure shall be rejected.

4.1.3 Field Panel Identification

The CQA Consultant shall verify that each field panel is given a unique identification code (number or letter-numbered) consistent with the installer's layout plan. This identification code shall be agreed upon by the Installer and CQA Consultant. The CQA Consultant and Installer shall establish a table or chart showing correspondence between roll numbers and field panel

identification codes. The field panel identification code shall be used for all quality assurance documentation.

The CQA Consultant shall verify that field panels are installed at the location indicated in the Installer's layout plan, as approved or modified and that the Installer has marked the identification code and roll number on each installed panel. The Installer and CQA Consultant shall also verify that the condition of the supporting soil has not changed detrimentally during installation. The CQA Consultant shall record the identification code, location and date of installation of each field panel.

4.1.4 Field Panel Placement and Deployment

Geomembrane panel placement shall not be done during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in areas of ponded water or in the presence of strong winds. Manufacturer's recommendations or the Specifications should be followed, whichever is more stringent, for extreme ambient temperature conditions.

Panels shall be oriented according to the Installer's panel layout drawing as approved by the CQA Consultant and OWNER/COUNTY. Seams shall be located outside of areas of potential high stress conditions, at slope intersections and corners, or other areas considered critical. Horizontal seams on slopes steeper than 10 (horizontal) to one (vertical) shall be avoided. The CQA Consultant shall review the seam orientations prior to seaming operations to determine if these conditions are satisfied.

The CQA Consultant shall verify that the geomembrane handling equipment used does not pose risk of damage to the geomembrane or sub-base and that the Installer's personnel take care in handling the geomembrane at all times.

Contact between the sub-base and the geomembrane shall be maintained in all areas. The Installer shall take into account ambient temperature and its effect on the thermal expansion and contraction of the geomembrane. The geomembrane materials shall be deployed in a manner which minimizes wrinkling. Partial backfilling of anchor trenches, adequate loading of the toe of slope during lower ambient temperatures is recommended to prevent displacement by bridging.

The CQA Consultant shall also verify and notify the OWNER/COUNTY that:

- Equipment used does not damage the geomembrane during trafficking, handling, excessive heat or other means.
- The method of deploying the geomembrane does not cause excessive scratches or crimps in the geomembrane and does not damage the approved sub-base surface.
- Personnel working on the geomembrane do not smoke or wear damaging shoes.

- The geomembrane is protected by appropriate means in areas of excessive traffic.
- Adequate ballast (e.g., sand bags) has been placed to prevent wind uplift and is not likely to damage the geomembrane. Continuous loading is recommended along edges of panels in high winds, or when work is terminated for several days or longer periods.

The CQA Consultant shall visually inspect each panel for defects or damage after placement and prior to seaming. Damaged panels or portions of damaged panels shall be marked and repaired, or removed from the work area. Repairs shall be made according to procedures described in the Specifications.

4.1.5 Field Seaming

4.1.5.1 Personnel Requirements

The Installer shall be prequalified in accordance with the Specifications and approved by the OWNER/COUNTY.

The Installer's Superintendent shall be qualified based on previously demonstrated experience, management ability and authority. The Superintendent is responsible for the Installer's field crew and will represent the Installer at all project meetings.

4.1.5.2 Seam Layout

Prior to the installation of geomembrane, the Installer shall provide the OWNER/COUNTY and CQA Consultant with a panel layout drawing showing all expected major panel seams. The OWNER/COUNTY or ENGINEER shall approve in writing the panel layout drawing.

4.1.5.3 Seaming Methods

Accepted seaming methods consist of those recommended by the Manufacturer of the geomembrane product and which will result in seams that meet testing requirements as indicated in the Specifications for both destructive and non-destructive samples.

For polyethylene geomembranes, the accepted methods include extrusion and fusion-welding.

Proposed alternate methods shall be documented by the Installer and CQA Consultant. The CQA Consultant shall review all documentation regarding alternative seaming methods to be used. The OWNER/COUNTY or ENGINEER shall approve in writing any alternative seaming methods.

Fusion-welding apparatus shall be an automated, roller-mounted device. The fusion-welding apparatus shall be equipped with gauges indicating the applicable temperatures and pressures.

The CQA Consultant shall log ambient, seaming apparatus and geomembrane surface temperatures as well as seaming apparatus pressures.

Extrusion-welding apparatus shall be equipped with gauges indicating the temperature in the apparatus and at the nozzle.

