APPENDIX M

CONSTRUCTION QUALITY ASSURANCE PLAN

Honeywell

Prepared for

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CONSTRUCTION QUALITY ASSURANCE PLAN

ONONDAGA LAKE SEDIMENT CONSOLIDATION AREA (SCA) FINAL DESIGN

Camillus, New York

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LIST OF ACRONYMS

ACAP	Alternative Cover Assessment Program
ASTM	American Society for Testing and Materials
BOD	Basis of Design
CHASP	Construction Health and Safety Plan
CM	Construction Manager
CQA	Construction Quality Assurance
CQAP	Construction Quality Assurance Plan
CQC	Construction Quality Control
cy	Cubic yards
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
OM&M	Operation, Maintenance, and Monitoring
PM	Parsons Project Manager
PRG	Preliminary Remedial Goal
QA/QC	Quality Assurance/Quality Control
RAO	Remedial Action Objectives
RAC	Remedial Action Contractor
ROD	Record of Decision
SCA	Sediment Consolidation Area
SHSO	Site Health and Safety Officer
SMU	Sediment Management Unit
SOW	Statement of Work
USEPA	United States Environmental Protection Agency

1. INTRODUCTION

1.1 Purpose

This Construction Quality Assurance Plan (CQAP) presents the procedures and protocols that will ensure the construction of the Onondaga Lake Sediment Consolidation Area (SCA) will be executed in accordance with the approved design documents.

This CQAP has been prepared on behalf of Honeywell International Inc. (Honeywell). The Onondaga Lake bottom is on the New York State Registry of Inactive Hazardous Waste Sites and is part of the Onondaga Lake National Priorities List (NPL) Site. Honeywell entered into a Consent Decree (United States District Court, Northern District of New York, 2007) (89-CV-815) with the New York State Department of Environmental Conservation (NYSDEC) to implement the selected remedy for Onondaga Lake as outlined in the Record of Decision (ROD) issued on July 1, 2005. The following documents are appended to the Consent Decree: ROD, Explanation of Significant Differences, Statement of Work (SOW), and Environmental Easement. The Onondaga Lake SCA Civil and Geotechnical Final Design (Final Design) Report (Parsons and Geosyntec, 2010) presents the design of the SCA.

1.2 Remedial Action Objectives

Activities associated with the Onondaga Lake remediation, including construction of the SCA, are designed to ensure the health and safety of the surrounding community, the environment, and onsite workers from potential hazards associated with the execution of the remedy. The ROD also provides more specific objectives - referred to as remedial action objectives [RAOs] - and goals (referred to as preliminary remedial goals [PRGs]) for the lake remedy. The specific objectives related to the SCA design include the following:

- Design the SCA for the efficient and secure containment of sediments dredged as part of the Onondaga Lake remedy in a manner that ensures the health and safety of the community and the environment.

- Incorporate dredging, SCA operations, and water treatment into the SCA civil and geotechnical design.

- Incorporate stakeholder (i.e., regulatory agencies and the community) input in the process to identify design criteria (i.e., odor mitigation, redundancy of operations, leachate containment, dewatering, traffic, beneficial use, groundwater monitoring, etc.).

1.3 Report Organization

This CQAP is organized into five sections and three attachments. The remedial action objectives, and site location and description are presented in Section 1. The definitions relative to the Quality Management System are defined in Section 2. Project management, including roles and responsibilities of the project team, chain of command, communication, and meetings is presented in Section 3. Construction oversight tasks, which will ensure SCA construction quality, such as inspections, Quality Assurance/Quality Control (QA/QC) testing, and documentation are presented as Section 4. References are included in Section 5.

Attachment A contains CQA testing and monitoring procedures. Sample copies of construction documentation forms are provided in Attachment B. A Field Change Form is presented as Attachment C.

1.4 Site Location and Description

Onondaga Lake is a 4.6 square mile (3,000 acre) lake located in Central New York State immediately northwest of the City of Syracuse. As specified in the ROD, a component of the selected lake remedy includes the dredging and onsite consolidation of sediments removed from the lake. Honeywell evaluated potential locations for building and operating an SCA to contain sediment removed from Onondaga Lake during the remedial action, as documented in the Onondaga Lake SCA Siting Evaluation (Parsons, 2006). Each of Honeywell's Solvay Wastebeds was evaluated as a potential location for an SCA based on accessibility, estimated capacity, current and future site use, geotechnical considerations, and distance from residences. Based on the evaluation results, and as documented in the SOW of the Consent Decree, Wastebed 13 was selected for building and operating the SCA.

Wastebed 13 is located in the Town of Camillus and encompasses approximately 163 acres. It is bordered to the north by Ninemile Creek and the CSX Railroad tracks; to the west by an Onondaga County Garage property and a former gravel excavation owned

by Honeywell; and to the east and south by Wastebeds 12 and 14, respectively. Wastebed 13 was originally designed as a settling basin for the disposal of Solvay waste and has recently been used by the State University of New York College of Environmental Science and Forestry (SUNY ESF) and Honeywell for willow/evapotranspiration cover pilot test plots. These test plots now occupy several acres along the southern border of the wastebed.

1.5 SCA Design

The SCA has been designed to provide long-term protection to human health of the surrounding community members and the public, and satisfy the requirements of the NYSDEC's ROD, and the RDWP. The SCA design is presented in the Draft Final SCA Civil and Geotechnical Design. This CQAP describes CQA activities that will be performed on SCA construction, including installation of the composite liner and liquid collection system.

The composite liner and liquid collection system consists of the following components from top to bottom:

- 24-inch (average) drainage layer (24-inch minimum in truck traffic areas);
- geotextile cushion;
- 60-mil HDPE geomembrane liner;
- Geosynthetic Clay Liner (GCL) in sump areas; and
- 12-inch minimum (18-inch minimum at the sumps) low-permeability soil component with top 6 inches compacted to achieve a permeability less than or equal to 1×10^{-6} centimeters per second (cm/sec).

The liquids management system includes the drainage layer (which is also part of the base composite liner system), pumps, sumps, and risers, which are designed to handle the appropriate design flows. The design and performance criteria for these systems and the assumptions made and calculations performed to develop the liquid management system design are presented in the SCA Final Design.

2. DEFINITIONS AND USE OF TERMS

2.1 Definitions Relating to CQA

Generally, construction quality assurance and construction quality control are defined as follows:

- *Construction Quality Assurance (CQA)* - The planned and systematic means and actions that provides the permitting agency and Honeywell International, Inc. (Honeywell) adequate confidence that materials and/or services meet contractual and regulatory requirements and will perform satisfactorily in service.

- *Construction Quality Control (CQC)* - Planned system of inspections and testing taken by the contractor to monitor and control the characteristics of an item or service in relation to contractual and regulatory requirements.

In the context of this document:

- CQA refers to means and actions employed by the Engineer to assess conformity of the various components of the SCA construction with the requirements of the Drawings, Specifications, and work plans.

- CQC refers to those actions taken by the Contractor to determine compliance of the materials and workmanship of the SCA construction with the requirements of the Drawings, Specifications, and work plans.

Generally, manufacturing quality assurance and manufacturing quality control are defined as follows:

- *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 certification documents and contract specifications.

- *Manufacturing Quality Assurance (MQA)* - A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and contract specifications. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the raw materials (resins and additives) and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organization to determine if the manufacturer is in compliance with the product certification and contract specifications for the project.

Roles and responsibilities of the SCA Construction Team relating to the CQA/CQC tasks are described in the next section.

2.2 References to Standard

The CQAP references to test procedures indicate that they pertain to the latest editions of the American Society for Testing and Materials (ASTM).

2.3 Units

In this CQAP, all parameters, properties, and dimensions are expressed in English units, unless specified otherwise. If the geomembrane manufacturer, fabricator, or installer provides SI units, a conversion to English units shall be provided.

3. PROJECT MANAGEMENT

3.1 Roles and Responsibilities of the SCA Construction Team

The SCA construction is a consorted effort between NYSDEC and Honeywell. Each entity plays a key role and has responsibilities necessary to execute the project in accordance with the ROD, Consent Decree, Final Design, and Contract Documents. An established chain of command is essential for communication and decisive decision making. Roles and responsibilities of the team members and agencies are described below. Key contact information is presented in Table 3.1.

3.1.1 Agencies

NYSDEC

The NYSDEC is the lead agency for the SCA construction. The NYSDEC will designate a Project Manager for the SCA construction project. The NYSDEC's Project Manager participates in progress meetings, conducts site inspections, and provides regulatory approval for components of the remedy. The NYSDEC's Project Manager both conducts and participates in public meetings, as necessary, and is the point of contact for public questions and concerns.

OTHER AGENCIES

The USEPA, Onondaga County, and the Town of Camillus are parties of interest to the project. These agencies provide comments to the project team through NYSDEC.

3.1.2 Honeywell

Honeywell, as the Owner, is ultimately responsible for implementing the SCA construction in accordance with the ROD and Consent Decree. Mr. John McAuliffe is Honeywell's Project Manager and direct contact with the NYSDEC. Honeywell's Project Manager attends public meetings and specific construction meetings, and reviews documents prior to submission to the NYSDEC.