The Installer shall provide documentation regarding the extrudate to the CQA Consultant and shall certify that the extrudate is compatible with the Specifications and is comprised of the same resin as the geomembrane sheeting.

The CQA Consultant shall log apparatus temperatures, extrudate temperatures, ambient temperatures and geomembrane surface temperatures at appropriate intervals.

4.1.5.4 Seam Preparation

The CQA Consultant shall verify that:

- Seams are aligned with the fewest possible number of wrinkles and "fishmouths".
- Prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind and foreign material.
- If seam overlap grinding is required, the process is completed according to the Manufacturer's instructions within one hour of the seaming operation and does not damage the geomembrane.
- For cross seams, the edge of the cross seam is ground to a smooth incline (top and bottom) prior to welding.
- A smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage.
- The geomembrane is protected from damage in heavily trafficked areas.
- A movable protective layer (i.e., plywood, geomembrane) may be used as necessary directly below each overlap of geomembrane that is to be seamed to prevent buildup of moisture between the sheets.
- The panels of geomembrane have a finished overlap of 4 inches for extrusion welding and 6 inches for fusion welding, but in any event sufficient overlap shall be provided to allow peel tests to be performed on the seam.
- The procedure used to temporarily bond adjacent panels together does not damage the geomembrane.

4.1.5.5 Weather Conditions for Seaming

The Installer and CQA Consultant shall observe weather conditions during seaming operations to determine if excessive temperatures, moisture or humidity, or winds exist that could impact the welding process. Manufacturer's recommendations shall be followed for seaming under extreme weather conditions, unless otherwise approved by the OWNER/COUNTY and CQA Consultant based on the Installer's experience and recommendations.

As indicated in the Specifications, welding shall not occur when ambient air temperatures measured one-foot above the geomembrane are below 32-degrees F or above 104-degrees F and as noted in the Specifications. Preheating of the seams may be used if trial seams have been performed using the same preheating method(s) and meet all criteria for acceptance. Wind conditions shall also be considered in determination of acceptable ambient conditions.

4.1.5.6 General Seaming Procedures

During seaming, the CQA Consultant shall verify the following conditions:

- Seaming shall extend to the outside edge of panels placed within the anchor trench.
- A firm substrate shall be provided using a flat board or similar hard surface directly under the seam overlap to achieve proper support, if necessary.
- "Fishmouths" or wrinkles at the seam overlap shall be cut along the ridge in order to achieve a flat overlap. The cut "fishmouth" or wrinkle shall be seamed and any portion where the overlap is inadequate shall be patched with an oval or round geomembrane patch that extends a minimum of 6 inches beyond the cut in all directions.
- Adequate lighting shall be provided if seaming operations are performed at night or during periods of diminished natural light.
- Startup testing is conducted and recorded prior to initiating welding.

4.1.6 Seam Testing

4.1.6.1 Nondestructive Testing of Field Seams

The Installer shall nondestructively test all field seams over their full length using a vacuum test unit, air pressure test (double fusion seams only), or other approved method. The purpose of this testing is to determine the continuity of the seams only. Nondestructive testing shall be performed as work progresses and not at project completion.

The CQA Consultant shall observe nondestructive testing procedures and inform the Installer and OWNER/COUNTY of required repairs. The CQA Consultant shall record the location, date, name and outcome of all testing.

The Installer shall complete required repairs in accordance with the Specifications. The CQA Consultant shall observe the repair and testing of the repair, document the repair and test results and mark on the geomembrane that the repair has been completed. All non-destructive repairs shall be shown on the record Drawings and noted on daily reports.

Vacuum testing equipment and methods are discussed in the Specifications.

Air pressure testing procedures are applicable to fusion-welding that produces a double seam with an enclosed air channel. The equipment and methods are discussed in the Specifications.

4.1.6.2 Destructive Testing

Destructive seam tests shall be performed on seam samples cut from the geomembrane locations selected by the CQA Consultant. The purpose of these tests is to evaluate seam strength. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming.

The CQA Consultant shall select locations where seam samples will be cut by the installer for laboratory testing. Those locations shall be established as follows:

- A minimum average frequency of one test location per 500 feet of seam length or one test location per seam, whichever is the greater.
- At least one location for each seaming machine each day.
- At locations where the CQA Consultant suspects that inadequate seaming methods or conditions occurred or other factors causing to reduce seam strength exist.