3.1.3 Parsons Project Manager

The Parsons Project Manager (PM) serves as Honeywell's onsite representative. The PM is responsible for ensuring that SCA construction is completed in accordance with

the Contract Documents and approved Final Design. The PM will interface directly with Honeywell, NYSDEC, the Construction Manager, the Project Engineer, and the CQA Engineer as necessary.

The PM has the following specific duties:

- Provide centralized leadership for project activities;
- Interpret and plan the overall work effort;
- Communicate directly with the Construction Manager, CQA Engineer, and Project Engineer for project needs;
- Ensure that QA/QC activities are conducted;
- Define personnel and equipment requirements and secure resource commitments;
- Orchestrate and participate in meetings as required; and
- Maintain overall project safety standards.

3.1.4 Construction Manager

The Construction Manager (CM) is responsible for completion of the construction work. The CM's project team will consists of, at a minimum, construction personnel and/or, subcontractors, a Site Health and Safety Officer (SHSO), and a Construction Quality Control (CQC) Inspector.

The CM has the following specific duties:

- Communicate directly with the PM for project needs;
- Implement onsite construction activities and direct the work crew and onsite construction personnel on daily operations;
- Prepare for and attend meetings as required;
- Procure, contract with, and monitor subcontractors and suppliers as needed;

- Establish work budgets and schedules with milestones;
- Assure that documentation is submitted to the Project Engineer as required in the Contract Documents;
- Monitor the financial status of the project, negotiate change orders, and submit pay applications; and
- Maintain construction quality and safety standards.

The full-time onsite SHSO is responsible for implementation of the Construction Health and Safety Plan (CHASP). The SHSO has the following specific duties:

- Ensure that site personnel possess necessary training and medical surveillance;
- Conduct daily safety meetings with the workers;
- Establish work zones and relocating zones as necessary;
- Determine personnel protective equipment requirements for specific work tasks and order any changes based on work area monitoring data;
- Ensure work is performed in compliance with the HASP and applicable regulations;
- Implement air monitoring program and report data;
- Perform routine safety inspections; and
- Report and investigate accidents or incidents.

The full-time onsite CQC Inspector is responsible for preparing technical submittals, conducting CQC testing (or working with independent testing subcontractor), and documenting the work (i.e., daily reports, etc.).

The CM is responsible for obtaining a surveyor to determine the lines and grades required to control the work during the construction. The project surveyor shall be a

licensed Professional Land Surveyor in the state of New York, who will sign and seal survey record drawings.

3.1.5 Project Engineer

The Project Engineer is responsible for providing engineering support and interpretation of the design. The Project Engineer will coordinate with the Design Engineer on issues that require engineering interpretation related to the design. The Project Engineer is responsible for managing submittal review and submittal of appropriate submittals to the Design Engineer and the CQA Engineer.

3.1.5.1 Design Engineer

The Design Engineer will provide engineering support as needed and review construction submittals that require engineering interpretation. The Design Engineer will be a New York State licensed Professional Engineer. The Design Engineer for the SCA is Dr. Jay Beech, P.E. of Geosyntec Consultants (Geosyntec). The Design Engineer is also responsible for the instrumentation (i.e., piezometers, settlement cells, settlement profilers, and inclinometers) associated with the SCA as shown on the SCA Final Design Drawings. If modifications to the approved Final Design are necessary, approval by the Design Engineer is required.

3.1.6 CQA Engineer

The CQA Engineer is responsible for certifying that the construction is performed in accordance with the design. The CQA Engineer will be a New York State licensed Professional Engineer. The CQA Engineer will have an independent line of reporting to the Owner's Representative, separate from the PM. The CQA Engineer (or Engineer) will conduct routine inspections, document the work, and communicate with the PM, the CM, and the Project Engineer on a day-to-day basis. The CQA Engineer, or his representatives, should be onsite full-time during construction. The CQA Engineer will be responsible for completing QA activities including, monitoring, and documenting daily construction work, monitoring the compliance of materials, and confirming that workmanship is in accordance with the requirements of the Drawings and Specifications. Daily reporting will include a daily summary report, field logs, photographic documentation, and, if necessary, reports of problem identification and corrective measures taken.

The CQA Engineer will also be responsible for onsite and offsite QA testing and documentation of materials as required. The CQA Engineer will review the CQC procedures and documentation as provided by CM. In addition to the QA testing described in the design documents, additional QA testing may be required by the CQA Engineer and/or Honeywell.

3.1.6.1 Soils CQA Laboratory

The soils CQA laboratory is the party, independent from Honeywell and the CM, responsible for conducting geotechnical laboratory tests in accordance with standards referenced in the Design Specifications. Tests include, for example, material qualifications (conformance) tests and material construction quality assurance (performance) tests as described in the Design Specifications. The CQA Engineer will verify that CQA laboratory test results comply with the requirements of the Design Specifications and previously approved submittals. The Soils CQA laboratory shall not be the same Independent Testing Lab used by the CQC Inspector for QC testing, as defined in the Design Specifications.

3.1.6.2 Geosynthetics CQA Laboratory

The geosynthetics CQA laboratory is the party, independent from Honeywell and the CM, responsible for conducting geosynthetic laboratory tests in accordance with standards referenced in the Design Specifications. Tests include, for example, material qualifications (conformance) tests and material construction quality assurance (performance) tests as described in the Design Specifications. The CQA Engineer will verify that test results comply with the requirements of the Design Specifications and previously approved submittals. The Geosynthetics CQA laboratory shall not be the same Independent Testing Lab used by the CQC Inspector for QC testing, as defined in the Design Specifications.

3.2 Chain of Command and Communication

A SCA Construction Work Plan will be prepared by the Contractor. The SCA construction cannot commence until the SCA Construction Work Plan is approved by the NYSDEC. Once approved and the work starts, Honeywell ultimately controls the work in terms of its contractors, the project schedule, sequencing, and means and methods as long as the work is conducted in accordance with the approved design.

The chain of command onsite starts with the PM. Issues or concerns from the NYSDEC will be channeled through the PM. During construction, the PM will be in direct communication with the NYSDEC and Honeywell's Project Manager. To minimize confusion and miscommunication, NYSDEC, other agencies, and the media will not communicate directly with the CM or subcontractors.

NYSDEC, Honeywell, the PM, or any other project personnel may immediately stop work if a condition is observed that threatens the safety of an onsite worker. However, if the work is being conducted safely and in accordance with the approved Final Design and Contract Documents, only the PM and Honeywell have authority to stop work. NYSDEC or other agencies can communicate directly with the PM regarding a specific issue. If it is agreed by the agencies and the PM that work must be stopped to rectify the issue, the PM is to communicate directly with the CM.

A design change procedure will be implemented to properly evaluate and approve changes, as described in Section 4.4.6. The Design Engineer will notify the CQA Engineer of modifications, and the CQA Engineer will document the correspondence and the modification.

3.3 Meetings

3.3.1 Construction Kickoff Meeting

Following approval of the Final Design, PM is to conduct a Construction Kickoff Meeting scheduled for the Project Team. Meeting attendees include Representatives from NYSDEC, Honeywell, the CQA Engineer, Project Engineer, the Design Engineer, and the CM. At a minimum, the meeting agenda includes the planned construction activities, construction means and methods, site safety, roles and responsibilities, and should include a site walk.

3.3.2 Progress Meetings

The PM is to conduct progress meetings on a weekly basis to discuss the prior week's completed work and the next week's anticipated work. The NYSDEC representative, the PM, the CM, the Project Engineer, and the CQA Engineer will participate, at a minimum. The agency's issues will be raised and addressed during the meeting. One weekly meeting will be substituted by a monthly meeting for which a larger audience of

Honeywell and agency personnel will be invited to participate. A brief project summary will be provided at the monthly meeting.

3.3.3 Public Meetings

If deemed necessary by NYSDEC, a public meeting prior to starting the SCA construction will be conducted. Residents, business, local officials, and others will be invited to the meeting to discuss the project. The PM will work closely with NYSDEC to arrange the meeting, provide appropriate public notifications (i.e., fact sheets and meeting agendas), and meeting presentation materials.

3.3.4 Construction Wrap-up Meeting

Following substantial completion of the SCA construction, the project team will conduct a Wrap-up Meeting to discuss the final punch list, site operation, maintenance, monitoring, and project completion issues. The Construction Certification Report punch list also will be addressed at this meeting.

Table 3.1
Key Contact List

NEW YORK STATE DEC
State Project Manager
Mr. Timothy Larson
NYS Dept. of Environmental Conservation
625 Broadway
Albany, NY 12233-7013
Phone: (518) 402-9676
Fax: (518) 402-9020

U.S. ENVIRONMENTAL PROTECTION AGENCY
Remedial Project Manager
Mr. Robert Nunes
U.S. Environmental Protection Agency, Region II
290 Broadway, 20th Floor
New York, NY 10007-1866
Phone: (212) 637-4254

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4. CONSTRUCTION OVERSIGHT

4.1 Inspections

Members of the project team will conduct site inspections at various stages of the construction to ensure consistent quality is maintained. The CQA Engineer, or his representatives, will conduct inspections of representative work areas on a daily basis. NYSDEC and the other agencies are free to conduct inspections during any work hour period. Inspections by the CQA Engineer, Project Engineer, and regulatory agencies are intended to augment, not replace, the Contractor's inspections required by the Contract Documents and good practice.