The Installer shall not be informed in advance of the locations where the destructive seam samples will be taken.

4.1.6.3 Sampling Procedures

Samples shall be cut by the Installer at locations selected by the CQA Consultant as the seaming progresses, such that laboratory test results are available before the geomembrane is covered by another material.

The CQA Consultant shall observe the sample cutting, assign a number to each sample, mark it accordingly and record the sample location on the layout drawing.

All holes in the geomembrane resulting from destructive seam sampling shall be immediately repaired in accordance with specified repair procedures. The continuity of the new seams in the repaired area shall be non-destructively tested according to procedures described herein.

The sample for laboratory testing shall be 12 inches wide by 36 inches long with the seam centered lengthwise. The sample shall be cut into three segments and distributed as follows:

- 12 inches x 14 inches to the Installer for laboratory testing.
- 12 inches x 14 inches to the CQA Geosynthetics Laboratory for testing.
- 12 inches x 14 inches to the OWNER/COUNTY for archive storage.

The CQA Consultant is responsible for packaging and shipping samples to the CQA Geosynthetics Laboratory in a manner which will not damage the samples.

4.1.6.4 CQA Geosynthetics Laboratory

Testing shall include ASTM D 6392 "Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods". The minimum acceptable values to be obtained in these tests are those indicated in the Specifications. At least five specimens shall be tested for each test method. Specimens shall be selected from the samples and tested alternately (i.e., peel, shear, peel, shear, etc.). For double wedge welds, both inner and outer seams shall be tested and determined to be acceptable.

The CQA Geosynthetics Laboratory shall provide verbal test results no more than 24 hours after they receive the samples. The CQA Consultant shall review laboratory test results as soon as they become available and make appropriate recommendations to the Installer.

4.1.6.5 Procedures for Destructive Test Failures

All acceptable seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken. In cases exceeding 150 feet (50 m) of reconstructed seam, a sample taken from the zone in which the seam has been reconstructed must pass destructive testing.

The procedures outlined in the Specifications shall apply whenever a sample fails a destructive test, whether that test is conducted by the CQA Consultant, the Installer, the CONTRACTORS independent CQC laboratory, or by field tensiometer.

The CQA Consultant shall document all actions taken in conjunction with destructive test failures.

4.1.6.6 Defects, Repairs and Wrinkles

The entire geomembrane, including seams, shall be visually examined by the CQA Consultant for identification of visual defects, holes, blisters, undispersed raw materials and signs of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of examination. The geomembrane surface shall be swept or washed by the Installer if dust, mud or other matter inhibits examination. All areas having defects and/or requiring repairs shall be repaired.

Work shall not proceed with any materials which will cover locations which have been repaired until the CQA Consultant has re-examined the repaired area and applicable laboratory test results with passing values are available.

Panels or portions of panels which are, in the opinion of the CQA Consultant, damaged beyond repair shall be removed from the site and replaced. Damage, which in the CQA Consultant's opinion, can be repaired may be repaired or replaced.

Any portion of the geomembrane exhibiting a flaw or failing a destructive or nondestructive test shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the CQA Representative, Installer and ENGINEER.

Each repair shall be numbered and logged. Each repair shall be non-destructively tested using the methods described in the Specifications as appropriate. Repairs which pass the non-destructive test shall be taken as an indication of an adequate repair. Large caps may be of sufficient extent to require destructive test sampling, at the discretion of the CQA Consultant. In the case of failed tests, the repair shall be redone and retested until a passing test results. The CQA Consultant shall observe all repairs and all non-destructive testing of repairs, note on the membrane that it has been repaired and document each repair thoroughly.

When seaming of the geomembrane is completed (or when seaming of a large area of the geomembrane is completed) and prior to placing overlying materials, the CQA Consultant shall indicate which wrinkles should be cut and re-seamed by the Installer. Wrinkle size shall be evaluated during the time of day and under conditions similar to those expected when overlying material is to be placed. All wrinkles higher than they are wide across their base or, more than 6 inches high shall be removed by repair methods and retested.

5 WELL DRILLING AND INSTALLATION

5.1 SURVEYING AND WELL SCHEDULE

The CQA Consultant shall coordinate with CONTRACTOR when drilling will begin to allow sufficient time for SURVEYOR to survey proposed well locations.