4.1.1 Routine Work Inspections

The CQA Engineer will conduct routine inspections of specific work elements, including:

- Earthwork;
- low permeability soil layer construction;
- GCL installation in sump areas;
- geomembrane installation;
- geotextile installation; and
- gravel drainage layer installation.

In addition to these specific work elements, the CQA Engineer will periodically inspect the overall site condition. Overall site condition items include field trailer, parking lot, access roads, soil erosion and sediment control measures, security fence/gate(s), and survey markings.

4.1.2 Pre-Final and Final Inspections

Following notification of substantial completion by the CM, the PM, CQA Engineer, the Project Engineer, and the NYSDEC inspector will conduct a pre-final inspection of the site. A final written work punchlist will be prepared by the PM and the NYSDEC

inspector for submittal to the CM. The final punch list will enable the CM to understand the project completion expectations and schedule work activities, including demobilization. Once punch list items have been addressed by the CM and approved by the PM in writing, the NYSDEC inspector will conduct a final inspection. Upon written NYSDEC approval, the SCA construction activities will be considered completed and the Contractor will demobilize from the site.

4.2 Construction Quality Control and Assurance Testing

CQA/QC testing is part of ensuring the construction is completed in accordance with the Final Design. CQC testing will be performed by the Contractor. Requirements of CQC testing are detailed in the Technical Specifications. CQA testing will be performed by the CQA Engineer. Procedures of CQA testing and monitoring are presented in Attachment A.

4.3 Technical Submittal Review

The CM is required to prepare a schedule of submittals and meet the submittal requirements as stated in the Design Specifications. Construction submittals will be reviewed by the Project Engineer. Submittals requiring engineering interpretation will be reviewed by the Design Engineer. Submittals required by the Consent Decree such as the Certification Report will be reviewed by the agencies.

4.4 Documentation

4.4.1 Field Log Book

The CQA Engineer and CM will maintain daily field log books for the project. Construction activities will be documented with the following details at a minimum: dates, times, weather conditions, personnel onsite, equipment used, materials used, visitors, health and safety issues, work activities completed, delays, and other construction related issues.

4.4.2 Daily Field Reports

The CM will prepare a Daily Activity Report that summarizes construction activities from the field book. Required information for the Daily Activity Report is detailed in the specifications. The Report will also include site photos and sketches of work

completed as necessary. The Daily Activity Reports will be prepared and submitted to the Project Engineer on a regular basis. Refer to Attachment B for an example of the Daily Activity Report. The CM will prepare a weekly report which will document the various aspects of the work. This will include but not be limited to construction activities, safety issues, QC requirements, deviations, schedule, budget, and other topics related to the weekly construction activities.

The CQC Inspector will prepare a daily CQC report summarizing the CQC activities. The report will be submitted to the Project Engineer on a daily basis. The CQA Engineer will also prepare a daily CQA report. Any CQA/QC issues will be addressed at the daily CQA/QC meeting between the CM, the CQA Engineer, and the PM.

4.4.3 Photographic Documentation

The CQA Engineer will be responsible for obtaining photographic documentation of the construction activities, materials installation methods, and testing procedures. Photographs will serve as a pictorial record of work progress, problems, and corrective measures. Photographic reporting data sheets should be utilized to organize and document photographs taken during construction. Such data sheets could be cross-referenced or appended to summary reports, CQA monitoring logs, or test data sheets and/or problem identification and corrective measures reports.

4.4.4 Monthly Progress Report

The CM will prepare a monthly status report and submit it to the Project Engineer. Information to be included in the monthly status report is detailed in the specifications of the design.

Per the Consent Decree, Honeywell will prepare and submit a monthly progress report to the NYSDEC. The Monthly Progress Report will summarize work activities and other issues pertinent to the construction completion. The PM will assist Honeywell to fulfill this requirement.

4.4.5 Construction Certification Report and Record Drawings

Per the Consent Decree, a Construction Certification Report will be prepared and submitted to the NYSDEC 90 days following each phase of SCA completion. The CQA Engineer will certify that the construction was performed in accordance with the

approved Final Design and approved field changes. The Construction Certification Report will include a description of the completed SCA construction work activities, approved design changes to the Final Design, Record Drawings, a project photo log, sampling/analysis summary table, waste manifests, material trip tickets and/or summary table, and other pertinent information.

Record Drawings will be prepared based on the Design Drawings, Contractor markups on the drawings conducted throughout the construction, and construction survey information conducted during and after the construction. The Record Drawings will be signed/sealed by the CQA Engineer.

4.4.6 Field Change Form

Changes to the approved Final Design will require approval by the Design Engineer, Contractor Representative, Owner, and NYSDEC Representative prior to the change being implemented. Changes will be documented by the Field Change Form. Attachment C presents an example Field Change Form that includes a description and reason for the field change, date, and signatures. Material substitutions (i.e., "or equals") and determinations associated with construction means and methods are not considered a design change and will be approved by the Project Engineer as part of the technical submittal review process.

5. REFERENCES

United States District Court, Northern District of New York. 2007. State of New York and Denise M. Sheehan against Honeywell International, Inc. Consent Decree Between the State of New York and Honeywell International, Inc. Senior Judge Scullin. Dated October 11, 2006. File January 4, 2007.

ATTACHMENT A

CQA TESTING AND MONITORING PROCEDURES

EARTHWORK

1. Introduction

CQA testing and monitoring will be performed during installation of the various soil components of the SCA. Criteria to be used for determination of acceptability of the various soil components are identified in the Specifications and this CQAP. CQA testing will consist of conformance testing and performance testing. Conformance testing will be conducted in the laboratory on samples of the soil materials before they are placed in the SCA. Performance testing will be conducted in the field on the soil materials after they are placed in the SCA. Testing may be performed as duplicates of CQC tests or as independently selected locations or samples at the CQA Engineer's discretion.

2. Soil Components

The CQA personnel will conduct soil material conformance and performance testing. Soil material components include those soil materials provided to establish the perimeter berm and the liner system. The CQA personnel should test soil materials in accordance with the tests methods and frequencies shown in Table A-1 (for conformance testing) and A-2 (for performance testing) to verify conformance with the Specifications and this CQAP. The CQA personnel will monitor placement of the soil materials to verify compliance with the Specifications.

3. Conformance Testing

Initial evaluation of various soil types by the CQA personnel during construction will be largely visual; therefore, the CQA personnel must be experienced with visual-manual soil classification procedures. The CQA personnel will be aware that changes in color or texture can be indicative of a change in soil type. The CQA personnel will observe soils for deleterious materials (e.g., roots, stumps, glass, and large objects). When necessary, the visual-manual procedure for the description and identification of soils will be conducted by the CQA personnel in accordance with test method ASTM D 2488.

Conformance tests will be performed in accordance with the current ASTM or other applicable test procedures indicated in Table A-1. The frequency of conformance tests will conform to the minimum frequencies presented in Table A-1. The frequency of testing may be increased at the discretion of the CQA Engineer or if variability of the materials is observed. The test reporting will indicate if a test is a duplicate of a CQC test or is performed on an independently selected sample.

4. Construction Monitoring

During installation of the various soil components, the CQA personnel will visually observe and document the Contractor's earthwork activities for the following:

- changes in the soil consistency;
- the thickness of lifts as loosely placed and as compacted;
- soil conditioning prior to placement including general observations;
- moisture distribution, clod size, etc.;
- the action of the compaction and heavy hauling equipment on the construction surface (penetration, pumping, cracking, etc.);
- the number of passes used to compact each lift;
- desiccation cracks or the presence of ponded water; and
- final lift or layer thickness.

5. Performance Testing

During construction, the CQA personnel will observe and test the soil components of the SCA construction to verify that they are installed in accordance with the requirements of the Drawings, Specifications, and CQAP. The CQA Engineer will also evaluate the procedures, methods, and equipment used by the Contractor to install the various soil components.

The contractor shall perform Quality Control laboratory testing at the frequency specified in the specifications meeting Part 360. The contractor will submit the laboratory data to the Project Engineer. The Project Engineer shall route the submittal to the Design Engineer for approval at which time it will be forwarded to the CQA Engineer by the Project Engineer. The CQA Engineer shall perform the performance testing described above to ensure that the soil is placed and compacted meeting Part 360 requirements.

Performance tests will be performed in accordance with the current ASTM or other applicable test procedures indicated in Table A-2. The frequency of performance tests will conform to the minimum frequencies presented in Table A-2. The frequency of testing may be increased at the discretion of the CQA Engineer or if variability of the materials is observed. Sampling locations will be selected by the CQA Engineer. If necessary, the location of routine in-place density tests will be determined using a non-biased sampling approach. The test reporting will indicate if a test is a duplicate of a CQC test or is performed on an independently selected sample.

6. Deficiencies

If a defect is discovered in the soils construction, the CQA Engineer will immediately determine the extent and nature of the defect. The failing area will be reworked at the Contractor's cost. Retests will be performed by the CQA personnel to verify that the deficiency has been corrected before additional work is performed by the Contractor in the area of the deficiency.

7. Initial Monitoring and Testing of Low Permeability Soil Liner

The CQA Engineer will work closely with the Contractor to monitor the construction of the first acre of the low permeability soil liner. As indicated in Table A-2, additional performance testing will be conducted during this initial area of liner construction to confirm that the low permeability soil liner was installed in accordance with the requirements of the Drawings and Specifications. The objective of this additional monitoring and testing in the initial area is to determine the effectiveness of the material and construction procedures for the installation of the low permeability soil liner and to make modifications if necessary. After one acre is successfully completed, the data will be compiled and provided to the NYSDEC. Construction of the low permeability soil liner will progress directly from the one acre demonstration to the remaining liner areas.

Table A-1
MINIMUM EARTHWORK CONFORMANCE TESTING REQUIREMENTS

TEST NAME/ TEST METHOD	ENGINEERED FILL[1],[2]	LOW PERMEABILITY SOIL LINER[1],[2]	GRAVEL DRAINAGE LAYER[1],[2]
SPECIFICATION SECTION	02200	02250	02300
Particle Size Analysis/ASTM D 422 for soils, ASTM C 136 for aggregate	1 test per ten QC tests	1 test per ten QC tests	1 test per ten QC tests
Atterberg Limits/ASTM D 4318	1 test per ten QC tests	1 test per ten QC tests	N/A
Moisture Content/ASTM D 2216 or ASTM D 4643	1 test per ten QC tests	1 test per ten QC tests	N/A
Organic Content/ASTM D 2974	1 test per ten QC tests	1 test per ten QC tests	N/A
Soil Classification/ ASTM D 2487	1 test per ten QC tests	1 test per ten QC tests	1 test per ten QC tests
Standard Proctor/ASTM D 698	1 test per ten QC tests	1 test per ten QC tests	N/A
Hydraulic Conductivity/ASTM D 5084 for soil, ASTM D2434 for aggregates	N/A	1 test per ten QC sample	1 test per ten QC tests
Interface Direct Shear/ASTM D 5321	N/A	1 test per ten QC tests	N/A

Notes:

1. Perform a minimum of 1 test per borrow source to verify that the material meets the NYSDEC requirements for clean fill.
2. The CQA Engineer shall perform the tests per the frequency in the table or a minimum of 1 test per source, whichever is more frequent.
2. N/A = Not Applicable

Table A-2
MINIMUM EARTHWORK PERFORMANCE TESTING REQUIREMENTS

TEST NAME/ TEST METHOD	**ENGINEERED FILL**	**LOW PERMEABILITY SOIL LINER** Initial Area	**LOW PERMEABILITY SOIL LINER** Full-Scale Area	**GRAVEL DRAINAGE LAYER**
In-situ Moisture/ ASTM D 3017	5 tests per acre	18 tests per acre	9 tests per acre	N/A
In-situ Density/ ASTM D 2922	5 tests per acre	18 tests per acre	9 tests per acre	N/A
Drive Cylinder/ASTM D 2937	1 test per 25 in-situ moisture density tests	1 test per 25 in-situ moisture density tests	1 test per 25 in-situ moisture density tests	N/A
Hydraulic Conductivity/ASTM D 5084	N/A	1 test per acre (top 6" lift)	NA	N/A

Note:
N/A = Not Applicable

GEOSYNTHETIC CLAY LINER

1 Overview

CQA testing and monitoring will be performed during installation of the geosynthetic clay liner for the base liner system of the SCA. Criteria to be used for determination of acceptability of the geosynthetic clay liner are identified in the Specifications and this CQAP. CQA testing will consist of conformance testing. Conformance testing will be conducted in the laboratory on samples of the materials before they are placed in the SCA. During construction, CQA monitoring of GCL transportation, handling, and storage; field panel placement; and field panel seaming will be performed.

2 Material Conformance Testing

Conformance sampling of geosynthetic clay liner rolls will be performed under the supervision of the CQA Engineer. Samples will be obtained and forwarded to the Geosynthetics CQA Laboratory for testing to evaluate whether the material meets the requirements of the Specifications and geosynthetic clay liner Manufacturer's list of guaranteed properties.

Conformance samples will be taken across the entire width of the roll and will not include the first 3-ft (1-m) of material. Unless otherwise specified, samples will be 3-ft (1-m) long by the roll width. CQA personnel will mark the machine direction on the samples with an arrow and affix a label, tag, or otherwise mark each sample with the following information:

- date sampled;
- project number;
- lot/batch number and roll number;
- conformance sample number; and
- CQA personnel identification.

The laboratory test methods and frequencies required for CQA conformance testing of the geosynthetic clay liner are given in Table A-3.

The CQA Engineer will review conformance test results before deployment of the geosynthetic clay liner. Any nonconformance of the material's physical properties will be immediately reported to the CM. The following procedure will apply whenever a geosynthetic clay liner sample fails a conformance test conducted by the Geosynthetics CQA Laboratory:

- The geosynthetic clay liner Manufacturer will be required to replace all of the rolls of geosynthetic clay liner within the batch from which the sample that is not in conformance with the specifications was obtained. The material must be replaced with geosynthetic clay liner that meets the requirements of the Specifications.

- Alternatively, if the geosynthetic clay liner Manufacturer and the CM both agree, CQA personnel will obtain additional conformance samples from the closest numerical roll on both sides of the roll from which the failing sample was obtained. These two samples must pass the conformance tests specified above. If either of these samples fails to meet the requirements, material must be replaced with geosynthetic clay liner that meets the requirements of the Specifications.

During conformance testing, CQA personnel will also verify that the geosynthetic clay liner Manufacturer has identified all rolls of geosynthetic clay liner with the following information:

- name of manufacturer;

- product identification;

- lot number;

- batch number;

- roll number; and

- roll dimensions.

Additionally, if any special handling of the geosynthetic clay liner is required, it will be so marked on the top surface of the geosynthetic clay liner (e.g., "This Side Up"). CQA personnel will record the above information for each roll delivered to the Site using the Material Inventory Log form.

3 Construction Monitoring

3.1 Transportation, Handling, and Storage

During unloading and storage, the Contractor and/or the Geosynthetics Installer will be required to keep the geosynthetic clay liner off the ground and protect the geosynthetic clay liner from precipitation or other inundation, UV, excessive heat or cold, mud, dirt, dust, puncture, cutting, or any other damaging or deleterious conditions.

CQA personnel and the Geosynthetics Installer will observe rolls upon delivery at the site and any deviation from the above requirements will be reported to the CM. Any damaged rolls will be rejected by CQA personnel and required to be repaired or replaced by the Contractor or Geosynthetics Installer.

3.2 Field Panel Placement

CQA personnel will monitor field panel placement and verify that field panels are installed at acceptable locations indicated in the Specifications, as approved or modified by the CM. CQA personnel will monitor geosynthetic clay liner deployment and verify compliance with the following:

- any equipment used does not damage the geosynthetic clay liner by handling, trafficking, or other means;

- the prepared surface underlying the geosynthetic clay liner has not deteriorated since previous acceptance, and is still acceptable immediately prior to geosynthetic clay liner placement, without excessive moisture (e.g., dew, ponding, etc.);

- all personnel working on the geosynthetic clay liner do not smoke, wear damaging shoes, or engage in other activities which could damage the geosynthetic clay liner;

- the method used to unroll the panels does not cause tears or breaks in the geosynthetic clay liner and does not damage the underlying supporting soil;

- adequate temporary loading and/or anchoring (e.g., sand bags, tires) has been placed; and

- direct contact with the geosynthetic clay liner is minimized in areas where excessive traffic may be expected (e.g., the geosynthetic clay liner is protected by geotextiles, extra geosynthetic clay liner, or other suitable materials).

CQA personnel will observe the geosynthetic clay liner panels, after placement, for damage, and will advise the CM which panels, or portions of panels, should be rejected, repaired, or accepted. Damaged panels or portions of damaged panels which have been rejected will be marked and their removal from the work area will be recorded by CQA personnel.

3.3 Field Panel Seaming

3.3.1 Panel Layout and Seaming

In general, seams should be oriented parallel to the line of maximum slope, i.e., oriented along, not across, the slope. In corners and odd-shaped geometric locations, the number of seams should be minimized. No horizontal seam should be within 5 ft (1.5 m) of the toe of a slope. Overlap adjacent panels at least 6 inches along the sides of installed panels and at least 12 inches along the ends of installed panels. Use of granular or powdered bentonite should conform with the Specifications and the geosynthetic clay liner Manufacturer's recommendations.