SURVEYOR must survey and stake all well locations prior to drilling with the ground surface elevation and well number written on the stake. Once surveyor supplies ground elevations of the proposed well locations, ENGINEER can finalize the well schedule. The well schedule shall be signed by the ENGINEER, OWNER/COUNTY, CQA Consultant and driller. If a proposed well location is relocated in the field or any other changes need to be made to the well schedule with the approval of the ENGINEER, its new location must be resurveyed and an updated well schedule shall be prepared and resigned by all parties.

5.2 DRILLING

CQA Consultant shall verify all proposed well locations if surveyor stakes are present with the well number and ground surface elevation written on the stake. If stake is not present or information does not match the well schedule, CQA Consultant shall notify the ENGINEER, EM and CONTRACTOR.

If an obstruction is encountered during drilling, driller must advance boring for 2 hours unless otherwise directed by ENGINEER. If borehole is decided to be abandoned, CONTRACTOR shall backfill borehole with cutting removed during drilling. Soil shall be backfilled and compacted to a ground surface. CONTRACTOR shall supply addition soil backfill to refill any settlement within the abandoned borehole, as approved by the ENGINEER. CQA Consultant shall notify ENGINEER and document that CONTRACTOR has followed the above procedures for well abandonment and the procedures outlined in the technical specifications.

5.3 WELL LOGS

CQA Consultant shall maintain separate Well Logs for each well drilled using the Landfill Borehole and Well Logging Guidance. Well logs and landfill borehole and well logging guidance are shown in section 33 21 70. Each well log shall contain the following:

1. Total depth of well
2. Visual description of refuse at 5-foot intervals:
 - a. Type of refuse encountered including the estimated percentage of the following components (by volume) on visual inspection:

- Paper/Cardboard
- Plastic
- Yard refuse
- Construction debris
- Textiles
- Tires
- Sludge
- Dirt

- b. Moisture content (in percentages) based on the guidelines in Attachment 2
 - c. State of decomposition based on the guidelines in Attachment 2
 - d. Temperature of excavated refuse
3. Occurrence, depth, and thickness of water-bearing zones
 4. Length of slotted pipe and solid pipe below grade
 5. Thickness, description and depth from ground surface of backfill layers
 6. Length of above ground riser stick-up pipe

Final copies of well logs shall be typed and submitted with Construction Certification Report.

5.4 WELL INSTALLATION

CQA Consultant shall verify that lengths of solid pipe above and below grade and perforated pipe matches the well schedule and borehole depth.

CQA Consultant shall verify that well cap was properly installed according to design details.

Location and thickness of stone backfill, bentonite plugs and soil backfill shall be documented by the CQA Consultant on the well logs and correspond to well schedule and design details. Bentonite hydration shall be observed and documented.

All open boreholes are to be covered by steel safety grates. The steel safety grate shall remain in place during all backfilling and well installation activities and removed from the completed well with drill rig or other equipment.

5.5 WELLHEAD INSTALLATION

CQA Consultant shall verify and document new and/or replacement wellheads were properly installed on the well and the wellhead valve is in the closed position or else otherwise directed by ENGINEER.

6 DOCUMENTATION

An effective CQA Program depends largely on recognition of all construction activities that shall be monitored and on assigning responsibilities for the monitoring of each activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The CQA Consultant shall document that quality assurance requirements have been addressed and satisfied.

The CQA Consultant shall maintain at the site a complete file of design plans, project Specifications, test procedures, daily logs and other pertinent documents.

6.1 REPORTS

Standard reporting procedures shall include preparation of a daily report which, at a minimum, shall consist of:

- A daily summary report including memoranda of meetings and discussions with the OWNER/COUNTY and/or site CONTRACTORS.
- Observation logs detailing construction activities for the day and test results, as appropriate.

Other forms of daily recordkeeping to be used as appropriate include construction problem and solution data sheets and photographic reporting data sheets. This information shall be regularly submitted to and reviewed by the OWNER/COUNTY.

6.1.1 Daily Logs and Summary Reports

The CQA Consultant shall prepare daily logs and summary reports which shall include the following information:

- An identifying report number for cross referencing and document control.
- Date, project name, location and other identification.
- Data on weather conditions.
- Information on meetings held or discussions which took place:
 1. Names of parties to discussion.
 2. Relevant subject matter or issues.
 3. Decisions reached.
 4. Activities and their schedule.
- A reduced-scale site plan or sketch showing work areas and test locations.
- Descriptions and locations of ongoing construction.