3.4 Deficiencies, Problems, and Repairs

3.4.1 Inspection for Defects

All seams and non-seam areas of the geosynthetic clay liner will be examined by CQA personnel for identification of defects, holes, undispersed raw materials and any sign of contamination by foreign matter.

3.4.2 Repair Procedures

Any portion of the geosynthetic clay liner exhibiting a flaw must be repaired by the Geosynthetics Installer in accordance with the Specifications. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the Geosynthetics Installer and the CQA Engineer.

In addition, the following conditions will be monitored by CQA personnel:

- all surfaces must be clean and dry at the time of the repair;
- the repair procedures, materials, and techniques are those approved by CQA personnel in advance of the specific repair;
- patches or caps should extend at least 1 foot (12 inches) beyond the edge of the defect on slopes 5 percent or flatter and at least 2 feet (24 inches) beyond the edge of the defect on slopes greater than 5 percent; and
- granular or powdered bentonite should be applied in accordance with the geosynthetic clay liner Manufacturer's recommendations.

TABLE A-3

REQUIRED GEOSYNTHETIC CLAY LINER PROPERTY VALUES

TEST	QUALIFIER	METHOD	REQUIRED VALUE	FREQUENCY [1]
Bentonite Properties:				
Bentonite Moisture Content (%)	Maximum	ASTM D 4643	per specification	1 per 110,000 lb
Bentonite Fluid Loss (mL)	Maximum	ASTM D 5891	per specification	1 per 110,000 lb
Bentonite Free Swell (ml/2g)	Minimum	ASTM D 5890	per specification	1 per 110,000 lb
Geosynthetic Clay Liner Properties:				
Bentonite Mass/Area (lb/ft^2)	MARV	ASTM D 5993	per specification	1 per 250,000 ft^2
Index Flux ($m^3/m^2/s$)	Maximum	ASTM D 5887	per specification	1 per 250,000 ft^2
Tensile Strength (lb/in)	MARV	ASTM D 6768	per specification	1 per 250,000 ft^2
Average Peel Strength (lb/in)	Minimum	ASTM D 6496	per specification	1 per 250,000 ft^2
Geotextile Properties:				
Cap Geotextile Mass/Area (oz/yd^2)	MARV	ASTM D 5261	per specification	1 per 250,000 ft^2
Carrier Geotextile Mass/Area (oz/yd^2)	MARV	ASTM D 5261	per specification	1 per 250,000 ft^2
Geotextile Polymer Composition (%)	Minimum	N/A	per specification	N/A

Notes:

1. The QA Engineer shall perform the tests per the frequency in the table or a minimum of 1 test per material, whichever is more frequent.
2. N/A = Not Applicable

GEOMEMBRANE

1. Introduction

CQA testing and monitoring will be performed during installation of the geomembrane in the SCA. Criteria to be used for determination of acceptability of the geomembrane are identified in the Specifications and this CQAP. CQA testing will consist of conformance testing and performance testing. Conformance testing will be conducted in the laboratory on samples of the geomembrane materials before they are placed in the SCA. Performance testing will be conducted in the field on the geomembrane materials after they are placed in the SCA.

2. Conformance Testing

Conformance sampling of geomembrane rolls will be performed under the supervision of the CQA Engineer. . Samples will be obtained and forwarded to the Geosynthetics CQA Laboratory for testing to evaluate whether the material meets the requirements of the Specifications and Geomembrane Manufacturer's list of guaranteed properties.

Conformance samples will be taken across the entire width of the roll and will not include the first 3-ft (1-m) of material. Unless otherwise specified, samples will be 3-ft (1-m) long by the roll width. The machine direction will be marked on the samples with an arrow, and a label, tag, or other mark will be affixed to each sample with the following information:

- date sampled;
- project number;
- lot/batch number and roll number;
- conformance sample number; and
- CQA personnel identification.

The laboratory test methods and frequencies required for CQA conformance testing of the geomembrane are given in Table A-4.

The CQA Engineer will review conformance test results before geomembrane deployment. Any nonconformance of the material's physical properties will be immediately reported to the Construction Manager (CM). The following procedure will apply whenever a geomembrane sample fails a conformance test conducted by the Geosynthetics CQA Laboratory:

- The Geomembrane Manufacturer will be required to replace all of the rolls of geomembrane within the batch from which the sample that is not in conformance with the specifications was obtained. The material must be replaced with geomembrane that meets the requirements of the Specifications.

- Alternatively, if the Geomembrane Manufacturer and the CM both agree, the CQA personnel will obtain additional conformance samples from the closest numerical roll on both sides of the roll from which the failing sample was obtained. These two samples must pass the conformance tests specified above. If either of these samples fails to meet the requirements, material must be replaced with geomembrane that meets the requirements of the Specifications.

The CQA personnel will also verify that the Geomembrane Manufacturer has identified all rolls of geomembrane with the following information:

- name of manufacturer;

- product identification;

- lot number;

- batch number;

- roll number; and

- roll dimensions.

Additionally, if any special handling of the geomembrane is required, it will be so marked on the top surface of the geomembrane (e.g., "This Side Up"). The CQA personnel will record all of the above information for each roll delivered to the Site using the Material Inventory Log form.

3. Construction Monitoring

3.1 Handling and Delivery

During unloading and storage, the Contractor and/or the Geosynthetics Installer will be required to keep the geomembrane off the ground and protect the geomembrane from precipitation or other inundation, excessive heat or cold, mud, dirt, dust, puncture, cutting, or any other damaging or deleterious conditions.

The CQA personnel and the Geosynthetics Installer will observe rolls upon delivery at the site and any deviation from the requirements will be reported to the CM. Any damaged rolls will be rejected by the CQA personnel and required to be repaired or replaced by the Contractor or Geosynthetics Installer.

3.2 Field Panel Identification

The CQA personnel will ensure that each field panel is given an identification code consistent with the Geosynthetics Installer's panel layout plan. This identification code will be agreed upon by the CQA Engineer, CM, and Geosynthetics Installer, and will allow for the geomembrane roll numbers to be traceable to the field panel identification code.

The CQA personnel will document the relationship between roll numbers, factory panels, and field panel identification codes. The field panel identification code will be used for all quality assurance/quality control records.

3.3 Field Panel Placement

The CQA personnel will monitor field panel placement and verify that field panels are installed at the location indicated in the Geosynthetics Installer's panel layout plan. CQA personnel will record the field panel identification code, manufacturers roll number, location, date of installation, and dimensions of each field panel.

The CQA personnel will monitor geomembrane deployment and verify compliance with the following:

- ambient temperatures are within the limits required by the Manufacturers Specifications, and wind is not excessive;
- any equipment used does not damage the geomembrane by handling, trafficking, excessive heat, leakage of hydrocarbons or other means;
- the prepared surface underlying the geomembrane has not deteriorated since previous acceptance, and is still acceptable immediately prior to geomembrane placement, without excessive moisture (e.g., dew, ponding, etc.);
- all personnel working on the geomembrane do not smoke, wear damaging shoes, or engage in other activities which could damage the geomembrane;
- the method used to unroll the panels does not cause scratches or crimps in the geomembrane and does not damage the supporting soil;

- the method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels);

- adequate temporary loading and/or anchoring (e.g., sand bags, tires) has been placed to prevent uplift by wind; and

- direct contact with the geomembrane is minimized in areas where excessive traffic may be expected (e.g., the geomembrane is protected by geotextiles, extra geomembrane, or other suitable materials).

The CQA personnel will observe the geomembrane panels, after placement and prior to seaming, for damage, and will advise the CM which panels, or portions of panels, should be rejected, repaired, or accepted. Damaged panels or portions of damaged panels which have been rejected will be marked and their removal from the work area will be recorded by CQA personnel.

3.4 Field Panel Seaming

3.4.1 Panel Layout

CQA personnel will review and become familiar with the panel layout drawing previously submitted to the CM by the Geosynthetics Installer. In general, seams should be oriented parallel to the line of maximum slope, i.e., oriented along, not across, the slope. In corners and odd-shaped geometric locations, the number of seams should be minimized. Horizontal seam should be located in accordance with the specifications, unless otherwise authorized by the CM and the Design Engineer. A seam numbering system compatible with the field panel identification numbering system will be agreed upon prior to any seaming.

3.4.2 Seaming Equipment and Products

Fillet Extrusion Process

The CQA personnel will perform the following activities during the fillet extrusion welding process:

- verify and document that the extrusion-welding apparatus is permanently marked with an identification number;

- verify that the extrusion-welding apparatus is equipped with gauges giving the temperature in the apparatus and at the nozzle;

- verify that the extrudate is comprised of the same resin as the geomembrane sheeting;

- monitor extrudate temperatures, ambient temperatures, and geomembrane sheet temperatures at appropriate intervals;
- verify that a suitable number of spare operable seaming apparatus are maintained on site;
- verify that the extruder is purged prior to beginning a seam until all heat-degraded extrudate has been removed from the barrel;
- confirm that the electric generator is placed on a smooth base such that no damage occurs to the geomembrane; and
- confirm that a smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage.

Fusion Process

The CQA personnel will perform the following activities during the fusion welding process:

- verify and document that the fusion-welding apparatus is a self-propelled device and that it is permanently marked with an identification number;
- verify that the fusion-welding apparatus is equipped with gauges giving the applicable temperatures and welding speed;
- verify that a suitable number of spare operable seaming apparatus are maintained on site;
- confirm that the electric generator is placed on a smooth base such that no damage occurs to the geomembrane;
- confirm that, for cross seams, the edge of the cross seam is ground to a smooth incline (top and bottom) prior to welding;
- verify that a smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage; and
- verify that a movable protection layer is used, as necessary, directly below each overlap of geomembrane that is to be seamed to prevent build-up of moisture between the sheets.

3.4.3 Seam Preparation

The CQA personnel will monitor that:

- weather conditions for seaming are within the limits required by the Specifications, unless authorized by the Design Engineer;

- prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material;

- seams are overlapped per the specifications;

- if seam overlap grinding is required, the process is completed according to the Geomembrane Manufacturer's instructions or the Specifications, whichever is the more stringent, prior to the seaming operation, and in a way that does not damage the geomembrane;

- the grind depth shall not exceed 10 percent of the geomembrane thickness;

- grinding marks shall not appear beyond the extrudate after it is placed; and

- seams are aligned with the fewest possible number of wrinkles and "fishmouths".

3.4.4 Overlapping and Temporary Bonding

The CQA personnel will monitor that:

- the panels of geomembrane have a finished overlap in accordance with the specifications for both extrusion and fusion welding, but in any event sufficient overlap shall be provided to allow peel tests to be performed on the seam;

- no solvent or adhesive is used; and

- the procedure used to temporarily bond adjacent panels together does not damage the geomembrane; in particular, the temperature of hot air at the nozzle of any spot welding apparatus is controlled such that the geomembrane is not damaged.

4. Performance Testing

4.1 Trial Seams

Trial seam testing will be performed by the Geosynthetics Installer. The CQA personnel will observe and document the Geosynthetic Installer's trial seam testing procedures and verify that they are in accordance with the Specifications. The CQA personnel will document identification numbers of trial seam samples and record results. The Installer will ensure that each is marked

with the date, time, machine temperature(s) and setting(s), number of seaming unit, and name of seaming technician.

4.2 Nondestructive Seam Testing

Nondestructive field seam testing will be performed by the Geosynthetics Installer to check the continuity of seams. During the Geosynthetics Installer's nondestructive testing of field seams, the CQA personnel will confirm that seams are tested over their full length using either the vacuum test (for extrusion seam type) or the air pressure test (for double fusion seams). The CQA personnel will also monitor nondestructive testing and document the results.

Any required seam repairs identified as a result of failed nondestructive seam testing will be made by the Geosynthetics Installer in accordance with the Specifications, and the CQA personnel will:

- observe the repair procedures;
- observe the retesting procedures; and
- document the results.

4.3 Destructive Testing

4.3.1 Location and Frequency

The CQA personnel will select all destructive seam test sample locations in order to accomplish the sampling and testing frequencies given in Table A-5. Sample locations will be established by the CQA personnel according to the guidelines given below.

- Test locations will be determined during seaming at the CQA Engineer's discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset welds, or any other potential cause of imperfect welding.
- The Geosynthetics Installer will not be informed in advance of the locations where the seam samples will be taken.

4.3.2 Sampling Procedures

The Geosynthetics Installer will cut the destructive samples at the locations designated by the CQA Engineer, under observation of the CQA personnel when possible. The CQA personnel will mark each sample accordingly and record the sample location on the standardized Seam and

Panel Repair Location Log. At a given sampling location, two types of samples will be taken: (i) field test samples; and (ii) laboratory test samples. A minimum of two field samples (i.e., test strips) should be taken for field-testing (see section 4.3.3). Each of these test strips should be 1 in. wide by 12 in. long, with the seam centered parallel to the width. The distance between these two specimens should be 42 in. If both specimens pass the field test described in this Section, a full destructive sample will be taken for testing by the CQA personnel, as follows:

- The full destructive sample should be located between the two field test strips. The sample should be 12 in. wide by 42 in. long with the seam centered lengthwise. The sample shall be cut into three parts and distributed as follows:
    - one 12 in. by 12 in. portion retained by the Geosynthetics Installer;
    - one 12 in. by 12 in. portion archived by the CQA personnel; and
    - the remaining 12 in. by 18 in. portion should be tested by the CQA personnel.

All holes in the geomembrane resulting from destructive seam test sampling will be immediately repaired by the Geosynthetics Installer in accordance with repair procedures described in the Specifications. The continuity of the new seams in the repaired area will be nondestructively tested, followed by the CQA procedures described in Section 5.2.

4.3.3 Field Testing

The test strips will be tested for peel adhesion and bonded seam strength in the field by the Geosynthetics Installer, using a gauged tensiometer. The CQA personnel will observe all field tests and mark all samples and portions with their number. The CQA personnel will also document using the appropriate standardized field forms: the date, number of seaming unit, seaming technician identification, destructive sampling, and pass or fail description.

4.3.4 CQA Testing

Destructive test samples will either be shipped to the Geosynthetics CQA laboratory for testing or be tested by the CQA personnel using equipment provided by the Geosynthetics Installers. The testing methods and criteria are given in Table A-5. The CQA personnel should provide test results no more than 24 hours after they receive the samples. Results will be reviewed for conformance with the Specifications as soon as they become available. The CM will be notified of any inconsistencies or nonconformances.

4.3.5 Procedures for Destructive Test Failure

The following procedures will apply whenever a sample fails a destructive test, whether that test was conducted in the field by the Installer or by the CQA personnel. The CQA personnel will monitor that the Geosynthetics Installer follows one of two options between points that are judged by the CQA personnel to represent conditions of the failed seam (e.g., a tie-in seam or a seam made by the apparatus and/or operator used in the failing seam):

- The Geosynthetics Installer can reconstruct the seam (e.g., remove the old seam and reseam) between any two passed destructive test locations.

- The Geosynthetics Installer can trace the welding path to an intermediate location a minimum of 10 ft from the point of the failed test in each direction and take a small sample for an additional field-test in accordance with the destructive test procedure at each location. If these additional isolation samples pass the field test, then full samples for CQA testing are taken at both locations. If these samples meet the specified strength criteria, then the seam is reconstructed or capped between these locations. If either sample fails, then the process is repeated to establish the zone in which the seam should be reconstructed or capped.

All failed seams must be bounded by two locations from which samples passing destructive tests have been taken or the entire seam is reconstructed or capped and retested. In cases exceeding 150 ft of reconstructed seam, a sample taken from the zone in which the seam has been reconstructed must pass destructive testing. Repairs will be made in accordance with this Section. The CQA personnel will document all actions taken in conjunction with destructive test failures.

4.4 Leak Location Survey

An electrical leak location survey will be performed for the base geomembrane liner. The survey will be generally based on ASTM D 7007 and ASTM D 6747. The leak survey will be performed after the placement of approximately two ft of the gravel drainage layer. In the event weather prevents the leak location survey from being conducted at the end of construction, it will be conducted at the start of the subsequent construction season. The equipment and survey procedures used will be capable of detecting a 0.01 in^2 leak. A specialty leak detection survey contractor who is independent of the Contractor will be selected to perform the work by the Project Manager. The Contractor shall provide assistance as needed for the post-construction electrical leak location survey. The specific procedures and associated health and safety requirements will be decided during a pre-survey meeting with the selected leak detection specialty contractor, CQA Engineer, and Project Engineer. The leak detection specialty contractor will be required to inspect the site and provide a written work plan before the pre-survey meeting. The Contractor shall assist in creating and repairing the 0.1-inch diameter holes

in the liner required for instrument calibration in the presence of CQA Engineer, Project Engineer, and leak detection survey contractor. The leak detection survey contractor will be required to provide a written report that includes a drawing identifying locations of calibration and detection holes. All calibration holes and detected holes will be repaired by the Contractor in the presence of the CQA Engineer.

5. Defects and Repairs

5.1 Inspection for Defects

The CQA personnel will examine seam and non-seam areas of the geomembrane for identification of defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign matter. Because light reflected by the geomembrane helps to detect defects, the surface of the geomembrane should be clean at the time of examination.

5.2 Repair Procedures

Any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test, must be repaired by the Geosynthetics Installer in accordance with the Specifications. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the Geosynthetics Installer, the CQA Engineer, and the CM.

In addition, the following conditions will be monitored by the CQA personnel:

- surfaces of the geomembrane which are to be repaired shall be abraded no more than one hour prior to the repair;
- all surfaces must be clean and dry at the time of the repair;
- all seaming equipment used in repairing procedures must be approved;
- the repair procedures, materials, and techniques are those approved by the CQA Engineer in advance of the specific repair;
- patches or caps should extend at least 6 in. beyond the edge of the defect, and all corners of patches should be rounded with a radius of at least 3 in.; and
- the geomembrane below large caps should be appropriately cut to avoid water or gas collection between the two sheets.