- Descriptions and specific locations of areas, or units, of work being tested and/or observed and documented.
- Locations where tests and samples were taken or reference to specific observation logs and/or test data sheets where such information can be found.
- A summary of field/laboratory test results or reference to specific observation logs and/or test data sheets.
- Calibrations of test equipment.
- Off-site materials received, including quality verification documentation.
- Decisions made regarding acceptance of units of work and/or corrective actions to be taken in instances of substandard quality.
- The CQA Consultant's signature.
- Photographs of representative activities.

6.1.2 Observation and Testing Reports

The CQA Consultant shall record observations of construction and CQA-related activities on project specific observation and testing reports. At a minimum, the observation and testing reports shall include the following information:

- An identifying sheet numbered for cross referencing and document control.
- Date, project name, location and other identification.
- Description or title of activity monitored.
- Location of activity and locations of samples collected.
- Locations of field tests performed and their results.
- Results of laboratory tests received.
- Results of monitoring activity in comparison to Specifications.
- The CQA Consultant's signature.

Reports describing problem identification, corrective measures reports or special construction situations shall be prepared by the CQA Consultant and cross-referenced to specific observation and testing reports. These reports shall include the following information:

- An identifying sheet number for cross-referencing and document control.
- A detailed description of the situation or deficiency.

- The location and probable cause of the situation or deficiency.
- How and when the situation or deficiency was found or located.
- Documentation of the response to the situation or deficiency.
- Final results of any responses.
- Any measures taken to prevent a similar situation from occurring in the future.
- The signature of the CQA Consultant and the signature of the OWNER/COUNTY or ENGINEER indicating concurrence.

The OWNER/COUNTY shall be made aware of nonconformance with the project Specifications. The OWNER/COUNTY shall then determine the cause of the nonconformance and recommend appropriate changes in procedures or Specifications. These changes will be submitted to the Design Engineer for approval. When this type of evaluation is made, the results shall be documented and any revision to procedures or project Specifications will be approved by the OWNER/COUNTY, Design Engineer and, if necessary, the Permitting Agency.

6.2 PHOTODOCUMENTATION AND REPORTING DATA SHEETS

Photo documentation and reporting data sheets shall be cross-referenced with observation and test reports and/or problem identification and corrective measure reports.

These photographs will serve as a pictorial record of work progress, problems and mitigation activities. All photographs of a problem shall be paired with a photograph of the corrected problem. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONFIRM THE PHOTOGRAPH OF THE CORRECTION HAS BEEN MADE PRIOR TO COVERING THE EFFECTED LOCATION. The basic file shall contain color prints; a digital file shall be retained in a separate file in chronological order. These records will be presented to the OWNER/COUNTY upon completion of the project.

In support of photographic documentation, videotaping may be used to record work progress, problems and mitigation activities.

6.2.1 Design and/or Specification Changes

Design and/or project Specification changes may be required during construction. In such cases, the CQA Consultant shall notify the OWNER/COUNTY and the Design Engineer. The OWNER/COUNTY shall then notify the Permitting Agency if necessary.

Design and/or project Specification changes shall be made only with the written agreement of the OWNER/COUNTY and the Design Engineer and shall take the form of an Addendum to the project Specifications.

6.3 FINAL DOCUMENTATION REPORT AND CERTIFICATION

At the completion of the work, the CQA Consultant shall submit to the OWNER/COUNTY the signed Final Documentation Report. At a minimum, the Final Documentation Report shall include:

- Summaries of all construction activities.
- Observation logs and test data sheets including sample location plans and supporting field and laboratory test results.
- Construction problems and solutions reports.
- Changes from design and material specifications.
- Record Drawings.
- If required by the regulatory agency, a summary statement sealed and signed by a professional engineer registered in the state that the construction has been completed in substantial conformance with project Specifications and design plans.

APPENDIX A
DAILY FIELD REPORT

SCS ENGINEERS DAILY FIELD REPORT

Page _____ of _____

Project: CCSWDC Phase II Landfill LFGCCS Design **Project number:** _____

Owner: Sarasota County **Contractor:** _____

Date: _____ **Contract Day:** _____ **Contract Duration** _____

Weather

Temperature: (AM) _____ (PM) _____ **Rain** _____ **Rainfall (inches)** _____

Description of weather: _____

List of Active Equipment on site

Equipment Not Used/Down:

Personnel on site:

No. of Superintendents	No. of Skilled	No. of Laborers
------------------------	----------------	-----------------

Description of Construction Activity

List of Subcontractors

List of Materials Delivered

Contract Issues/Conflicts

Description: _____

Field Representative _____ **Date** _____

APPENDIX B
GEOMEMBRANE PLACEMENT LOG

SCS Engineers

GEOMEMBRANE PLACEMENT LOG

SHEET _____ of _____
 PROJECT TITLE **CCSWDC Phase II Landfill LFGCCS Design**
 PROJECT NO. _____
 DATE _____

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
Page Total							
Cumulative Total							

PRINT NAME: _____

SIGNATURE: _____

APPENDIX C
GEOMEMBRANE SEAMING LOG

SHEET _____ of _____

PROJECT TITLE

CCSWDC Phase II Landfill LFGCCS Design

PROJECT NO. _____

DATE _____

GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS
Page Total									
Cumulative Total									

PRINT NAME: _____

SIGNATURE: _____

APPENDIX D
GEOMEMBRANE REPAIR LOG

GEOMEMBRANE REPAIR LOG

SHEET _____ of _____
 PROJECT TITLE CCSWDC Phase II Landfill LFGCCS Design
 PROJECT NO. _____
 DATE _____

DATE REPAIRED	REPAIR NO.	SEAM /PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS

DEFECT CODES:

AD	-ANIMAL RELATED DAMAGE	DS	-DESTRUCTIVE SAMPLE	IO	-INSUFFICIENT OVERLAP	SS	-START/STOP
B	-UNDISPERSED RESIN BEAD	EE	-EARTH/CK EQUIP DAMAGE	LB	-LEISTER BURN	SSI	-SOIL SURFACE IRREGULARITY
BO	-BURN OUT	EXT	-EXTENSION	MOT	-MACHINE OFF TRACK	T	-MULTIPLE PANEL INTERSECTION
BS	-BOOT SKIRT	FB	-FUSION WELDER BURN	N	-NODULE	VL	-VACUUM TEST LEAK
C	-COUPON	FD	-FACTORY DAMAGE	PTC	-PRESSURE TEST CUT	WC	-WRINKLE CUT
CO	-CHANGE OF OVERLAP	FM	-FISH MOUTH	SI	-SUBGRADE IRREGULARITY	WR	-WRINKLE
CR	-CREASE	FS	-FAILED SEAM	SL	-SLAG ON TEXTURED SHEET	WS	-WELDER RESTART
D	-INSTALLATION DAMAGE	HT	-HEAT TACK BURN	SO	-SHARP OBJECT		

PRINT NAME: _____

SIGNATURE: _____

APPENDIX E
TRIAL WELD LOG

SCS Engineers

SHEET

of

PROJECT TITLE

CCSWDC Phase II Landfill LFGCCS Design

TRIAL WELD LOG

PROJECT NO.

DATE

TIME	TECH I.D.	MACH. I.D.	AMB. TEMP	EXTRUSION WELDS		FUSION WELDS		PEEL				SHEAR				P/F
				BARREL TEMP.	PREHEAT TEMP.	WEDGE TEMP	WEDGE SPEED									

PRINT NAME: _____

SIGNATURE: _____

APPENDIX F
NON-DESTRUCTIVE TEST LOG

SCS Engineers

NON-DESTRUCTIVE TEST LOG

SHEET _____ of _____
 PROJECT TITLE CCSWDC Phase II Landfill LFGCCS Design
 PROJECT NO. _____
 DATE _____

SEAM NO.	TECH I.D.	AIR TEST						VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME				
		START	END	DROP	START	END	DURATION		

PRINT NAME: _____

SIGNATURE: _____

APPENDIX G
DESTRUCTIVE TEST LOG

SAMPLE NO.	SEAM I.D.	MACHINE NO.	WELD TYPE	DATE SEAMED	DATE SAMPLED	TEST STATUS			COMMENTS
						PASS/FAIL			
						INSTALLER	SCS	ARCH	

PRINT NAME: _____

SIGNATURE: _____

APPENDIX H
PANEL PLACEMENT LOG

SCS Engineers

SHEET _____ of _____
PROJECT TITLE **CCSWDC Phase II Landfill LFGCCS Design**
PROJECT NO. _____
DATE _____

PANEL PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS

PRINT NAME: _____

SIGNATURE: _____