5.3 Verification of Repairs

Each repair will be numbered, logged, and non-destructively tested using approved methods. Repairs which pass the non-destructive test will 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 Engineer or as specified in Table A-5. The CQA personnel will observe all non-destructive testing of repairs and will record the number of each repair, date, and test outcome.

Table A-4
MATERIAL CONFORMANCE TESTING REQUIREMENTS FOR HDPE GEOMEMBRANE

TEST	METHOD	REQUIRED VALUE	FREQUENCY [1]
Thickness, mil (min.)	ASTM D 5994	per specification	1 per 250,000 ft^2
Density, g/cm^3 (max)	ASTM D 1505	per specification	1 per 250,000 ft^2
Carbon Black Content (Allowable range in %)	ASTM D 1603	per specification	1 per 250,000 ft^2
Carbon Black Dispersion	ASTM D 5596	per specification	1 per 250,000 ft^2
Tensile Strength (force per unit width at Break and Yield (lb/in.)	ASTM D 6693	per specification	1 per 250,000 ft^2
Elongation at Break and Yield (%)	ASTM D 6693	per specification	1 per 250,000 ft^2
Tear Resistance, lbs (min.)	ASTM D 1004, Die C Puncture	per specification	1 per 250,000 ft^2
Puncture Resistance, lbs (min)	ASTM D 4833	per specification	1 per 250,000 ft^2
Shear Strength	ASTM D 5321	per specification	1 per 250,000 ft^2

Note

1. The QA Engineer shall perform the tests per the frequency in the table or a minimum of 1 test per material, whichever is more frequent.

Table A-5
FIELD TESTING REQUIREMENTS FOR GEOMEMBRANE SEAMS

TEST	METHOD	REQUIRED VALUE	MINIMUM FREQUENCY OF TESTING
Peel Adhesion Fusion and Extrusion, lb/in. (min)	ASTM D 6392[1,3]	per specification	1 per 500 ft of seam
Shear Strength Fusion and Extrusion, lb/in. (min)	ASTM D 6392[2,3]	per specification	1 per 500 ft of seam
Vacuum Testing Welded Seams	Vacuum = 5 psi gauge suction Test time = 20 seconds (s)	No visible air bubbles	100 percent of extrusion seams[4]
Air Pressure Testing Welded Seams	Pressure = 25 to 30 psi Test time = 5 minutes (min)	Shall not lose more than 3 psi over the 5 minute duration	100 percent of fusion seams[4]

Notes:

1. For peel adhesion, seam separation shall not extend more than 10 percent into the seam interface. Testing shall be discontinued when the sample has visually yielded.
2. For shear tests, the sheet shall yield before failure of the seam.
3. For either test, sample failure shall be a Film Tear Bond (FTB).
4. Vacuum and air pressure testing will be conducted by the Contractor as part of the quality control requirements presented in the specifications. The CQA personnel will observe the testing.

GEOTEXTILE

1. Overview

CQA testing and monitoring will be performed during installation of the geotextile for the base liner system of the SCA. Criteria to be used for determination of acceptability of the geotextile are identified in the Specifications and this CQAP. CQA testing will consist of conformance testing. Conformance testing will be conducted in the laboratory on samples of the geotextile materials before they are placed in the SCA. CQA monitoring will be performed during the installation of the geotextile.

2. Conformance Testing

Conformance sampling of geotextile rolls will be performed on geotextile under the supervision of the CQA Engineer. . Samples will be obtained at the manufacturing plant and forwarded to the Geosynthetics CQA Laboratory for testing to evaluate whether the material meets the requirements of the Specifications and Geotextile Manufacturer's list of guaranteed properties.

Conformance samples will be taken across the entire width of the roll and will not include the first 3-ft (1-m) of material. Unless otherwise specified, samples will be 3-ft (1-m) long by the roll width. The machine direction will be marked on the samples with an arrow and a label, tag, or otherwise mark will be affixed to each sample with the following information:

- date sampled;
- project number;
- lot/batch number and roll number;
- conformance sample number; and
- CQA personnel identification.

The laboratory test methods and frequencies required for conformance testing of the geotextiles are given in Table A-6.

The following procedure will apply whenever a geotextile sample fails a conformance test conducted by the Geosynthetics CQA Laboratory:

- The Geotextile Manufacturer will be required to replace all of the rolls of geotextile within the batch from which the sample that is not in conformance with the specifications

was obtained. The material must be replaced with geotextile that meets the requirements of the Specifications.

- Alternatively, if the Geotextile Manufacturer and the CM both agree, the CQA personnel will obtain additional conformance samples from the closest numerical roll on both sides of the roll from which the failing sample was obtained. These two samples must pass the conformance tests specified above. If either of these samples fails to meet the requirements, the material must be replaced with geotextile that meets the requirements of the Specifications.

During conformance testing, the CQA personnel will also verify that the Geotextile Manufacturer has identified all rolls of geotextile with the following information:

- name of manufacturer;
- product identification;
- lot number;
- batch number;
- roll number; and
- roll dimensions.

Additionally, if any special handling of the geotextile is required, it will be so marked on the top surface of the geotextile (e.g., "This Side Up"). The CQA personnel will record all of the above information for each roll delivered to the site using the Material Inventory Log form for the geotextile.

3. Construction Monitoring

During unloading and storage, the Contractor and/or the Geosynthetics Installer will be required to keep the geotextile off the ground and protect the geotextile from direct sunlight, precipitation or other inundation, excessive heat or cold, mud, dirt, dust, puncture, cutting, or any other damaging or deleterious conditions. The Specifications require that the geotextile rolls be shipped and stored in opaque and watertight wrappings.

The CQA personnel will observe rolls upon delivery at the site and any deviation from the above requirements will be reported to the CM. Any damaged rolls will be rejected by the CQA

Design Engineer and required to be repaired or replaced by the Contractor or Geosynthetics Installer.

The Contractor and/or the Geosynthetics Installer will be required to handle all geotextile in such a manner as to ensure the geotextile is not damaged in any way. The CQA personnel will verify compliance with the following:

- immediately prior to geotextile placement, the subgrade is free of sharp protrusions or other obstructions that could potentially damage the geotextile, if applicable;
- in the presence of wind, all geotextile is weighted with sandbags (or equivalent ballast weight approved by the CQA Engineer), and that sandbags remain until replaced with an overlying layer;
- geotextile is kept continually under slight tension to minimize the presence of wrinkles in the geotextile, and if necessary, the geotextile is positioned by hand after being unrolled to minimize wrinkles;
- a visual examination of the geotextile is carried out over the entire surface, after installation, to verify that no potentially harmful foreign objects, such as needles or tools, are present; and
- the geotextile is not left exposed for a period in excess of 14 days after placement unless a longer exposure period is approved by the Engineer and warranted by the Geotextile Manufacturer.

The CQA personnel will verify that, where required in the Specifications or shown on the Drawings, geotextiles are continuously sewn or overlapped in accordance with the specifications, and that sewing (where performed) is performed using polymeric thread and stitching type, as required in the Specifications.

The CQA personnel will verify that the Contractor places all soil and aggregate materials on top of geotextiles in such a manner as to verify:

- the geotextile and underlying materials are not damaged;
- wrinkles are minimized; and
- excess tensile stresses are not produced in the geotextile.

4. Defects and Repairs

The CQA personnel will report to the Contractor and the PM any deficiencies in the subgrade prior to geotextile placement, and will not allow geotextile deployment until the subgrade is improved to the satisfaction of CQA personnel and in accordance with the Specifications. The CQA personnel will verify that any holes or tears in the geotextile are repaired as follows:

- a patch made from the same geotextile is overlapped per the specifications and stitched into place; and

- care is taken to remove any soil or other material which may have penetrated the torn geotextile.

The CQA personnel will document any deficiencies or noncompliance with the specified requirements and report them to the PM. The extent of deficiencies will be evaluated by observations, a review of records, or other means deemed appropriate.

The Geosynthetics Installer will correct the deficiency to the satisfaction of the CQA Engineer and the CM. If a project specification criterion cannot be met, or unusual weather conditions hinder work, then the CQA Engineer will develop and present to the CM suggested alternative solutions for approval. All subsequent re-evaluations recommended by the CQA Engineer must verify that the deficiency has been corrected before any additional work is performed by the Contractor and/or the Geosynthetics Installer in the area of the deficiency.

Table A-6
MATERIAL CONFORMANCE TESTING REQUIREMENTS FOR GEOTEXTILE

PROPERTIES	QUALIFIER	UNITS	SPECIFIED VALUES	TEST METHOD	FREQUENCY[1]
Type					
nonwoven needlepunched	N/A	N/A	N/A	(-)	N/A
Polymer composition	Minimum	%	per specification	(-)	N/A
Mass per unit area	Minimum	oz/yd^2	per specification	ASTM D 5261	1 per 250,000 ft^2
Mechanical Requirements					
Grab strength	minimum	lb	per specification	ASTM D 4632	1 per 250,000 ft^2
Tear strength	minimum	lb	per specification	ASTM D 4533	1 per 250,000 ft^2
Puncture strength	minimum	lb	per specification	ASTM D 4833	1 per 250,000 ft^2
Durability					
Ultraviolet Resistance	minimum	%	per specification	ASTM D 4355	certify

Notes:
1. The QA Engineer shall perform the tests per the frequency in the table or a minimum of 1 test per material, whichever is more frequent.
2. N/A = Not Applicable

ATTACHMENT B

SAMPLE FORMS

Property Consultants

1214 JFK Blvd.
Suite 850
Philadelphia, PA 19000

Phone: 215-555-2091

DAILY REPORT
No. 00007

COMPANY: ACME General Contractors
DATE: 8/16/2008

REPORT PERIOD: Daily
DAY: Monday

PROJECT: School Addition-Automotive Center
JOB: JBAA450

WEATHER:

CONDITION DURATION: More than 50% of workday

PERIOD 1:		PERIOD 2:	PERIOD 3:
DURATION:		DURATION:	DURATION:
TEMP:	77	TEMP:	TEMP:
PRECIPITATION:	Drizzle	PRECIPITATION:	PRECIPITATION:
SKY:	Clear	SKY:	SKY:
WIND:	None	WIND:	WIND:
TIME PERIOD:		TIME PERIOD:	TIME PERIOD:
IMPACT:		IMPACT:	IMPACT:

ACTIVITY

COMPANY: ACME General Contractors
DATE: 8/16/2008

REPORT PERIOD: Daily
DAY: Monday

PROJECT: School Addition-Automotive Center
JOB: JBAA450

TEMPERATURE:77 **PRECIPITATION:**Drizzle **SKY:**Clear **WIND:** None

ACTIVITY

Standard Paving continued mass excavation with 3/4 CY track mounted back-hoe and a smaller track hoe with mounted bucket.

SCHEDULE

Activity ID	Title	ES	A	EF	A	PCT	OD	RD	TF	FF
DM003O0000	Sitework	8/11/2008	x	9/12/2008		15.00	20	17	-9	0
DM005O0000	Footing Excavation	8/11/2008	x	9/12/2008		15.00	20	17	-9	0

EQUIPMENT

Description	Source	Units	Type	Work Area	Remarks
D6 Bulldozer	STDPAV	1	Caterpillar	ALL	
PC200 Hoe	STDPAV	1	3/4 CY Hoe	B	

FIELD FORCE LABOR

Category	Source	Supv.	Frmn.	Jrny.	Appr.	Work Area	Remarks
Site Prep	STDPAV	1	2	1	4	B	
	Totals:	1	2	1	4		

MATERIALS DELIVERED

Time	Material Name	Quantity	Location	Ticket No	Description	Remarks
	24PIPE	15.000		12435		

Property Consultants
1214 JFK Blvd.
Suite 850
Philadelphia, PA 19000

Phone: 215-555-2091

DAILY REPORT
No. 00007

Certified By: Property Consultants

Date: 11/19/2009

Signed: _____
Mary Shuttleworth

Principal

Parsons
301 Plainfield Road
Suite 350
Syracuse, NY 13212

MEETING AGENDA
No. MA-05

PROJECT TITLE: Willis Groundwater Collecion Trench **MEETING DATE:** 10/6/2009

LOCATION: Willis Site Trailer **SUBJECT:** Weekly Meeting Agenda

DID ATTEND	INITIALS	ATTENDEE NAME	COMPANY NAME
Y	AL	Al Labuz	Honeywell
Y	ANS	Al Steinhoff	Parsons
Y	DD	Dan Douglas	Parsons
Y	DDS	David D Steele	Parsons
N	DX	Doreen	Peak Environmental, LLC
Y	JXD	John Dillon	Peak Environmental, LLC
N	JHL	John H Lawler	Parsons
Y	JXH	John Hobbs	Parsons
Y	MEO	Marcus E O'Rourke, Jr.	Peak Environmental, LLC
Y	MJW	Matthew J Warren	Parsons
Y	MBB	Michael B Brosclart	Parsons
Y	RJA	Rebecca J Absolom	Parsons
N	RXM	Richard Mustico	NYS Depat. of Environ. Conservation
N	SAW	Stephen A Warren	Parsons
N	SJM	Steve J Miller	Parsons
Y	SXT	Steven Thompsor	Peak Environmental, LLC
N	TAC	Tamara A Cooper	Parsons
Y	TOR	Timothy O'Rourke	Peak Environmental, LLC
N	TXR	Tonya X. Ridgway	Peak Environmental, LLC
Y	WXS	William Simpson	Peak Environmental, LLC

ITEM	DESCRIPTION	STATUS	STARTED	CLOSED	DUE	BIC
00001	Safety a) Safety Moment b) Safety review c) 2 week JSA look ahead	OPN	9/22/2009			
00002	Schedule / 2-Week Look Ahead	OPN				
00003	Light Weight Fill placement (LWF) a) LWF receiving b) Testing of LWF	OPN	9/15/2009			
00004	Pump station installation	OPN	9/15/2009			
00005	Collection system installation	OPN	9/15/2009			

Parsons
301 Plainfield Road
Suite 350
Syracuse, NY 13212

MEETING AGENDA
No. MA-05

ITEM	DESCRIPTION	STATUS	STARTED	CLOSED	DUE	BIC
00006	Site access and security. a) PDI dock requirements and coordination b) Labor status update	OPN	9/15/2009			
00007	Submittal log review and update. a. QC phase 1 meetings - 2 week look ahead	OPN	9/15/2009			
00008	Administrative Items a) Change order sump relocation	OPN	9/21/2009			

Design Group
1215 Ventnor Avenue
Philadelphia, PA 19000
Phone: (215) 555-0444
Fax: (215) 555-0445

MEETING MINUTES
No. 00002

PROJECT TITLE: Office Building
MEETING DATE: 4/7/2008
LOCATION: 8th Floor Conference
SUBJECT: Design Progress

DID ATTEND	INITIALS	ATTENDEE NAME	COMPANY NAME
Y	BW	Bill Watts	Electrical Engineering Department
Y	CA	Chris Atkinson	The Design Group
Y	LS	Larry Writer	Specifications Department
Y	LT	Lester Trumbull	Architectural Department
Y	MS	Mathew Strong	Structural Engineering Department
Y	SG	Sally Gears	Mechanical Engineering Department
Y	SB	Stoney Brookes	Civil Engineering Department

ITEM	STATUS	STARTED	DUE	CLOSED	BALL IN COURT
00001	AOK	4/7/2008			

Chris assigned specific activities to be accomplished by each department and reported on each meeting. One person from each department will attend the meetings and notify others in the department. Meeting minutes will be distributed to all involved in the design including A-1.

00002	NEW	4/7/2008			DESIGN CA

For each meeting each department will give an account of progress on their part of the design and how many man hours have been spent. Chris will accumulate these numbers and total them to find our total hours spent for the design.

00003	AOK	4/7/2008			

Chris reviewed the building design and the results of the project kickoff meeting for those who did not attend.

00004	AOK	4/7/2008			

Chris explained that the design will now include a fitness and health facility. This will affect mostly the Architectural, Mechanical and Electrical departments.

00005	AOK	4/7/2008			

To promote design coordination Chris explained that Expedition will be used on the network. The project is set up and passwords and access rights be will given. He encouraged the use of the InBasket and the Telephone log to keep the process moving.

Design Group
1215 Ventnor Avenue

Philadelphia, PA 19000

Phone: (215) 555-0444
Fax: (215) 555-0445

MEETING MINUTES
No. 00002

ITEM	STATUS	STARTED	DUE	CLOSED	BALL IN COURT
00006	AOK	4/7/2008			

Accoording to the P3 schedule the Schematic Design submission is due September 29, 1997.

Prepared By: The Design Group

Signed: _____
Chris Atkinson

Dated: 11/19/2009

Prinsevers 4b

REQUEST FOR INFORMATION

Project: Wastebed B/Harbor Brook IRM	**Date:** mm/dd/yy
From: Vendor Name Address Phone Contact	**RFI No.**
To:	**Ref:**
Subject:	

Est. Work Impacted:	
Est. Schedule Impact:	
Est. Cost Impact:	
Request Response By:	

Drawing Reference:	
Specification Reference:	

REQUEST:

PROPOSED SOLUTION:

ANSWER:

Signed:	Date:
Printed:	

ATTACHMENT C

FIELD CHANGE FORM

SCA CONSTRUCTION
CAMILLUS, NEW YORK

FIELD CHANGE FORM # ___

Page 1 of ___

Project Number:	Date:
Construction Manager:	
Contractor:	

You are hereby authorized and instructed to complete the following modifications to the approved Final Design:

APPROVALS:

Design Engineer

Name:
Signature:
Date:

Contractor Representative

Name:
Signature:
Date:

Owner

Name:
Signature:
Date:

NYSDEC Representative

Name:
Signature:
Date: