

REPORT

Wastebeds 1-8 Integrated IRM Construction Quality Assurance Project Plan

Honeywell

October 2012

Revised January 2013

 **O'BRIEN & GERE**

Wastebeds 1-8 Integrated IRM Construction Quality Assurance Project Plan

Prepared for:

Honeywell



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TABLE OF CONTENTS

List of Tables (IN TEXT)	iii
List of Figures	iii
List of Appendices	iii
List of Exhibits	iii
1 Introduction.....	1
1.1 Construction Quality Assurance/Construction Quality Control.....	1
1.2 Manufacturer Quality Assurance/Manufacturer Quality Control.....	1
1.3 Responsibilities.....	1
2 Project Organization and Responsibilities.....	2
2.1 Project Organization and Responsibilities.....	2
2.2 Personnel Qualifications.....	4
2.3 Lines of Communication	5
2.4 Meetings.....	5
3 Quality Assurance/Quality Control	7
3.1 Earthwork.....	7
3.1.1 Excavation	7
3.1.2 Backfill.....	8
3.1.3 Embankment.....	8
3.1.4 Compaction.....	8
3.2 LLDPE Geomembrane.....	9
3.3 Geocushion.....	16
3.3.1 High Tensile Strength Geotextile Cushion.....	17
3.3.2 Ditch A Geocushion.....	18
3.3.3 Wet Swales Geocushion.....	19
3.4 Structural Geogrid.....	21
3.4.1 Uniaxial Geogrid.....	21
3.4.2 Triaxial Geogrid.....	22
3.5 Geotextile Stabilization Fabric	24
3.5.1 Woven Geotextile Stabilization Fabric.....	24
3.5.2 Woven Geotextile Separation Fabric.....	25
3.6 Select Fill.....	26
3.7 Rip-rap.....	29
3.8 Topsoil and Seeding.....	30
3.8.1 Topsoil	30
3.8.2 Fertilization and Seeding.....	32
3.9 Passive Wells.....	33
3.10 Piping and Appurtenances	34

3.11 Process Equipment..... 35

3.12 Electrical & Controls 35

3.13 Pre-Cast Concrete..... 36

3.14 Cast in Place Concrete 37

3.15 Chain Link Fence..... 37

4 Documentation..... 39

4.1 Problem Identification and Corrective Measures Reports..... 39

4.2 Action Item List..... 39

4.3 Photographs 39

4.4 Record Drawings..... 39

4.5 Storage and Disposition of Records 39

4.6 Daily Report..... 39

4.7 Weekly Report..... 39

5 Changes and Corrections of Work..... 40

5.1 Procedure for Changes 40

5.2 Inspection and Correction of Work..... 40

LIST OF TABLES (IN TEXT)

Table 3-1	Frequency of In-Field Density Testing
Table 3-2	MQC of Geomembrane Physical Properties
Table 3-3	MQC of Geomembrane Seaming
Table 3-4	CQC for Laboratory Testing Following Geomembrane Installation
Table 3-5	MQC of High Tensile Strength Geocushion Physical Properties
Table 3-6	MQC of Ditch A Geocushion Physical Properties
Table 3-7	QC of Wet Swales Geocushion Physical Properties
Table 3-8	MQC of Structural Uniaxial Geogrid Physical Properties
Table 3-9	MQC of Structural Triaxial Geogrid Physical Properties
Table 3-10	MQC of Woven Geotextile Stabilization Fabric Physical Properties
Table 3-11	MQC of Woven Geotextile Separation Fabric Physical Properties
Table 3-12	CQC of Select Fill Prior to Construction
Table 3-13	CQC of Select Fill During Construction
Table 3-14	CQC of Select Fill Particle Size Prior to Construction
Table 3-15	CQC of Rip-Rap Prior to Construction
Table 3-16	CQC of Topsoil Layer Prior to Construction
Table 3-17	CQC of Topsoil Layer During Construction

LIST OF FIGURES

Figure 1	Lines of Communication
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LIST OF APPENDICES

Appendix A	Submittal List
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LIST OF EXHIBITS

Exhibit 1	40 CFR 261.20 Table 1 – Maximum Concentration of Contaminants for the Toxicity Characteristic
Exhibit 2	6 NYCRR Part 375-6.8 Table 375-6.8(a) – Unrestricted Use Soil Cleanup Objectives

1 INTRODUCTION

This Construction Quality Assurance Project Plan (CQAPP) has been prepared to provide guidelines and procedures for Construction Quality Assurance and Construction Quality Control (CQA/CQC) and Manufacturing Quality Assurance and Manufacturing Quality Control (MQA/MQC) during construction of the Wastebeds 1-8 Integrated Interim Remedial Measure (IRM).

1.1 CONSTRUCTION QUALITY ASSURANCE/CONSTRUCTION QUALITY CONTROL

CQA means a planned system of activities that provides assurance that the facility is constructed as specified in the design. CQA refers to measures taken by the CQA organization to assess if the installer or contractor is in compliance with the plans and specifications and permits for the project. This may also include quality control for those actions taken before construction to evaluate if materials chosen and workmanship comply with agency approved engineering plans and specifications.

CQC means a planned system of inspections that are used to directly monitor and control the quality of a construction project. CQC includes those actions normally performed by the installer to achieve quality in the constructed or installed system. CQC refers to measures taken by the installer or contractor to assess compliance with the requirements for materials and workmanship as stated in the plans and specifications for the project.

1.2 MANUFACTURER QUALITY ASSURANCE/MANUFACTURER QUALITY CONTROL

MQA is defined as a planned system of activities that provides assurance that materials were manufactured as specified in the contract documents and contract plans. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the quality of manufactured materials. MQA refers to measures taken by MQA organization to evaluate if the manufacturer is in compliance with the product certification and contract plans for a project.

MQC is defined as a planned system of inspections that is used to directly monitor and control the manufacture of a material that is factory originated. MQC is usually performed by the manufacturer of the materials and is necessary to document minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to assess compliance with the requirements for materials and workmanship as stated in certification documents and contract documents.

1.3 RESPONSIBILITIES

This section outlines the responsibilities of each of the entities associated with the project as well as the lines of communication between the Owner, Regulatory Agency, Contractor, inspection personnel and design personnel associated with construction activities. Also provided is a description of the required level of qualification, experience and training for the installers and subcontractors and CQA/CQC inspectors. In addition to personnel requirements, a description of the quality assurance/quality control protocols to be utilized for documenting construction activities and compliance with the specifications is provided.

2 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 PROJECT ORGANIZATION AND RESPONSIBILITIES

Several organizations are involved in CQA/CQC prior to, during, and following construction. These include the following:

- New York State Department of Environmental Conservation (NYSDEC) as the lead regulatory agency
- Honeywell International, Inc. (Honeywell) as the Owner
- O'Brien & Gere as the Design Engineering Firm
- O'Brien & Gere as the Contractor for construction
- Testing laboratories (to be determined)
- Manufacturers and fabricators (to be determined)
- Installers (to be determined)

The responsibilities of these organizations are delineated in the following subsections.

NYSDEC Responsibilities. As the lead regulatory agency, the NYSDEC shall perform the following functions:

- Review and approve original designs
- Review project submittals for compliance with regulations
- Issue approval to construct the project once design has been approved
- Review and approve major design modifications or requests for variances from the regulatory conditions during construction.

Honeywell Responsibilities. As the Owner, Honeywell shall:

- Bear responsibility for the design, construction, construction inspection and operation of the project
- Comply with NYSDEC requirements to obtain approvals and/or permits, as necessary
- Bear responsibility for communications with the NYSDEC
- Bear responsibility for providing CQA/CQC documentation to the NYSDEC that construction activities associated with the project are proceeding in accordance with the approved design (and approved design modifications)
- Accept or reject design plans and specifications, CQAPP, reports and recommendations of the design engineer, and the materials and workmanship of the Contractor
- Bear responsibility for providing the Construction Certification Report to the NYSDEC for review and acceptance.

O'Brien & Gere Responsibilities. As the Design Engineering Firm and Contractor for construction, O'Brien & Gere, shall perform the following:

- Provide a project design that fulfills the performance requirements of the NYSDEC and USEPA
- Prepare this CQAPP
- Prepare design modifications during construction, if necessitated by unexpected site conditions or required changes in construction methodology
- Retain and oversee qualified subcontractors to perform specialized components of construction
- Coordinate the review of the subcontractor, supplier, and installer shop drawing submittals
- Observe construction activities

- Confirm that regular calibration of testing equipment is properly conducted and recorded
- Confirm that testing laboratories conform to CQAPP requirements and procedures and sample custody procedures are followed
- Confirm that test data inspection reports are accurately recorded and maintained
- Provide the Owner with reports on testing and inspection results
- Schedule and attend project CQA/CQC meetings during construction
- Provide daily on-site inspection of the work in progress to assess compliance with design plans and specifications
- Attend job meetings as required
- Prepare construction work plan
- Construct the project in accordance with the design plans, specifications, and NYSDEC-approved modifications using appropriate construction procedures and techniques
- Schedule and coordinate CQA/CQC inspection and testing activities
- Retain testing laboratories to provide CQC testing services
- Oversee the preparation of the Construction Completion Report and Record Drawings

The O'Brien & Gere Construction Manager shall have overall responsibility for CQA and CQC. Other related duties may include coordinating shop drawings submittals, providing required samples, and coordinating with the NYSDEC.

CQC Inspector. As the third party CQC person or entity hired by the Contractor, independent from the manufacturer, fabricator, installer, owner and engineer, the CQC Inspector will perform the following relative to geosynthetic materials:

- Observe and document activities related to the quality control of remedial activities from delivery of materials through installation
- Review of contract documents
- Recommend to the Engineer changes in the CQA Plan and in the contract documents
- Communicate directly with the geosynthetics quality assurance laboratory for testing
- Maintain daily reports
- Prepare weekly reports
- Verify calibration of the field testing equipment for LLDPE geomembrane
- Obtain, identify, and ship all samples for laboratory testing
- Review results of laboratory testing and recommend acceptance or rejection of the tested component.

Testing Laboratory Responsibilities. The testing laboratory utilized shall meet the following requirements:

- Have an internal CQC plan in-place to confirm that laboratory procedures conform to the appropriate American Society for Testing and Materials (ASTM) standards or other applicable standards and methods
- Follow internal CQC procedures
- Maintain sample chain-of-custody records
- Report results of testing.

The testing laboratory shall be required to allow representatives of Honeywell, NYSDEC, O'Brien & Gere, and/or the Installer to observe sample preparation, testing procedures, or record-keeping procedures upon request.

Honeywell, NYSDEC, O'Brien & Gere, and/or the Installer shall be allowed to observe tests on a particular job at any time, either announced or unannounced. It is anticipated that the laboratories shall include quality control testing for analytical, geotechnical, and geosynthetic properties.

Manufacturer and Fabricator Responsibilities. The manufacturers and fabricators of geosynthetic components and other equipment required for construction of the project shall:

- Certify that materials manufactured or fabricated meet the specifications
- Provide documentation that describes QC taken during manufacturing or fabrication
- Allow Honeywell, NYSDEC, O'Brien & Gere, and/or the Installer to observe the manufacturing and fabrication process and QC procedures.

Installer Responsibilities. Installers include subcontractors performing work under the Contractor. Installer's task may include, but may not be limited to, installing manufactured and fabricated products, such as geosynthetic materials, installing equipment and electrical utilities, or landscaping. The Installer's responsibilities include the following:

- Maintaining a CQC Plan in-place for handling, storing, placing, and installing materials or equipment
- Handling, storage, placement, and installation of manufactured and fabricated materials or equipment
- Following CQC procedures
- Informing the Contractor of the schedule for installation of manufactured or fabricated materials or equipment.

2.2 PERSONNEL QUALIFICATIONS

It is important that organizations and personnel involved in implementing the remedy possess suitable qualifications to perform the work. The following sections describe qualifications and minimum acceptable experience for positions identified in the CQAPP.

Contractor. O'Brien & Gere shall serve as the Contractor based upon experience in constructing projects of similar size and scope, including, but not limited to, projects requiring construction of pump stations, material excavation, construction of ground water collection trenches, and installation of LLDPE geomembrane and other geosynthetic materials. Specialty contractors shall be retained under subcontract for construction of some components of the work. Prior to award of subcontracts, O'Brien & Gere shall request evidence that each subcontractor has the necessary experience to fulfill the requirements set forth in this plan.

Contractor's CQC Manager. O'Brien & Gere's Construction Manager shall serve as the CQC Manager. The CQC Manager shall have a working knowledge of civil and construction engineering and soil and geosynthetic materials. The CQC Manager shall be on-site during the construction period. The CQC Manager shall have a thorough familiarity with the project and testing requirements. The CQC Manager shall have demonstrated experience with earthwork projects, geosynthetic materials, concrete, and drainage structures.

Contractor's CQA Manager. O'Brien & Gere's Engineering Manager shall serve as the CQA Manager. The CQA Manager shall have a working knowledge of civil and construction engineering and soil and geosynthetic materials. The CQA Manager, or other designated qualified personnel reporting directly to the CQA Manager, shall perform inspections on-site during the construction period and review CQA testing results and associated submittals. The CQA Manager shall have a thorough familiarity with the project and testing requirements. The CQA Manager shall have demonstrated experience with earthwork projects, geosynthetic materials, concrete, and drainage structures.

CQC Inspector. The CQC Inspector shall be from an engineering firm or certified testing laboratory experienced in the installation and testing of LLDPE geomembrane. The CQC Inspector shall be required to demonstrate qualification by having previous experience in inspecting at least two million square feet of LLDPE geomembrane. The CQC Inspector's qualifications will be submitted and reviewed by the Engineer.

CQC Geotechnical Laboratory. The CQC Geotechnical Laboratory shall be an independent laboratory selected by O'Brien & Gere.

The laboratory shall be qualified to perform geotechnical testing presented in the specifications and have a minimum of five years experience in testing soil properties required for the project. The laboratory shall be required to submit references from three other similar projects. Laboratory test results shall be certified by a Laboratory Manager with a minimum of two years of soils testing experience.

CQC Geosynthetic Laboratory. The CQC Geosynthetic Laboratory shall be an independent laboratory selected by O'Brien & Gere.

The laboratory shall be qualified to perform geosynthetic testing presented in the specifications and have a minimum of five years experience in testing geosynthetics. Laboratory test results shall be certified by a Laboratory Manager with a minimum of two years of geosynthetic testing experience.

CQC Analytical Laboratory. The CQC analytical laboratory shall be an independent laboratory selected by O'Brien & Gere.

The laboratory shall be qualified to perform analytical testing presented in the specifications and have a minimum of five years experience in the testing required for the project. The laboratory shall be required to submit references from three other similar projects. Laboratory test results shall be certified by a Laboratory Manager with a minimum of two years of analytical testing experience.

Manufacturers and Fabricators. Manufacturers and fabricators of the project components shall be required to have experience in manufacturing or fabricating similar materials. The manufacturers and fabricators shall demonstrate experience in projects of similar size and nature for review by O'Brien & Gere. The manufacturers and fabricators shall each be required to submit a list of the projects for review by O'Brien & Gere.

Installers. Installers of specified equipment and materials shall be required to demonstrate experience in projects of similar size and nature for review by O'Brien & Gere. Installers responsible specifically for the installation of geosynthetic materials shall be trained and qualified to install and test geosynthetic materials. Geosynthetic Installers shall be required to demonstrate experience in installing LLDPE geomembrane for a minimum of five completed facilities. The Geosynthetic Installer shall be required to submit the list of facilities for review by O'Brien & Gere.

2.3 LINES OF COMMUNICATION

An important component to the successful completion of any project is effective communication between the parties involved. A project specific communications matrix has been developed (**Figure 1**) as part of O'Brien & Gere's pre-construction project execution planning efforts.

A contact list shall be developed to provide roles, responsibilities and contact information for parties involved in the construction phase. The list shall be maintained and updated as appropriate as construction progresses by O'Brien & Gere.

O'Brien & Gere shall notify Honeywell and the NYSDEC if deficiencies in the work are noted based on field inspections, CQA/CQC results and, if appropriate, order corrective measures or recommend work stoppage. Formal communications related to submittals and changes or modifications of work shall be made in accordance with the Contract Documents and this CQAPP.

2.4 MEETINGS

To enhance communications and maintain the progress of the work in an orderly and efficient manner, scheduled on-site construction and project management meetings shall be held prior to and throughout the course of construction.

Pre-Construction Meeting. After award of the contract, a Pre-Construction Meeting shall be held. Attendees at this meeting may include:

- Regulatory representatives (NYSDEC and NYSDOH)
- O'Brien & Gere and select subcontractors
- Representatives of Honeywell

The meeting shall cover scheduling and construction details. Important objectives of the meeting directly related to construction quality shall be to:

- Provide each organization with relevant CQA/CQC documents and supporting information
- Familiarize entities with this CQAPP and its role relative to the plans and specifications
- Evaluate changes to the CQAPP that may be needed to monitor that the Project shall be constructed to meet or exceed the specified design
- Review the responsibilities of each organization
- Review lines of authority and communication
- Discuss the established procedures or protocol for observations and tests including sampling strategies
- Discuss CQA/CQC proposed by O'Brien & Gere and Installers
- Discuss established procedures or protocol for handling construction deficiencies, repairs, and retesting
- Review methods for documenting and reporting inspection data
- Review methods for distributing and storing documents and reports
- Review work area security and safety protocols
- Discuss procedures for the location, storage, and protection of construction materials and for the prevention of damage to the materials from inclement weather or other adverse events
- Conduct a site walk to review the project site layout, construction material and inspection equipment storage locations.

Minutes of the Pre-Construction Meeting shall be kept by O'Brien & Gere and distributed to attendees.

Weekly Construction Meetings. Construction meetings shall be held weekly to discuss project progress and scheduling. In addition to O'Brien & Gere, attendees at the meeting may include representatives of Honeywell, NYSDEC, installers, and property owners. Items of discussion shall include:

- The progress of the work to date
- The schedule to accomplish upcoming work tasks
- Health and safety issues
- Value Engineering items
- Status of submittals and Requests for Information (RFI)
- Procurement items
- Problems encountered or anticipated during construction
- Proposed field modifications to the design
- Work deficiencies that have been noted in the field.

O'Brien & Gere shall prepare, distribute and maintain an "Action Item" list summarizing key items discussed during the weekly construction meetings.

3 QUALITY ASSURANCE/QUALITY CONTROL

This CQAPP shall provide the basis for CQA/CQC and MQA/MQC activities associated with the Integrated IRM Design, including the following components:

- Excavation
- Ground water collection system
- Seep collection system
- Stormwater facilities
- Mitigation Wetlands
- Pump stations, piping, and appurtenances
- Vegetative cover
- Revetment

Detailed information, including the frequency of inspection, field testing methods, sampling requirements for laboratory testing, testing procedures and equipment to be used, criteria for acceptance/failure, and a description of the corrective actions to be initiated upon test failure are presented in the Technical Specifications which have been attached to the 100% design report, provided under separate cover. A preliminary list of anticipated submittals has been attached to this document as **Appendix A**.

3.1 EARTHWORK

This section includes activities associated with excavation, backfilling, and placing embankment including the placement, loosening, removing, refilling, transporting, storage and disposal of materials necessary to be removed for construction.

3.1.1 Excavation

Construction Quality Control. Excavations shall be dewatered during construction activities, as necessary. The bottom of the excavation shall be cleaned of loose or soft material and leveled. Prior to installation of the select fill and piping, O'Brien & Gere shall inspect the excavation and record the findings of the inspection. Records of excavation inspections shall be kept by O'Brien & Gere.

Excavations shall not be opened for more than 300 feet in advance of pipe installation or left unfilled for more than 100 feet in the rear of the installed pipe when work is in progress. Excavations shall be protected and barricaded at the end of each working day or when the excavation is left opened for an extended period of time.

Excavations of the revetment toe shall be conducted in staged construction limited to 20-foot sections. Each 20-foot section of revetment toe shall be excavated and backfilled with the required stone materials prior to additional excavation. Loading limitations for the area above the revetment and around the excavation along Ninemile Creek are as described in Appendix C of the 100% Design Report.

For Structural Excavation, the subgrade shall be undisturbed existing material or, mud mat on undisturbed existing material, or where excavation below subgrade is ordered, it shall be thoroughly compacted select fill or concrete mud mat as specified or directed and shall be sufficiently stable to remain firm and intact during the preparation for the placing of concrete, structure or pipe thereon.

Material excavated from the Site shall be transported to and placed at the material handling area(s) that shall be specified in the Construction Work Plan (CWP) or designated by Honeywell. At the completion of the project, the stockpiles shall be stabilized in accordance with the project specific Storm Water Pollution Prevention Plan (SWPPP) to minimize contact with storm water and runoff. The stockpiles, and associated sediment and erosion control measures will be maintained as necessary per the SWPPP, until final disposition of these materials is addressed as part of the final WB 1-8 Site remedy. In the event that grossly contaminated soil is encountered during the excavation/site grading activities, this material shall be staged separately on site.

Construction Quality Assurance. If sheeting is used during excavation, sheeting design drawings shall be stamped and signed by a licensed Professional Engineer in New York State. Drawings and material cut-sheets shall be reviewed by O'Brien & Gere prior to procurement and installation of materials.

A written Control of Water Management Plan for removal of water is required. O'Brien & Gere shall review the plan to evaluate that information provided meet the requirements of the Contract Documents.

3.1.2 Backfill

Construction Quality Control. Backfill with suitable excavated materials that can be compacted as specified in this document and in the Contract Documents. In the event the excavated materials are not suitable, Select Fill as specified shall be used for backfilling.

Backfilling around structures shall not be commenced before the structure has developed sufficient strength to withstand the loads applied. No backfill material shall be allowed to fall directly on a structure nor shall any material be pushed directly against a structure in backfilling.

Deposit backfill in horizontal layers and at no greater thickness than can be compacted to obtain the specified minimum densities.

Pipe shall be protected from lateral displacement and possible damage resulting from superimposed backfill loads, impact or unbalanced loading during backfilling operations by being adequately embedded in suitable pipe embedment material. To ensure adequate lateral and vertical stability of the installed pipe during pipe jointing and embedment operations, a sufficient amount of the pipe embedment material to hold the pipe in rigid alignment shall be uniformly deposited and thoroughly compacted around each pipe as laid.

Embedment materials placed above the centerline of the pipe to a depth of 12 inches above the top of the pipe barrel shall be deposited in such manner as to not damage the pipe. Compaction shall be as required for the type of embedment being installed.

The remaining portion of the pipe trench above the embedment shall be refilled with suitable materials compacted as specified. The surface shall be restored in accordance with the Contract Drawings and topsoil and seeding specification.

3.1.3 Embankment

Construction Quality Control. Embankments shall be constructed with suitable material that can be compacted as specified in the following section. Embankment material shall be free from frost, stumps, trees, roots, sods, muck, marl, vegetable matter or other unsuitable material. Where embankments are to be placed underwater only acceptable granular materials shall be used. The surface to be covered with embankment shall be grubbed and stripped of grass, vegetation, topsoil, or other unsuitable materials before placement of embankment material. Stones within the embankment material shall not exceed 6 inches in greatest dimension and shall be well distributed throughout the soil mass.

Construction Quality Assurance. Embankment material shall be obtained from acceptable off-site sources. An affidavit stating the source of material shall be required for review by O'Brien & Gere. Analytical requirements are identified in section 3.6 Select Fill.

3.1.4 Compaction

Construction Quality Assurance. Compaction is specified as the percent of maximum dry density. Prior to compaction, the moisture-density relationship of the backfill material shall be tested in accordance with ASTM D1557. Compaction curves are required for each material that will be required to achieve a specified compaction during construction. Compaction curves shall be reviewed by O'Brien & Gere prior to placement of material. In-place density testing shall be performed by a third-party laboratory by ASTM 6398 or ASTM D1556 and be expressed as a percentage of maximum dry density. Water shall be added during compaction effort as required to achieve the specified densities. If the material exceeds optimum moisture content for satisfactory compaction, it shall be allowed to dry before compaction or filling effort is resumed.

Where excavations are located within existing or proposed access pathways, excavations shall be backfilled in horizontal layers not more than 8 inches in thickness and compacted to obtain 95% maximum density, or as shown on the Contract Drawings. Hand tamping shall be required around buried utility lines or other subsurface features that could be damaged by mechanical compaction equipment. Where excavations are outside of access pathways, compactive effort of the backfill material will be acceptable. Settlement of the backfill shall be refilled and compacted as it occurs. Material may be placed in greater thickness upon demonstration that the materials and compaction efforts are adequate to obtain the required density.

Embankments and berms shall be placed in horizontal layers not more than 8 inches in thickness, and compacted to obtain 95% maximum density or as shown on the Contract Drawings. Settlement of the embankment shall be filled and compacted as it occurs. Frequency of in-place density testing shall be as follows.

Backfill around structures shall be compacted to obtain 95% maximum density. Backfill shall be placed in horizontal layers and at no greater thickness than can be compacted to obtain 95% maximum density or as shown on the Contract Drawings. Subsurface for structures shall be compacted native material and thoroughly compacted select fill obtaining 95% maximum density or as shown on the Contract Drawings.

During winter months, when 95% maximum density may not be feasible, compactive effort of the backfill around the structures may be employed. These areas will be monitored for settlement and deficiencies will be top-dressed and recompacted. Where Type "C" (as defined in the Select Fill technical specification and in Section 3.6 of this Plan) is being placed as the sub base for structures, compactive effort of the material may be employed.

Table 3-1 Frequency of In-Field Density Testing

Parameter	Standard	Frequency
In-Place Density Test	ASTM D6398 or ASTM D1566	Minimum one (1) in-place density test per 10,000 square feet of compacted area per lift For linear construction elements, such as berms, minimum one (1) in-place density test per 200 linear feet

Source: O'Brien & Gere

Groundwater Collection Trench filter material shall be placed wet and will not be compacted. Topsoil and Filter Sand select fill shall not be compacted. Habitat Subgrade shall not be compacted to obtain a minimum density but shall have compacted effort to reduce the potential for settlement.

Records of the in-place density testing for each Select Fill and Embankment material shall be submitted to the Engineer. Testing that does not conform to the Contract Documents will be required to be performed again and resubmitted.

3.2 LLDPE GEOMEMBRANE

The following sections discuss QA/QC procedures for installation of the textured 40-mil LLDPE geomembrane.

Manufacturing Quality Assurance. The manufacturer will be required to provide O'Brien & Gere the following documentation regarding quality control of raw materials used to manufacture the LLDPE geomembrane.

- Certification that the polyethylene resin is new, first quality resin manufactured in the United States from virgin, uncontaminated ingredients, and meets or exceeds the requirements specified hereinafter and is free of contaminants
- Certification that resin is from the same manufacturer

- Origin, identification, and production date(s) of the raw materials used to manufacture the LLDPE geomembrane

Quality control certificates of raw materials used to manufacture the LLDPE geomembrane.

All compound ingredients of the geomembrane material will be randomly sampled on delivery to the manufacturing plant by the manufacturer of the geomembrane to document compliance with the specifications. Equivalent testing may be substituted with the prior review of O’Brien & Gere.

Manufacturer will supply O’Brien & Gere with certified copies of the factory test results prior to the arrival of material on site.

Manufacturing Quality Control. The manufacturer will be required to provide O’Brien & Gere documentation regarding quality control of physical properties of the geomembrane certified in accordance with the following performance standards:

Table 3-2 MQC of Geomembrane Physical Properties

Parameter	Standard	Frequency	Criteria
Thickness, absolute minimum	ASTM D5994	every roll	36 mils
Density (minimum)	ASTM D1505	200,000 lb	0.92 g/cm ³
Minimum Tensile Properties	ASTM 6693, Type IV		
1. Tensile Strength @ Break	Dumbell, 2 ipm	20,000 lb	115 lb/in (20 N/m)
2. Elongation @ Break	G.L.=2.0 in (51 mm)		500 %
Tear Resistance	ASTM D1004	45,000 lb	25lb (111 N)
Puncture Resistance	ASTM D4833	45,000 lb	65 lb (289 N)
Carbon Black Content	ASTM D1603/4218	20,000 lb	2.0-3.0 %
Carbon Black Dispersion	ASTM D5596	45,000 lb	Note 1
Asperity Height	ASTM D 7466	Second roll	18 mil (0.45 mm)
Oxidative Induction Time	ASTM D3895, 200°C; O ₂ , 1 atm	200,000 lb	>140
Roll Length (approximate)	Standard Textured		700 ft (213 m)
Roll Width			22.5 ft (6.9 m)
Roll Area			15,750 ft ² (1,463 m ²)

Notes: 1. Dispersion only applies to near spherical agglomerates are considered. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.

Source: O’Brien & Gere

The manufacturer will provide O’Brien & Gere certified copies of the factory test results and a complete stress rupture curve from the geomembrane manufacturer prior to the arrival of material on site. Equivalent testing may be substituted with the prior review of O’Brien & Gere.

In addition, a minimum of two 24-inch by 24-inch size samples, from each roll along with appropriate identification, will be provided to the O’Brien & Gere for further testing, if necessary.

Manufacturing Quality Control of LLDPE Geomembrane Seaming. The manufacturer will be required to provide O'Brien & Gere the following documentation regarding quality control of LLDPE geomembrane seaming by the manufacturer at the plant.

The LLDPE geomembrane will be visually inspected for:

- Uniformity
- Damage
- Imperfections
- Holes
- Cracks
- Thin spots
- Foreign material
- Tears
- Punctures
- Blisters

Imperfections, such as those noted above, will be immediately removed, repaired, and re-inspected prior to being fabricated into panels.

Non-destructive seam testing will be performed on fabricated seams over their full length. Non-destructive seam testing will be performed using either an approved vacuum box or pressurized dual seam method.

Destructive seam testing will be performed on a minimum of two samples per LLDPE geomembrane sheet in accordance with the following requirements:

- Where possible, the samples shall be taken from extra material at the beginning or end of sheet seams such that the LLDPE geomembrane sheet is not damaged and the sheet geometry is not altered.
- The samples taken will be a minimum of 18 inches wide by 72 inches long with the seam centered lengthwise. Each sample will be cut into three pieces with one piece (18 inches by 24 inches) retained by the fabricator, one piece given to an independent laboratory, and one piece given to O'Brien & Gere for further testing, if desired, and permanent record. Each sample shall be tagged to identify:
 - » Manufacturer's roll number
 - » Date cut
 - » Panel from which cut
 - » Location in panel
 - » Visual inspection comments
 - » Inspector's name
 - » Top sheet.
- Ten 1-inch wide replicate samples shall be cut from the fabricator sample. Five specimens shall be tested for shear strength and five for peel adhesion. If a sample fails a destructive test, the entire length of the seam shall be reconstructed or repaired, and retested using non-destructive seam testing over the full length of the seam using either the vacuum box or pressurized dual seam method. If no seams delaminate, but fail in the adjacent sheet material on either side of the seam in a film tear bond, the seam strength shall be calculated. Four out of five replicates must meet the specific seam strength property requirements as follows:

Table 3-3 MQC of Geomembrane Seaming

Parameter	Standard	Criteria
Fusion Seaming		
Shear Strength (minimum)	ASTM D6392	60lb/in
Peel Adhesion (minimum)	ASTM D6392	50 lb/in
Extrusion Seaming		
Shear Strength (minimum)	ASTM D6392	60 lb/in
Peel Adhesion (minimum)	ASTM D6392	48 lb/in

Source: O’Brien & Gere

The LLDPE geomembrane manufacturer shall be required to supply the following documentation to O’Brien & Gere, at a minimum, with each roll or pallet of LLDPE geomembrane manufactured:

- Name of manufacturer/fabricator
- Product type
- Product thickness
- Manufacturing batch code
- Date of manufacture
- Physical dimensions (length and width)
- Directions for unrolling or unfolding the LLDPE geomembrane.

CQC Prior to LLDPE Geomembrane Installation. Prior to placement of the LLDPE geomembrane, the Geosynthetic Installer shall be required to provide a copy of his Quality Control Program Manual regarding the installation of the geomembrane. The Quality Control Program Manual shall include, at a minimum:

- Installation procedures
- Field sampling procedures
- Procedures for repair
- Documentation procedures.

O’Brien & Gere shall perform laboratory friction tests using the ASTM D5321 - Direct Shear Test Method to document that a minimum factor of safety of 1.5 can be obtained between liner system components (geotextile bedding layer, gas venting layer, textured LLDPE geomembrane, geotextile, habitat subgrade, topsoil layer) for the steepest slopes proposed. Material incapable of meeting a 1.5 factor of safety shall not be allowed for use.

Friction testing shall be performed with a direct shear box having minimum dimensions of 12 inches by 12 inches and applied normal stresses of 1.0, 2.0 and 4.0 psi for each liner system interface. Displacement rates shall be less than 0.04 inches per minute. Liner system components shall be tested in a saturated condition.

The LLDPE geomembrane shall be oriented such that the shear force is parallel to the downslope orientation of the LLDPE geomembrane in the field. A minimum of one test per system interface shall be performed. Additional tests shall be performed if materials of construction in contact with the liner system or the materials of the liner system change from those originally tested.

The material on which the LLDPE geomembrane shall be installed shall be free of sharp materials and abrupt changes in grade that could damage the LLDPE geomembrane. The supporting layer shall be maintained in a smooth, uniform, and compacted condition during installation of the LLDPE geomembrane.

The Geomembrane Installer shall provide O'Brien & Gere with written acceptance of the subgrade prior to LLDPE geomembrane installation. No installation of the LLDPE geomembrane shall commence until the surface is accepted by the Geomembrane Installer and written acceptance is supplied to O'Brien & Gere.

The Geomembrane Installer shall provide two minimum 18-inch wide by 18-inch long samples of LLDPE geomembrane for each lot number of geomembrane material that arrives at the site for fingerprinting. The samples shall be provided to O'Brien & Gere for possible future testing and analysis. O'Brien & Gere shall archive one sample at room temperature and in a light-free environment.

The LLDPE geomembrane shall be stored in a sheltered area on-site to avoid possible damage caused by the following:

- Adverse weather
- Heavy winds
- Precipitation
- UV light
- Temperature extremes
- Vandals

The Geomembrane Installer shall be required to provide a geomembrane panel layout showing the proposed locations of field seams to be installed. The Geosynthetic Installer shall be required to document changes in field seam locations. The Geomembrane Installer shall be required to obtain written approval from the Owner's Representative prior to field seaming.

Non-destructive tests shall be performed on 100 percent of the field seams using either the vacuum test or pressurized dual seam test methods. Testing shall be performed as the seaming work progresses daily.

Geomembrane Installer shall perform the following during non-destructive seam testing:

- Non-destructive testing shall be witnessed by the CQC Inspector and documented
- Record location, date, test unit number, name of tester, and results of testing
- Document seams that fail testing
- Repair failed seams in accordance with the Geomembrane Technical Specification Section 02293

Destructive seam testing shall be performed as the seaming work progresses and not at the completion of seam fabrication. Destructive seam testing shall be performed at the locations established as follows:

- A minimum frequency of one destructive test sample per field seam at locations specified by the CQC Inspector and reviewed by the Engineer
- A minimum of one test for each seaming machine per day
- Additional test locations may be evaluated during seaming at O'Brien & Gere's discretion. Selection of such locations may be prompted by suspicion of excess grinding, moisture, excess crystallinity, contamination, offset welds, or other potential cause of imperfect welding.

The samples shall be a minimum of 18 inches wide by 72 inches long with the seam centered lengthwise. Each sample shall be cut into three pieces (18 inches x 24 inches) with one piece retained by the Geomembrane Installer, one piece given to the CQC Geosynthetic Laboratory, and the remaining piece given to O'Brien & Gere for further testing if desired and permanent record. Each sample shall be tagged to identify:

- Roll/panel number
- Seam number
- Date and time cut
- Ambient temperature
- Seaming unit
- Name of seamer
- Welding apparatus temperature and pressures
- Top sheet

The Installer shall cut ten 1-inch wide replicate specimens from his sample with the appropriate ASTM cutting tool. Five specimens shall be tested for shear strength and five for peel adhesion. Three shear strength tests and two peel tests shall be performed on one end and two shear strength tests and three peel adhesion tests shall be performed on the opposite end. If one of the tested seams delaminates, failing in a non-film tear bond, the entire length of the seam shall be reconstructed or repaired and tested using non-destructive seam testing over the full length of the seams using either the vacuum box or pressurized dual seam method. If no seams delaminate, but fail in the adjacent sheet material on either side of the seam in a film tear bond, the seam strength shall be calculated. To be acceptable, four out of five replicate test specimens shall be required to meet the specified property requirements. Certified test results from the Installer and independent laboratory on seams shall be submitted prior to acceptance of the seam. If the field tests pass, testing shall be performed by the CQC Geosynthetic Laboratory on duplicate samples as follows:

Table 3-4 CQC for Laboratory Testing Following Geomembrane Installation

Parameter	Standard	Criteria
Fusion Seaming		
Shear Strength (seaming)	ASTM D6392	60lb/in
Peel Adhesion (minimum)	ASTM D6392	50 lb/in
Extrusion Seaming		
Shear Seaming (minimum)	ASTM D6392	60 lb/in
Peel Adhesion (minimum)	ASTM D6392	48lb/in

Source: O'Brien & Gere

If the field tests fail, the seam shall be reconstructed between the failed location and passed test location. Seam reconstruction shall be achieved by cutting out the existing seam and seaming in a replacement strip or adding a cap strip. In lieu of this, the seaming path shall be retraced to an intermediate location at least 10 ft in each direction from the location of the sample which failed the test. At each location a minimum 12-inch by 12-inch size sample shall be taken for two additional shear strength tests and two additional peel adhesion tests using an approved field tensiometer. If these tests pass, then the remaining sample portion shall be sent to the CQC geosynthetic laboratory for two shear strength and two peel adhesion tests. If these tests fail, then the process shall be repeated. After reconstruction, the entire reconstructed seam shall be non-destructively tested. Acceptable seams shall be bounded by two passed test locations and include one test location along the reconstructed seam.

The geomembrane surface shall be cleaned by the Geomembrane Installer prior to examination of seams and non-seam areas by O'Brien & Gere. O'Brien & Gere shall identify defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign materials.

Each suspect location in seam and non-seam areas shall be non-destructively tested, as appropriate. Locations that fail the non-destructive testing shall be documented by O'Brien & Gere and repaired by the Geosynthetic Installer according to the following methods:

- Patching shall be used to repair holes, tears, blisters, undispersed raw materials, or contaminated areas by foreign materials. Patches and caps shall extend a minimum of 6 inches beyond the edge of the defect and be made of the same geomembrane. Corners of patches shall be rounded with a radius of approximately 3 inches. If extrusion materials are used, the surface of the geomembrane shall be replaced and abraded no more than one hour prior to the repair.
- Spot welding or seaming shall be used to repair small tears or other localized flaws.

Failed seams shall be reconstructed. Seams shall be required to pass non-destructive testing as appropriate.

CQC During LLDPE Geomembrane Installation. Prior to seaming, the Geosynthetic Installer shall observe the areas to be seamed to evaluate that they are free from dirt, dust, moisture, debris, and foreign material during seaming. No seaming shall be performed when the air temperature of sheet temperature is below 32° Fahrenheit (F), when the sheet temperature exceeds 158° F, when the air temperature is above 120° F, during periods of precipitation, or when winds are in excess of 20 miles per hour.

If circumstances require that field seaming be conducted in cold weather conditions (below 32° F), the following procedures shall be implemented:

- Surface temperatures of the geomembrane shall be measured at least every 10 ft of seaming length
- Preheating of the seaming area under wind protection shall be required if the measured surface temperature is below 32°F
- Preheating devices shall be accepted by O'Brien & Gere and the Owner's Representative prior to operation
- At the discretion of O'Brien & Gere, additional destructive tests shall be taken to monitor the quality of the installation
- No field sampling shall be conducted, if ambient temperature is above 120°F unless the Geomembrane Installer can demonstrate to the satisfaction of O'Brien & Gere that the quality of seaming is not compromised. Additional destructive tests may be required by O'Brien & Gere for suspect areas.

All seaming material shall be of a type recommended and supplied by the manufacturer and shall be delivered in the original sealed containers, each with an indelible label bearing the brand name, manufacturer's mark number, and complete directions as to proper storage.

Seams shall be made double wedge welding as the primary method. Extrusion welding shall be used only for patching and seaming around appurtenances. The minimum finished overlap of the panels of the geomembrane shall be 6 inches maximum for wedge welding and extrusion welding.

Test seams shall be made at the start of each seaming period, at O'Brien & Gere's discretion, whenever there is a change in seaming personnel or equipment, and if significant changes in geomembrane temperature are observed. The field test weld shall be a minimum two-ft long by one ft wide with the seam centered lengthwise and shall be made for each welding machine. Test weld samples shall be labeled with:

- Date and time
- Roll/panel number
- Seam number
- Ambient temperature

- Welding apparatus
- Temperature and pressures
- Welder's initials
- Top sheet

Five test strips approximately 1-inch wide shall be cut from each opposite end of test weld samples by the Installer and subjected to shear and peel tests at the site, as described in the following sections for destructive testing. If the field tests fail to meet the minimum specified seam requirements, the entire operation shall be repeated. If the additional test seam fails, the seaming apparatus or seamer shall not be accepted or used until the deficiencies are corrected and two consecutive successful full test seams are achieved. Remaining weld samples shall be retained by the Owner for subsequent laboratory testing if required. No seaming personnel may begin work until his test weld has passed the on-site shear and peel tests as indicated by O'Brien & Gere.

CQA Prior to LLDPE Geomembrane Installation. Prior to procurement of material, the Engineer will review and verify submittals and sample information from the Contractor's CQC Manager and Installer. The information will be reviewed to evaluate if the proper information has been submitted.

The material delivered to the site will be visually and continuously inspected by the Engineer to check that the same materials are used during construction. If changes in material occur prior to review of the material by the Engineer, the material will be tested and evaluated with respect to the requirements of the technical specification. Material not meeting the requirements will be removed from the site and replaced. The material will be installed according to manufacturer's recommendations.

CQA During LLDPE Geomembrane Installation. O'Brien & Gere shall inspect delivery tickets and the LLDPE geomembrane manufacturer's quality control documentation to verify that the LLDPE geomembrane rolls received on-site meet the project specifications. If the LLDPE geomembrane does not meet the required specifications, the material shall be rejected.

During installation of the LLDPE geomembrane, O'Brien & Gere shall observe that the LLDPE geomembrane is installed in accordance with the requirements of the NYSDEC-approved engineering plans, reports, and specifications.

O'Brien & Gere shall also inspect the LLDPE geomembrane visually for the following:

- Uniformity
- Damage
- Imperfections
- Tears
- Punctures
- Nodules
- Contaminants
- Blisters

Imperfections, such as those noted above, shall be immediately repaired and reinspected.

3.3 GEOCUSHION

The following sections discuss CQA/CQC and procedures for installation of the geocushion. Different types of geocushion will be used at various locations at the Site, which are indicated in the following sections.

3.3.1 High Tensile Strength Geotextile Cushion

The following sections discuss CQA/CQC and procedures for installation of the Mirafi HP565 geocushion to be installed in the revetment area.

Manufacturing Quality Assurance. The manufacturer shall be required to provide O’Brien & Gere the following documentation regarding quality control of raw materials used to manufacture the geocushion.

- Certification that the polyethylene resin is new, first quality resin manufactured in the United States from virgin, uncontaminated ingredients, and meets or exceeds the requirements specified hereinafter and is free of contaminants
- Certification that resin is from the same manufacturer
- Origin, identification, and production date(s) of the raw materials used to manufacture the geocushion
- Quality control certificates of raw materials used to manufacture the geocushion

All compound ingredients of the geocushion material shall be randomly sampled on delivery to the manufacturing plant by the manufacturer of the geocushion to document compliance with the specifications. Equivalent testing may be substituted with the prior review of O’Brien & Gere.

Manufacturer shall supply O’Brien & Gere with certified copies of the factory test results prior to the arrival of material on site.

Manufacturing Quality Control. The manufacturer shall be required to provide O’Brien & Gere documentation regarding quality control of mechanical and physical properties of the geocushion certified in accordance with the following performance standards:

Table 3-5 MQC of High Tensile Strength Geocushion Physical Properties

Properties	Test Method	Unit	Minimum Roll Value	
			MD	CD
Tensile Strength (at ultimate)	ASTM D4595	kN/m (lbs/ft)	66.5 (4560)	70.0 (4800)
Tensile Strength (at 2% strain)	ASTM D4595	kN/m (lbs/ft)	7.9 (540)	19.3 (1320)
Tensile Strength (at 5% strain)	ASTM D4595	kN/m (lbs/ft)	22.8 (1560)	35.0 (2400)
Sewn Seam Strength	ASTM D4884	kN/m (lbs/ft)	35.0 (2400)	
Apparent Opening Size (AOS)	ASTM D4751	mm (U.S. Sieve)	0.43 (40)	
Permittivity	ASTM D4491	sec ⁻¹	0.025	
Flow Rate	ASTM D4491	l/min/m ² (gal/min/ft ²)	82 (2)	
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	80	
Weight	ASTM D5261	g/m ² (oz/yd ²)	441 (13)	
Thickness	ASTM D5199	mm (mils)	3.2 (125)	
Dimensions (width x length)	--	m (ft)	4.5 x 91 (15 x 300)	
Area	--	m ² (yd ²)	418 (500)	
Estimated Roll Weight	--	kg (lb)	202 (445)	

Table 3-5 MQC of High Tensile Strength Geocushion Physical Properties

Properties	Test Method	Unit	Minimum Roll Value	
			MD	CD

Source: O'Brien & Gere

The geotextile cushion shall consist of a long-chain geosynthetic polymer composed of at least 95 percent by weight of polyolefins, or polyesters and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultra-violet and heat exposure. The geotextile cushion shall also be mildew and rot resistant, insect and rodent resistant, and inert to chemicals and hydrocarbons.

Construction Quality Assurance. Prior to procurement of any material and during construction, the Engineer will review and verify submittals and sample information from the Contractor’s CQC Manager. The information will be reviewed to evaluate if the proper information has been submitted.

The material delivered to the site will be visually and continuously inspected by the Engineer to check that the same materials are used during construction. If changes in material occur prior to review of the material by the Engineer, the material will be tested and evaluated with respect to the requirements of the technical specification. Material not meeting the requirements will be removed from the site and replaced. The material will be installed according to manufacturer’s recommendations..

3.3.2 Ditch A Geocushion

The following sections discuss CQA/CQC and procedures for installation of the Mirafi 1100N or BoomEnviro GN300 geocushion to be installed in Ditch A.

Manufacturing Quality Assurance. The manufacturer shall be required to provide O'Brien & Gere the following documentation regarding quality control of raw materials used to manufacture the geocushion.

- Certification that the polyethylene resin is quality resin manufactured in the United States from uncontaminated ingredients, and meets or exceeds the requirements specified hereinafter and is free of contaminants
- Certification that resin is from the same manufacturer
- Origin, identification, and production date(s) of the raw materials used to manufacture the geocushion
- Quality control certificates of raw materials used to manufacture the geocushion

All compound ingredients of the geocushion material shall be randomly sampled on delivery to the manufacturing plant by the manufacturer of the geocushion to document compliance with the specifications. Equivalent testing may be substituted with the approval of O'Brien & Gere.

Manufacturer shall supply O'Brien & Gere with certified copies of the factory test results prior to the arrival of material on site.

Manufacturing Quality Control. The manufacturer shall be required to provide O'Brien & Gere documentation regarding quality control of mechanical and physical properties of the geocushion certified in accordance with the following performance standards:

Table 3-6 MQC of Ditch A Geocushion Physical Properties

Properties	Test Method	Unit	Minimum Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D4632	N (lbs)	1113 (250)	1113 (250)

Table 3-6 MQC of Ditch A Geocushion Physical Properties

Properties	Test Method	Unit	Minimum Roll Value	
			MD	CD
Grab Tensile Elongation	ASTM D4632	%	50	50
Trapezoid Tear Strength	ASTM D4533	N (lbs)	445 (100)	445 (100)
CBR Puncture Strength	ASTM D6241	N (lbs)	3115 (700)	
Apparent Opening Size (AOS)	ASTM D4751	mm (U.S. Sieve)	0.15 (100)	
Permittivity	ASTM D4491	sec ⁻¹	0.8	
Flow Rate	ASTM D4491	l/min/m ² (gal/min/ft ²)	3056 (75)	
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	70	
Dimensions (width x length)	--	m (ft)	4.5 x 91 x (15 x 300)	
Area	--	m ² (yd ²)	418 (500)	
Estimated Roll Weight	--	kg (lb)	145 (320)	

Source: O'Brien & Gere

The geotextile cushion shall consist of a long-chain geosynthetic polymer composed of at least 95 percent by weight of polyolefins, or polyesters and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultra-violet and heat exposure. The geotextile cushion shall also be mildew and rot resistant, insect and rodent resistant, and inert to chemicals and hydrocarbons.

Construction Quality Assurance. Prior to procurement of any material and during construction, the Engineer will review and verify submittals and sample information from the Contractor’s CQC Manager. The information will be reviewed to evaluate if the proper information has been submitted.

The material delivered to the site will be visually and continuously inspected by the Engineer to check that the same materials are used during construction. If changes in material occur prior to review of the material by the Engineer, the material will be tested and evaluated with respect to the requirements of the technical specification. Material not meeting the requirements will be removed from the site and replaced. The material will be installed according to manufacturer’s recommendations.

3.3.3 Wet Swales Geocushion

The following sections discuss CQA/CQC and procedures for installation of the Mirafi 140N, Mirafi D4, or BoomEnviro GN100 geocushion to be installed in the wet swales.

Manufacturing Quality Assurance. The manufacturer shall be required to provide O’Brien & Gere the following documentation regarding quality control of raw materials used to manufacture the geocushion.

- Certification that the polyethylene resin is quality resin manufactured in the United States from uncontaminated ingredients, and meets or exceeds the requirements specified hereinafter and is free of contaminants
- Certification that resin is from the same manufacturer
- Origin, identification, and production date(s) of the raw materials used to manufacture the geocushion

- Quality control certificates of raw materials used to manufacture the geocushion

All compound ingredients of the geocushion material shall be randomly sampled on delivery to the manufacturing plant by the manufacturer of the geocushion to document compliance with the specifications. Equivalent testing may be substituted with the approval of O'Brien & Gere.

Manufacturer shall supply O'Brien & Gere with certified copies of the factory test results prior to the arrival of material on site.

Manufacturing Quality Control. The manufacturer shall be required to provide O'Brien & Gere documentation regarding quality control of mechanical and physical properties of the geocushion certified in accordance with the following performance standards:

Table 3-7 MQC of Wet Swales Geocushion Physical Properties

Properties	Test Method	Unit	Minimum Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D4632	N (lbs)	445 (100)	445 (100)
Grab Tensile Elongation	ASTM D4632	%	50	50
Trapezoid Tear Strength	ASTM D4533	N (lbs)	223 (45)	223 (45)
CBR Puncture Strength	ASTM D6241	N (lbs)	1113 (250)	
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	70	
Apparent Opening Size (AOS)	ASTM D4751	mm (U.S. Sieve)	0.212 (70)	
Permittivity	ASTM D4491	sec ⁻¹	1.7	
Flow Rate	ASTM D4491	l/min/m ² (gal/min/ft ²)	4889 (120)	
Dimensions (width x length)	--	m (ft)	3.8 x 110 (12.5 x 360)	
Area	--	m ² (yd ²)	418 (500)	
Estimated Roll Weight	--	kg (lb)	74 (164)	

Source: O'Brien & Gere

The geotextile cushion shall consist of a long-chain geosynthetic polymer composed of at least 95 percent by weight of polyolefins, or polyesters and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultra-violet and heat exposure. The geotextile cushion shall also be mildew and rot resistant, insect and rodent resistant, and inert to chemicals and hydrocarbons.

Construction Quality Assurance. Prior to procurement of any material and during construction, the Engineer will review and verify submittals and sample information from the Contractor's CQC Manager. The information will be reviewed to evaluate if the proper information has been submitted.

The material delivered to the site will be visually and continuously inspected by the Engineer to check that the same materials are used during construction. If changes in material occur prior to review of the material by the Engineer, the material will be tested and evaluated with respect to the requirements of the technical specification.

Material not meeting the requirements will be removed from the site and replaced. The material will be installed according to manufacturer’s recommendations.

3.4 STRUCTURAL GEOGRID

3.4.1 Uniaxial Geogrid

Manufacturing Quality Control. The manufacturer shall be required to provide documentation to O’Brien & Gere regarding quality control of physical properties of the structural geogrid (uniaxial and biaxial). The geogrid shall consist of an integrally formed grid structure manufactured of a stress resistant high-density polyethylene. The geogrid shall have high resistance to loss of load capacity, loss of structural integrity, and deformation under long-term stress. Samples of the production run of the geogrid shall be obtained and tested and the results certified in accordance with the following minimum average roll values:

Table 3-8 MQC of Structural Uniaxial Geogrid Physical Properties

Property	Test Method	Units	MD Values
<u>Index Properties</u>			
Tensile Strength @5% Strain	ASTM D6637	kN/m(lb/ft)	75 (5,140)
Ultimate Tensile Strength	ASTM D6637	kN/m(lb/ft)	175 (11,990)
Junction Strength	GRI GG2-05	kN/m(lb/ft)	160 (10,970)
Flexural Stiffness	ASTM D5732	mg-cm	9,075,000
<u>Durability</u>			
Resistance to Long Term Degradation	EPA 9090	%	100
Resistance to UV Degradation	ASTM D4355	%	95
<u>Load Capacity</u>			
Maximum Allowable (Design) Strength for 120-year Design Life	GRI GG4-05	kN/m (lb/ft)	64.1 (4390)
<u>Recommended Allowable Strength Reduction Factors</u>			
Minimum Reduction Factor for Installation Damage (RF _{ID})			1.05
Reduction Factor for Creep for 120-year Design Life (RF _{CR})			2.60
Minimum Reduction Factor for Durability (RF _D)			1.00
Notes:			
1.	Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759-02.		

Source: O’Brien & Gere

Reports of testing shall be submitted to O’Brien & Gere for acceptance.

Construction Quality Assurance. Prior to procurement of material and during construction, O'Brien & Gere shall review and verify submittals and sample information from the supplier. The information shall be reviewed to evaluate if the proper information has been submitted. O'Brien & Gere shall proceed with ordering the materials only after the submittals have been reviewed.

The material delivered to the site shall be visually inspected by O'Brien & Gere to check that the same materials are used during construction. If changes in material occur prior to the acceptance of the material by O'Brien & Gere the material shall be tested and evaluated with respect to the requirements of the Contract Documents. Material not meeting the requirements shall be removed from the site and replaced. The material shall be installed according to manufacturer's recommendations.

The manufacture shall identify rolls of geogrid with the manufacturer's name, product identification, lot number, roll number, and roll dimensions.

The manufacturer shall furnish complete written instructions for the storage, handling, installation, and seaming of the geogrid with the conditions of this warranty.

The manufacturer shall certify the quality of the rolls of geogrid. As a minimum, the manufacturer shall provide quality control certificates for each batch of resin and each shift's production. These quality control certificates shall be signed by an officer of the manufacturer and provided to O'Brien & Gere at least three (3) weeks prior to installation of the geogrid.

The quality control certificate shall include:

- Roll numbers and identification
- Sampling procedures
- Result of quality control tests, including a description of test methods used.

A qualified and experienced representative of the geogrid manufacturer or its supplier shall be on site for a minimum of two days at the start of and during installation to assist the Installer in the proper construction/installation techniques.

3.4.2 TRIAXIAL GEOGRID

Manufacturing Quality Control. The manufacturer shall be required to provide documentation to O'Brien & Gere regarding quality control of physical properties of the structural geogrid (triaxial). The geogrid shall consist of an integrally formed grid structure manufactured of a stress resistant high-density polyethylene. The geogrid shall have high resistance to loss of load capacity, loss of structural integrity, and deformation under long-term stress. Samples of the production run of the geogrid shall be obtained and tested and the results certified in accordance with the following minimum average roll values:

Table 3-9 MQC of Structural Triaxial Geogrid Physical Properties

Properties	Units	Longitudinal	Diagonal	Transverse	General
Rib Pitch	mm (in)	40 (1.60)	40 (160)		
Mid-Rib Depth	mm (in)		1.6 (0.06)	1.4 (0.06)	
Mid-Rib Width	mm (in)		1.6 (0.04)	1.4 (0.05)	
Rib Shape					Rectangular
Aperture Shape					Triangular
Junction Efficiency	%				93
Aperture Stability	Kg-cm/ deg @ 5.0kg-				3.6

Table 3-9 MQC of Structural Triaxial Geogrid Physical Properties

Properties	Units	Longitudinal	Diagonal	Transverse	General
	cm				
Radial Stiffness at Low Strain	kN/m @ 0.5% strain (lb/ft @ 0.5% strain)				300 (20,580)
Durability					
Resistance to Chemical Degradation	%				100
Resistance to UV Degradation	%				100

Notes:

- Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759-02.

Source: O'Brien & Gere

Reports of testing shall be submitted to O'Brien & Gere for acceptance.

Construction Quality Assurance. Prior to procurement of material and during construction, O'Brien & Gere shall review and verify submittals and sample information from the supplier. The information shall be reviewed to evaluate if the proper information has been submitted. O'Brien & Gere shall proceed with ordering the materials only after the submittals have been reviewed.

The material delivered to the site shall be visually inspected by O'Brien & Gere to check that the same materials are used during construction. If changes in material occur prior to the acceptance of the material by O'Brien & Gere the material shall be tested and evaluated with respect to the requirements of the Contract Documents. Material not meeting the requirements shall be removed from the site and replaced. The material shall be installed according to manufacturer's recommendations.

The manufacture shall identify rolls of geogrid with the manufacturer's name, product identification, lot number, roll number, and roll dimensions.

The manufacturer shall furnish complete written instructions for the storage, handling, installation, and seaming of the geogrid with the conditions of this warranty.

The manufacturer shall certify the quality of the rolls of geogrid. As a minimum, the manufacturer shall provide quality control certificates for each batch of resin and each shift's production. These quality control certificates shall be signed by an officer of the manufacturer and provided to O'Brien & Gere at least three (3) weeks prior to installation of the structural geogrid.

The quality control certificate shall include:

- Roll numbers and identification
- Sampling procedures
- Result of quality control tests, including a description of test methods used.

A qualified and experienced representative of the geogrid manufacturer or its supplier shall be on site for a minimum of two days at the start of and during installation to assist the Installer in the proper construction/installation techniques.

3.5 GEOTEXTILE STABILIZATION FABRIC

3.5.1 Woven Geotextile Stabilization Fabric

Manufacturing Quality Control. Prior to installation of the geotextile fabric, the Contractor's CQC Manager shall be required to provide documentation regarding quality control of physical properties of the geotextile fabric. The geotextile fabric shall be a woven geotextile. Samples of the production run of the geotextile material shall be obtained and tested and the results certified in accordance with the following minimum average roll values:

Table 3-10 MQC of Woven Geotextile Stabilization Fabric Physical Properties

Mechanical Properties	Test Method	Unit	Minimum Roll Value	
			MD	CD
Tensile Strength (at ultimate)	ASTM D4595	lbs/ft (kN/m)	3600 (52.5)	2700 (39.4)
Tensile Strength (at 2% strain)	ASTM D4595	lbs/ft (kN/m)	540 (7.9)	540 (7.9)
Tensile Strength (at 5% strain)	ASTM D4595	lbs/ft (kN/m)	1500 (21.9)0	1560 (22.8)
Tensile Strength (10% strain)	ASTM D4595	lbs/ft (kN/m)	2400 (35.0)	2400 (35.0)
Factory Seam Strength	ASTM D4884	lbs/ft (kN/m)	1688 (24.6)	
Flow Rate	ASTM D4491	Gal/min/ft ² (l/min/m ²)	40 (1630)	
Permeability	ASTM D4491	cm/sec	0.05	
Permittivity	ASTM D4491	sec ⁻¹	0.52	
Apparent Opening Size (AOS)	ASTM D4751	U.S. Sieve (mm)	30 (0.60)	
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	80%	
Mass/Unit Area	ASTM D 5261	Oz/yd ² (g/m ²)	8.8 (298)	

Source: O'Brien & Gere

The Contractor's CQC Manager shall provide the Engineer with certified copies of the factory and laboratory test results prior to arrival of material on-site. In addition, the Contractor's CQC Manager shall provide the manufacturer's certification that the geotextile fabric meets the chemical, physical, and manufacturing requirements.

Construction quality assurance. Prior to procurement of material and during construction, the Engineer shall review and verify submittal and sample information from the Contractor's CQC Manager. The information shall

be reviewed to evaluate if the proper information has been submitted. The Engineer shall return the submittals to the Contractor, and depending on the review (acceptance or non-acceptance), the Contractor shall proceed with ordering the materials. Upon delivery of the rolls of geotextile fabric, the Engineer shall visually inspect the material.

During installation of the geotextile fabric, the Engineer shall document that the geotextile fabric is installed in accordance with the requirements of the Contract Documents and as shown on the Contract Drawings.

During the installation phase, the geotextile fabric shall be visually inspected for the following:

- Defects
- Rips
- Holes
- Flaws
- Deterioration
- Damage.

Imperfections, such as those noted above, shall be immediately repaired by the Contractor and reinspected.

3.5.2 Woven Geotextile Separation Fabric

Manufacturing Quality Control. Prior to installation of the geotextile fabric, the Contractor's CQC Manager shall be required to provide documentation regarding quality control of physical properties of the geotextile fabric. The geotextile fabric shall be a woven geotextile. Samples of the production run of the geotextile material shall be obtained and tested and the results certified in accordance with the following minimum average roll values:

Table 3-11 MQC of Woven Geotextile Separation Fabric Physical Properties				
Mechanical Properties	Test Method	Unit	Minimum Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D4632	lbs (N)	200 (890)	200 (890)
Grab Tensile Elongation	ASTM D4632	%	15	10
Trapezoid Tear Strength	ASTM D4533	lbs (N)	75 (334)	75 (334)
CBR Puncture Strength	ASTM D6241	lbs (N)	700 (3115)	
Apparent Opening Size (AOS)	ASTM D4751	U.S Sieve (mm)	40 (0.43)	
Permittivity	ASTM D4491	sec ⁻¹	0.05	
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	70%	

Source: O'Brien & Gere

Construction Quality Assurance. Prior to procurement of material and during construction, the Engineer shall review and verify submittal and sample information from the Contractor's CQC Manager. The information shall be reviewed to evaluate if the proper information has been submitted. The Engineer shall return the submittals to the Contractor, and depending on the review (acceptance or non-acceptance), the Contractor shall proceed with ordering the materials. Upon delivery of the rolls of geotextile fabric, the Engineer shall visually inspect the material.

During installation of the geotextile fabric, the Engineer shall document that the geotextile fabric is installed in accordance with the requirements of the Contract Documents and as shown on the Contract Drawings.

During the installation phase, the geotextile fabric shall be visually inspected for the following:

- Defects
- Rips
- Holes
- Flaws
- Deterioration
- Damage.

Imperfections, such as those noted above, shall be immediately repaired by the Contractor and re-inspected.

3.6 SELECT FILL

Construction Quality Control. The select fill used for construction of the Integrated IRM shall vary as shown on the Contract Drawings and Specifications. Prior to installation, the supplier shall provide the following:

- Name and location of the material source
- Affidavit from the owner of the source for each type of borrow material to be imported to the site
- Laboratory analytic data for each Select Fill material
- CQC testing of Select Fill Materials

The Affidavit from the owner of the source of each type of borrow material shall state that, to the best of his knowledge, the site of the source material was never used as a dump site for chemical, toxic, hazardous or radioactive materials and it is not now, or ever has been, listed as a suspected depository for chemical, toxic, hazardous, or radioactive materials by any federal, state, or other governmental agency, department, or bureau.

Laboratory analytic data (or documentation of such data no older than one year from submittal) shall be provided for these soils for characteristics of hazardous waste found under Subpart C of 40 CFR 261.20 including percent solids, pH, flashpoint, reactive cyanide, and sulfide, as well as for constituents identified on Table 1 of 40 CFR 261 (**Exhibit 1**) which identifies Maximum Concentration of Contaminant for the Toxicity Characteristics. Laboratory data (or documentation of such data) shall be submitted to O'Brien & Gere for review and acceptance prior to use of the material on-site.

Select Fill shall have composite samples tested for the compounds in Table 375-6.8(a) "Unrestricted Use Soil Cleanup Objectives" in NYSDEC Subpart 375 (**Exhibit 2**). Test results shall be below the cleanup objective concentrations provided in this table, with the exception of mercury, which shall be below 0.15 mg/kg. Failure of a single compound test result shall mean that the entire material batch shall be rejected unless specifically accepted on a test-by-test basis in writing by O'Brien & Gere.

CQC Testing results shall be as follows:

Table 3-12 CQC of Select Fill Prior to Construction

Parameter	Standards	Criteria
Particle Size Analysis	ASTM D422 or C136 ¹	Specification Section 31 05 14-Select Fill
Organic Content Analysis ²	ASTM D2974 ³	Specification Section 31 05 14 – Select Fill
pH Analysis ²	ASTM D4972 ⁴	Specification Section 31 05 14 – Select Fill
Baseline Modified Proctor	ASTM D1557 ⁵	Specification Section 31 01 01 - Earthwork

Notes:

1. ASTM D422 or C136– Method for Particle-Size Analysis of Soil
2. Pertains to Type “H”, Type “E”, and Type “L” Select Fill Material passing the #40 Sieve
3. ASTM D2974 – Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
4. ASTM D4972 – Method for pH of Soils
5. ASTM D1557 – Standard Test Methods for Laboratory Compaction

Source: O’Brien & Gere

During installation of select fill, material from the borrow source shall be tested by the CQC Geotechnical Testing Laboratory in accordance with the following:

Table 3-13 CQC of Select Fill During Construction

Parameter	Standard	Minimum Frequency	Material Type to be Tested	Criteria
Particle Size Analysis	ASTM D422 or C136	Varies per results ⁶	A, B, C, D, E, F, H, I, J, K, L, M	Specification Section 31 05 14 – Select Fill
Modified Proctor	ASTM D1557	Once per 5,000 cy ⁵	A, B, C, D, E, F, H	See Contract Drawings and Section 3.1.4 above
Organic Content Analysis ²	ASTM D2974 ³	Varies per results ⁶	H, L	Specification Section 31 05 14 – Select Fill
pH Analysis ²	ASTM D4972 ⁴	Varies per results ⁶	H, L	Specification Section 31 05 14 – Select Fill

Notes:

1. ASTM D422 or C136– Method for Particle-Size Analysis of Soil
2. Pertains to Type “H” Select Fill Material passing the #40 Sieve
3. ASTM D2974 – Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
4. ASTM D4972 – Method for pH of Soils
5. Material may be tested more frequently on recommendation of the engineer
6.
 - A. Material shall be tested at the frequency of once per 500 cubic yards for two tests.
 - B. If the material is found to be adequate for two consecutive tests, the frequency shall be adjusted to once per 1,000 cubic yards.
 - C. If the material is found to be adequate for two consecutive tests at the once per, 1,000 cubic yard frequency, the frequency shall be adjusted to once per 2,000 cubic yards. If material is found to be inadequate at any frequency, the testing frequency must be adjusted back to once per 500 cubic yards. Material may be tested more frequently on the recommendation of the engineer.

Source: O’Brien & Gere

A minimum of one (1) test for each parameter shall be performed. Results of testing shall be submitted to O'Brien & Gere for review.

Construction Quality Assurance. Prior to procurement of material and during construction, O'Brien & Gere shall review and verify submittal and sample information for particle size from the supplier. The information shall be reviewed to evaluate if the proper information has been submitted. O'Brien & Gere shall proceed with ordering the materials only after the submittals have been reviewed. Particle size shall be as follows:

Table 3-14 CQC of Select Fill Particle Size Prior to Construction

Fill Type	Description	% Passing by weight	Sieve
Type A – Crushed Gravel	Thoroughly washed crushed, durable, sharp angled fragments of gravel free from coatings. Crushed particles shall be a minimum of 85% by weight of the particles with at least two fractured faces. The total area of each fractional face shall exceed 25% of the maximum cross-sectional area of the particle.	100 0-25 0-5	1½-inch ¾-inch ½-inch
Type B – Crushed Stone	Thoroughly washed clean, sound, tough, hard crushed limestone, or equal, free from coatings. Gradation for crushed stone shall be the same as specified for Type A Select Fill.	100 0-25 0-5	1½-inch ¾-inch ½-inch
Type C – Crushed Stone	Thoroughly washed, clean, sound, tough, hard, crushed limestone or equal free from coatings.	100 90-100 0-15	1½-inch 1-inch ¼-inch
Type D – Washed Sand	Washed coarse sand.	100 95-100 80-100 50-85 25-60 10-30 2-10	3/8-inch No. 4 No. 8 No. 16 No. 30 No. 50 No. 100
Type E – Run-of-Bank Gravel	Run-of-bank gravel free from organic matter. Gradation by weight evaluated by washing through the sieve in accordance with ASTM D422.	100 30-65 0-10	1½-inch ¼-inch No. 200
Type F – Run-of-Crusher Stone	Hard durable limestone or equal.	100 30-60 5-40 0-10	2-inch 1/4-inch No. 40 No. 200
Type H – Habitat Subgrade	Habitat subgrade fraction passing the #40 sieve shall have a soil pH from 5.5 to 7.5 and organic matter concentration of 0.5 to 6%.	100 30-65 15-60 0-25	4-inch ¼-inch No. 40 No. 200
Type H-SA – Habitat Subgrade for Seep Aprons	Habitat subgrade fraction passing the #40 sieve shall have a soil pH from 5.5 to 7.5 and organic matter concentration of 0.5 to 6%.	80-100 30-65 15-60 0-15	4-inch ¼-inch No. 40 No. 200

Table 3-14 CQC of Select Fill Particle Size Prior to Construction

Fill Type	Description	% Passing by weight	Sieve
Type I – Filter Sand	Clean, hard, durable and dense grains containing not more than 50% carbonate material	100	3/8-inch
		80-100	No. 4
		60-80	No. 8
		40-60	No. 16
		25-40	No. 30
		10-20	No. 50
Type J – Stone Substrate	Thoroughly washed, clean, non-angular, sound, hard, round, cobbley, “river stone” or “river rock” or other equal material free from coatings and organic matter.	2-10	No. 100
		100	4-inch
		5-20	1½-inch
		0-10	½-inch
Type K – Revetment Material	Meets the requirements of NYSDOT Item number 620.04M with the gradation specified herein	0-5	No. 200
		100	18-inch
		50	12-inch
Type L – Revetment Filter Material	Habitat subgrade fraction passing the #40 sieve shall have a soil pH from 5.5 to 7.5 and soil organic matter concentration of 0.5 to 6%.	0-10	6-inch
		100	3-inch
		75-85	No. 20
		15-40	No. 200
Type M – Collection Trench Sand	Non-crushed material having hard, durable, dense grains.	0-15	¾-inch-No. 20
		100	No. 4-25
		70	No. 16-30
		30	No. 25-60
Type N – Pea Gravel	Pea Gravel shall meet the requirements of New York State Department of transportation item number 733.2001 Underdraining Filter Type 1.	0	1-inch
		100	½-inch
		30-100	¼-inch
		0-30	No. 10
		0-10	No. 20
		0-5	

Notes:

1. Type “G” Select Fill is a mixture of Type “E” Select Fill material and Portland Cement mixed at a ratio of 15:1 and placed in a dry state

Source: O’Brien & Gere

The material delivered to the site shall be visually inspected by O’Brien & Gere to check that the same materials are used during construction. If changes in material occur prior to the acceptance of the material by O’Brien & Gere the material shall be tested and evaluated with respect to the requirements of the Contract Documents. Material not meeting the requirements shall be removed from the site and replaced.

3.7 RIP-RAP

Construction Quality Control. Prior to installation of the rip-rap, the supplier shall provide an affidavit designating the item type for the source material as defined by New York State Department of Transportation (NYSDOT) Technical Specification Section 620 – Bank and Channel Protection. No particle size distribution is required if material is obtained from a source designated as Type A. If source is designated as Type B, particle size evaluation shall be required for review. Material shall be submitted to the CQC Geotechnical Laboratory for testing as follows:

Table 3-15 CQC of Rip-Rap Prior to Construction

Parameter	Standard	Layer Thickness	Stone Size	% Total by Weight
Heavy Rip-Rap	ASTM C136	36 Inches	Heavier than 600 lbs Smaller than 6 inches	50 – 100 0 – 10
Medium Rip-Rap	ASTM C136	24 Inches	Heavier than 100 lbs Larger than 12 inches Larger than 18 inches Smaller than 4 inches	50 – 100 50 – 100 0 – 10 0 – 10
Light Rip-Rap	ASTM C136	18 Inches	Lighter than 100 lbs Larger than 6 inches Smaller than ½ inches	90 – 100 50 – 100 0 – 10
Fine Rip-Rap	ASTM C136	12 Inches	Smaller than 3 Inches Larger than 3 Inches Smaller than No. 10 Sieve	90 – 100 50 – 100 0 - 10

Notes:

1. Stone sizes other than weights refer to the average of the maximum and minimum dimensions of a stone particle.
2. Materials shall contain a sufficient amount of stones smaller than the average stone size to fill the spaces between the larger stones.
3. Materials shall contain less than 20 percent of stones with a ratio of maximum to minimum dimension greater than three.

Source: O'Brien & Gere

Results of the testing shall be submitted to O'Brien & Gere for acceptance.

The supplier shall submit an affidavit from the owner of the source of each type of borrow material to be imported to the site stating that to the best of his knowledge, the site of the source material was never used as a dump site for chemical, toxic, hazardous or radioactive materials and it is not now, or ever has been, listed as a suspected depository for chemical, toxic, hazardous, or radioactive materials by any federal, state, or other governmental agency, department, or bureau.

Construction Quality Assurance. O'Brien & Gere shall perform inspections to evaluate the construction of the storm water drainage facilities in accordance with the Contract Documents. Irregularities with respect to proposed storm water facilities shall be corrected prior to installation of the rip-rap.

3.8 TOPSOIL AND SEEDING

3.8.1 Topsoil

Construction Quality Control. Prior to installation of the topsoil, the supplier shall be required to collect samples of the proposed topsoil and submit, to O'Brien & Gere for review, geotechnical testing results as follows:

Table 3-16 CQC of Topsoil Prior to Construction

Parameter	Standard	Criteria
Grain Size	ASTM D422	Monitor consistency of borrow source
pH	ASTM D4972	pH in the range of 5.5 to 7.6
Organic Content	ASTM D2974	Organic concentration of 5% to 15% in wetland areas (deep emergent, shallow emergent and wet meadow)

Table 3-16 CQC of Topsoil Prior to Construction

Parameter	Standard	Criteria
		zones) Organic concentration of 3% to 15% in other areas
Liquid Limit, Plastic Limit and Plasticity Index	ASTM D4318	Silty Loam, Loam, Sandy Loam

Notes:

1. ASTM D422 – Method for Particle-Size Analysis of Soil
2. ASTM D2974 – Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
3. ASTM D4972 – Method for pH of Soils
4. ASTM D4318 – Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Source: O’Brien & Gere

Results of the testing shall be submitted to O’Brien & Gere for acceptance.

The supplier shall submit name and location of the source material, as well as an affidavit from the owner of the source of each type of borrow material to be imported to the site stating that to the best of his knowledge, the site of the source material was never used as a dump site for chemical, toxic, hazardous or radioactive materials and it is not now, or ever has been, listed as a suspected depository for chemical, toxic, hazardous, or radioactive materials by any federal, state, or other governmental agency, department, or bureau.

The supplier shall also provide laboratory analytic data (or documentation of such data) for these topsoils for characteristics of hazardous waste found under Subpart C of 40 CFR 261.20 including percent solids, pH, flashpoint, reactive cyanide, and sulfide, as well as for constituents identified on Table 1 of 40 CFR 261 which identifies Maximum Concentration of Contaminant for the Toxicity Characteristics. Laboratory data (or documentation of such data) shall be submitted to O’Brien & Gere for review and acceptance prior to use of the material on-site.

In addition, topsoil shall have composite samples tested for the compounds in Table 375-6.8(a) “Unrestricted Use Soil Cleanup Objectives” in NYSDEC Subpart 375. Test results shall be below the cleanup objective concentrations provided in this table, with the exception of mercury, which shall be below 0.15 mg/kg. Failure of a single compound test result shall mean that the entire material batch shall be rejected unless specifically accepted on a test-by-test basis in writing by O’Brien & Gere; or

During installation of the topsoil layer, the topsoil shall be tested by the CQC Geotechnical Testing Laboratory in accordance with the following:

Table 3-17 CQC of Topsoil During Construction

Parameter	Standard	Minimum Frequency	Criteria
Particle Size	ASTM D422-63	Once per 5,000 cy ⁵	Monitor consistency of borrow source
Topsoil pH	ASTM D4972-89	Varies per results ⁶	pH in the range of 5.5 to 7.6
Topsoil Organic Content	ASTM D2974-87	Varies per results ⁶	Organic concentration of 5% to 15% in wetland areas (deep emergent, shallow

Table 3-17 CQC of Topsoil During Construction

Parameter	Standard	Minimum Frequency	Criteria
			emergent and wet meadow zones) Organic concentration of 3% to 15% in other areas
Liquid Limit, Plastic Limit and Plasticity Index	ASTM D4318	Varies per results ⁶	Silty Loam, Loam, Sandy Loam

Notes:

1. ASTM D422 – Method for Particulate Size Analysis of Soil
2. ASTM D2974-89 – Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
3. ASTM D4972-89 – Standard Test Method for pH of Soils
4. Total organic content may be 3% to 15% in non-wetland areas.
5. Material may be tested more frequently on recommendation of the engineer
6.
 - A. Material shall be tested at the frequency of once per 500 cubic yards for two tests.
 - B. If the material is found to be adequate for two consecutive tests, the frequency shall be adjusted to once per 1,000 cubic yards.
 - C. If the material is found to be adequate for two consecutive tests at the once per, 1,000 cubic yard frequency, the frequency shall be adjusted to once per 2,000 cubic yards.
 - D. If material is found to be inadequate at any frequency, the testing frequency must be adjusted back to once per 500 cubic yards. Material may be tested more frequently on the recommendation of the Engineer.

Source: O'Brien & Gere

Results of testing shall be submitted to O'Brien & Gere for review and acceptance.

Construction Quality Assurance. Prior to procurement of material and during construction, O'Brien & Gere shall review and verify submittal and sample information from the supplier. The information shall be reviewed to evaluate if the proper information has been submitted. O'Brien & Gere shall proceed with ordering the materials only after the submittals have been reviewed.

The material delivered to the site shall be visually inspected by O'Brien & Gere to check that the same materials are used during construction. If changes in material occur prior to the acceptance of the material by O'Brien & Gere the material shall be tested and evaluated with respect to the requirements of the Contract Documents. Material not meeting the requirements shall be removed from the site and replaced.

O'Brien & Gere shall perform inspections to evaluate the placement of topsoil in accordance with the Contract Documents; irregularities with respect to proposed finished grades shall be corrected prior to installation of grass seed, fertilizer, and mulch.

3.8.2 Fertilization and Seeding

Construction Quality Control. As part of CQC, the suppliers shall be required to submit the following information to O'Brien & Gere for acceptance prior to fertilization and seeding activities:

- Seed vendor's certified statement for the grass seed mixture required, stating common name, scientific name, percentage by weight, and percentages of purity and germination
- Fertilizer vendor's certified statement for the fertilizer required stating guaranteed statement of analysis
- Documentation giving data concerning hydroseeding equipment (if used), including material application rates.

The grass seed shall be of commercial stock of the current season's crop and shall be delivered in unopened containers bearing the guaranteed analysis of the mix. The mix shall be in accordance with the requirements of the NYSDEC approved engineering plans and specifications.

Fertilizer shall be a standard quality commercial carrier of available plant food elements. Fertilizer shall be a complete, prepared, and packaged material and shall contain 10% nitrogen, 0% phosphoric acid, and 10% potash. Fertilizer shall be applied at a rate of 10 pounds per 1000 square feet. Each bag of fertilizer shall bear the manufacturers guaranteed statement of analysis. The mulch shall consist of un-rotted stalks of oats, wheat, rye or other reviewed crops that are free from noxious weeds, salts, mold, or other objectionable material.

Construction Quality Assurance. Plant materials shall comply with state and federal laws with respect to inspection for plant diseases and insect infestations. Plants shall be in accordance with the current edition of the American Standard for Nursery Stock (ANSI Z60.1-2004) unless otherwise specified. Woody plants shall be of high quality and symmetrical. They shall be healthy, well branched and densely foliated when in leaf. Herbaceous plants shall be free of disease and insects, eggs, or larvae, and have healthy, well-developed root systems such that the root ball does not fall apart upon plant removal from the pot or tray. Plants shall be tagged true to species name and variety and not contain weeds (each tray of herbaceous plants shall be tagged; each potted tree or shrub shall be tagged; each bundle of live stakes shall be tagged).

Each plant shall be handled and packed in a manner consistent with its requirements for survival and growth after planting. Precautions that are customary in good trade practice shall be taken to insure the arrival of the plants at the Site in good condition. Plants that arrive dried out, exposed to excessive heat, or that have been in storage for protracted periods of time, shall not be accepted. If, upon inspection, the plants or root stocks display mold or decay, the material shall not be accepted.

Plant materials shall be installed at a time of year appropriate for the species and type of stock (*i.e.*, seed, plant, live cutting), and sufficiently watered in the year of planting to achieve establishment.

Prior to procurement of materials and during construction, O'Brien & Gere shall review submittal information from the supplier. The information shall be reviewed to evaluate whether the submitted materials comply with the Contract Documents. Materials shall be ordered only after the submittals have been reviewed.

The materials delivered to the site shall be visually inspected by O'Brien & Gere to verify that they match the materials that were submitted and reviewed. If changes in material occur prior to the acceptance of the material by O'Brien & Gere, the material shall be evaluated with respect to the requirements of the Contract Documents.

If materials fail the requirements of the Contract Documents, the materials shall be rejected. O'Brien & Gere shall also inspect the application rates of seed, fertilizer, and mulch with respect to the specifications.

3.9 PASSIVE WELLS

Construction Quality Control. Prior to ordering materials, the installer shall submit, to O'Brien & Gere, the following information:

- Manufacturer's name for materials (*i.e.* well pipe, well casing, sand pack, etc.)
- Applicable codes, standards and specifications (ANSI, ASTM, *etc.*)
- Manufacturer's affidavit stating compliance with the applicable specification.
- Well casing and well screen material (*e.g.*, FRE)
- Slot size
- Type of joints, fittings and couplings
- Handling and storage requirements
- Drawings and manufacturer's data of the pipe, joints and fittings showing compliance with the applicable pipe specification.

Construction Quality Assurance. Prior to procurement of material and during construction, O'Brien & Gere shall review and verify submittal information from the supplier. The information shall be reviewed to evaluate if the proper information has been submitted. O'Brien & Gere shall proceed with ordering the materials only after the submittals have been reviewed.

The material delivered to the site shall be visually inspected by O'Brien & Gere to check that the same materials are used during construction. If changes in material occur prior to the acceptance of the material by O'Brien & Gere the material shall be evaluated with respect to the requirements of the Contract Documents. Material not meeting the requirements shall be removed from the site and replaced.

3.10 PIPING AND APPURTENANCES

Construction Quality Control. Prior to ordering materials, the supplier shall submit, to O'Brien & Gere, the following information:

- Manufacturer's name
- Applicable codes, standards and specifications (*e.g.*, ANSI, ASTM, *etc.*)
- Manufacturer's affidavit stating compliance with the applicable specification.
- Pipe material (*e.g.*, HDPE)
- Pipe class and/or pressure rating
- Type of joints, fittings, couplings, and appurtenances
- Linings and coatings
- Handling and storage requirements
- Drawings and manufacturer's data of the pipe, joints and fittings showing compliance with the applicable pipe specification.

Construction Quality Assurance. Prior to procurement of materials and during construction, O'Brien & Gere shall review submittal information from the supplier. The information shall be reviewed to evaluate whether the submitted materials comply with the Contract Documents. Materials shall be ordered only after the submittals have been reviewed.

The materials delivered to the site shall be visually inspected by O'Brien & Gere to verify that they match the materials that were submitted and reviewed. If changes in material occur prior to the acceptance of the material by O'Brien & Gere, the material shall be evaluated with respect to the requirements of the Contract Documents. Materials not meeting the requirements shall be removed from the site and replaced.

Pipelines designed to transport ground water under pressure shall be tested hydrostatically and for leakage prior to being placed in service. If the line fails the test, the Contractor shall explore for the cause of the excessive leakage and after repairs have been made the line shall be retested. This procedure shall be repeated until the pipe complies.

Test pressure shall be 150% of the design working pressure as identified by the Engineer. Test pressure shall be held on the piping for a period of at least 2 hours, unless a longer period is requested by the Engineer.

Leakage tests shall be conducted concurrently with the pressure test. The allowable leakage for pressure pipelines shall not exceed zero (0) gallons per 24 hours per inch of diameter per mile of pipe. Visible leaks shall be permanently stopped by the Contractor, prior to re-testing.

Pipelines designed to carry ground water in open channel flow or at minimal pressures shall be tested for leakage prior to being placed in service. If the line fails the test, the Contractor shall explore for the cause of the excessive leakage and after repairs have been made the line shall be re-tested. This procedure shall be repeated until the pipe complies.

Exfiltration tests shall be made by filling a section of the pipeline with water and measuring the quantity of leakage. Infiltration tests will be allowed when the water table is evaluated to be 2 feet or more above the highest pipe of the section being tested. The allowable leakage (exfiltration or infiltration) for non-pressure pipelines shall not exceed zero (0) gallons per 24 hours per inch of diameter per 1000 feet of pipe.

For large diameter non-pressure pipelines, where hydrostatic leakage testing may not be feasible, air testing of the joints on the interior of the pipe is acceptable. Under this method, joints should be tested for leakage at 5 psi for a minimum of 10 minutes. Alternate methods of leakage testing may also be employed, subsequent to the review of the method by the Engineer.

Reports of test results shall be provided to the Engineer for review. If any of the tests fail the requirements of the Contract Documents, the test shall be rejected.

3.11 PROCESS EQUIPMENT

Construction Quality Control. Prior to ordering materials, the supplier shall submit, to O'Brien & Gere, the following information:

- Manufacturer's name
- Applicable codes, standards and specifications (ANSI, ASTM, etc.)
- Manufacturer's affidavit stating compliance with the applicable standards, codes, and specifications
- Handling and storage requirements
- Drawings and manufacturer's data sheets showing compliance with the applicable specification.

Construction Quality Assurance. Prior to procurement of material and during construction, O'Brien & Gere shall review submittal information from the supplier. The information shall be reviewed to evaluate whether the submitted materials comply with the Contract Documents. Materials shall be ordered only after the submittals have been reviewed.

The materials delivered to the site shall be visually inspected by O'Brien & Gere to verify that they match the materials that were submitted and reviewed. If changes in material occur prior to the acceptance of the material by O'Brien & Gere, the material shall be evaluated with respect to the requirements of the Contract Documents. Material not meeting the requirements shall be removed from the site and replaced.

3.12 ELECTRICAL & CONTROLS

Construction Quality Control. The electrical subcontractor shall be required to perform the electrical work in accordance with the applicable codes and standards. New electrical equipment shall be listed and labeled by an acceptable organization.

The electrical subcontractor shall submit shop drawings and samples to O'Brien & Gere. The electrical subcontractor shall also prepare for final submission the following:

- Updated as-built shop drawings and plans, including field directed changes by O'Brien & Gere
- Wiring diagrams, including updated field directed changes by O'Brien & Gere.

Construction Quality Assurance. CQA shall consist of O'Brien & Gere evaluating work and submittals for compliance with the separately bound Contact Drawings.

Prior to procurement of material and during construction, O'Brien & Gere shall review submittal information from the supplier and sub-contractor. The information shall be reviewed to evaluate whether the submitted materials comply with the Contract Documents. Materials shall be ordered only after the submittals have been reviewed.

The materials delivered to the site shall be visually inspected by O'Brien & Gere to verify that they match the materials that were submitted and reviewed. If changes in material occur prior to the acceptance of the material

by O'Brien & Gere, the material shall be evaluated with respect to the requirements of the Contract Documents. Material not meeting the requirements shall be removed from the site and replaced.

3.13 PRE-CAST CONCRETE

Construction Quality Control. Prior to ordering materials, the supplier shall submit, to O'Brien & Gere, the following information:

- Product data for each type of manufactured material and product indicated, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing materials, bonding agents, water-stops, and others if requested by O'Brien & Gere
- Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, bent bar diagrams, arrangement, and support of concrete reinforcement
- Documentation for the concrete mix design in accordance with Section 4 of ACI 301 including required laboratory test reports for concrete materials and mix design
- Material certificates in lieu of material laboratory test reports as permitted by ACI. Provide certification from admixture manufacturers that chloride content complies with specification requirements
- Proposed method of concrete curing
- Manufacturer's literature for admixtures used in concrete mix
- Name and location of concrete supplier.
- Shop drawings for each precast structure that indicates dimensions.
- Shop drawings for frames, covers, gaskets, coatings, etc.

Precast concrete sections shall meet the following requirements:

- Precast concrete sections shall be designed and manufactured in accordance with ASTM C478 for manhole sections and ASTM C913 for other structures.
- Wall thicknesses shall be a minimum of 5 inches.
- Bell and spigot joints of precast sections shall have an appropriate "O" or square Buna-N rubber section ring as supplied by the manufacturer.
- Brick shall meet the requirements of ASTM C62, Grade SW, and shall be of hard-burned manufacture. Masonry cement for mortar shall meet the requirements of ASTM C 91, Type II and shall be mixed with a graded quality sand conforming to ASTM C144. Mix shall be one part masonry cement to three parts sand using the minimum amount of clean water required for workability.
- Frames and covers, grates, and other castings shall be as shown on the Contract Drawings and be in accordance with ASTM A48, Class 30.
- Precast sections shall be installed level on a flat subgrade.
- Precast section joints shall be filled inside and out with mortar to provide a smooth and continuous surface.
- Mortar surfaces of benchwalls and concrete floors shall be given a broom finish.
- Unless otherwise specified on the Contract Drawings, openings in precast sections for pipes shall contain a flexible rubber connection installed by the manufacturer of the section. The connection shall be KOR-N-SEAL, Lock Joint Flexible Manhole Sleeve, or equal.
- The exterior of precast sections shall be coated with Hi-Build Tneme-Tar Series 46H-413. Two 8 mil coats shall be applied per manufacturer's recommendations.

Construction Quality Assurance. Prior to procurement of material and during construction, O'Brien & Gere shall review submittal information from the supplier and sub-contractor. The information shall be reviewed to evaluate whether the submitted materials comply with the Contract Documents. Materials shall be ordered only after the submittals have been reviewed.

The materials delivered to the site shall be visually inspected by O'Brien & Gere to verify that they match the materials that were submitted and reviewed. If changes in material occur prior to the acceptance of the material by O'Brien & Gere, the material shall be evaluated with respect to the requirements of the Contract Documents. Material not meeting the requirements shall be removed from the site and replaced.

Pre-cast concrete structures shall be tested by exfiltration prior to or after backfilling. Lined structures shall be tested subsequent to application of the liner. The test shall be made by filling the structure with water and observing the level for a minimum of 12 hours. Penetration and connections into the structure shall be operational prior to testing. The rate of leakage shall initially be determined at intervals by means of volumetric measurement of the makeup water added to maintain the water level in the structure. The allowable leakage for structures shall not exceed zero gallons for 24 hours per structure. Leaks detected shall be permanently stopped.

Reports of test results shall be provided to the Engineer for review. If tests fail the requirements of the Contract Documents, the tests shall be rejected.

3.14 CAST IN PLACE CONCRETE

Construction Quality Control. Prior to ordering materials, the supplier shall submit, to O'Brien & Gere, the following information:

- Design Mixtures for each concrete mixture, including compressive strength and water-absorption tests.
- Shop drawings showing the member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement.
- Qualification data for installers, fabricators, and testing agencies.
- Material certificates from the manufacturer.
- Material test reports.

Construction Quality Assurance.

Prior to procurement of material and during construction, O'Brien & Gere shall review submittal information from the supplier and sub-contractor. The information shall be reviewed to evaluate whether the submitted materials comply with the Contract Documents. Materials shall be ordered only after the submittals have been reviewed.

The materials delivered to the site shall be visually inspected by O'Brien & Gere to verify that they match the materials that were submitted and reviewed. If changes in material occur prior to the acceptance of the material by O'Brien & Gere, the material shall be evaluated with respect to the requirements of the Contract Documents. Material not meeting the requirements shall be removed from the site and replaced.

3.15 CHAIN LINK FENCE

Construction Quality Control. Prior to procurement of material, the supplier shall submit, to O'Brien & Gere, the following information:

- Manufacturer's certifications that all materials furnished are in compliance with the applicable requirements of the referenced standards, this specification and the Contract Drawings.
- Cut sheets and specification sheets indicating details of fence and gate construction, fence height, post spacing, dimensions and unit weights of framework and concrete footing details marked to specifically

indicate the materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data.

- Manufacturer's affidavit stating compliance with all applicable provisions of all ASTM specifications specified herein.
- Qualification Statements: Provide statement indicating fence installer has five years experience in installing the specified fence and gate.

Construction Quality Assurance. Prior to procurement of material and during construction, O'Brien & Gere shall review submittal information from the supplier and sub-contractor. The information shall be reviewed to evaluate whether the submitted materials comply with the Contract Documents. Materials shall be ordered only after the submittals have been reviewed.

The materials delivered to the site shall be visually inspected by O'Brien & Gere to verify that they match the materials that were submitted and reviewed. If changes in material occur prior to the acceptance of the material by O'Brien & Gere, the material shall be evaluated with respect to the requirements of the Contract Documents. Material not meeting the requirements shall be removed from the site and replaced.

4 DOCUMENTATION

This section describes the recordkeeping that shall be used to document the CQA/CQC activities performed during construction of this project. The documentation shall comprise the final records of the project, with the results of material and installation inspections and tests.

4.1 PROBLEM IDENTIFICATION AND CORRECTIVE MEASURES REPORTS

In the event that O'Brien & Gere or others observes that material or workmanship does not meet the requirements of the plans, specifications or CQA/CQC Plan, or if an obvious defect in material or workmanship is noted and removal/replacement of work is not feasible, O'Brien & Gere shall complete a problem identification and corrective measures report and present it to the NYSDEC.

4.2 ACTION ITEM LIST

O'Brien & Gere shall prepare and maintain a list of "Action Items" based on the discussions during weekly meetings. The action item list shall be circulated to meeting attendees.

4.3 PHOTOGRAPHS

Photographs taken by O'Brien & Gere shall be recorded on a photo log that shall include, at a minimum, the date, time, location, and description of the work.

4.4 RECORD DRAWINGS

At the completion of the project, O'Brien & Gere shall transfer as-built information to a set of final record drawings to document site conditions.

4.5 STORAGE AND DISPOSITION OF RECORDS

During construction of this project, O'Brien & Gere shall be responsible for CQA/CQC documents. This includes the originals of the data sheets and reports.

Once project construction is complete, the original document shall be stored by the Engineer in a manner that shall allow for recovery while still protecting them from damage. Original documentation shall be stored by the Engineer until the Construction Completion Report is approved by NYSDEC.

4.6 DAILY REPORT

O'Brien & Gere shall prepare a daily report in accordance with Attachment 01100-6 to Honeywell Technical Specification 01100 – Remediation Construction Requirements, which has been incorporated into the Contract Documents. The daily reports shall provide a summary of project activities conducted that day and observations made. A copy of these reports shall be maintained and available for review on site during construction.

4.7 WEEKLY REPORT

O'Brien & Gere shall prepare a weekly report in accordance with Attachment 01100-6 to Honeywell Technical Specification 01100 – Remediation Construction Requirements, which has been incorporated into the Contract Documents. The weekly reports shall summarize the progress of work as it relates to the schedule, conditions encountered in the field and formal communications regarding the work. A copy of the weekly report shall be maintained and available for review on site during construction.

5 CHANGES AND CORRECTIONS OF WORK

This section summarizes the requirements and procedures for tracking requests for information, changes to design and/or drawings, control of discrepant and non-conformant items, and tracking corrective actions.

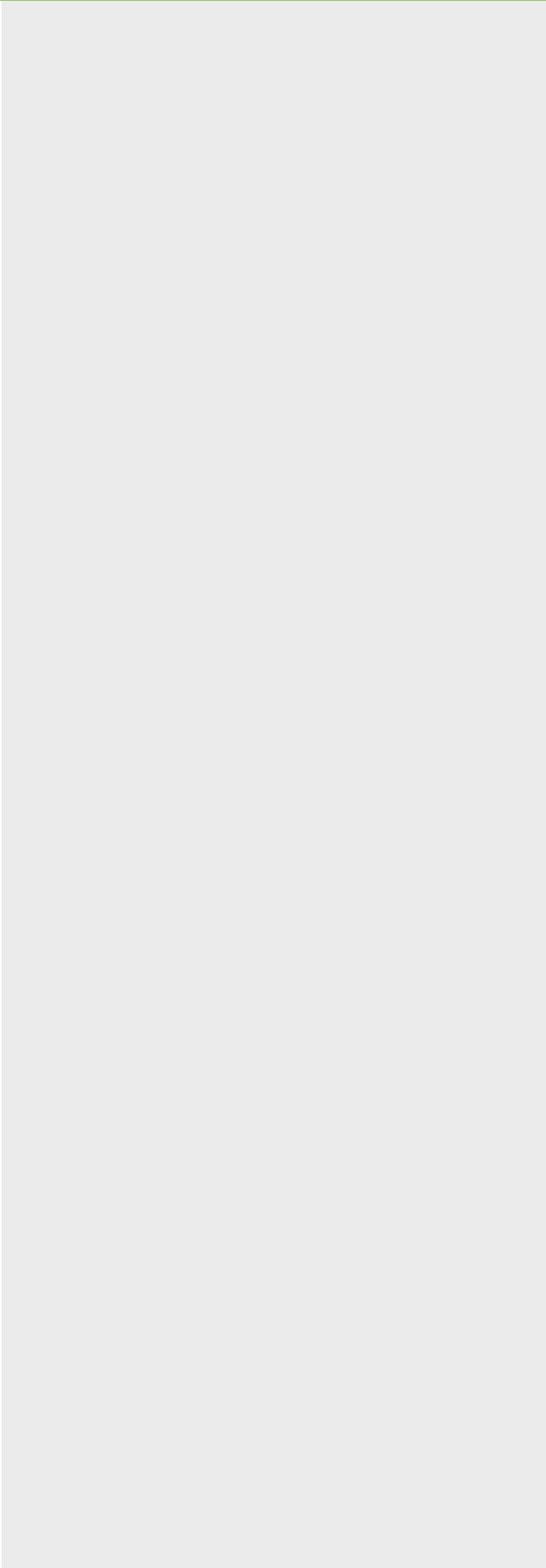
5.1 PROCEDURE FOR CHANGES

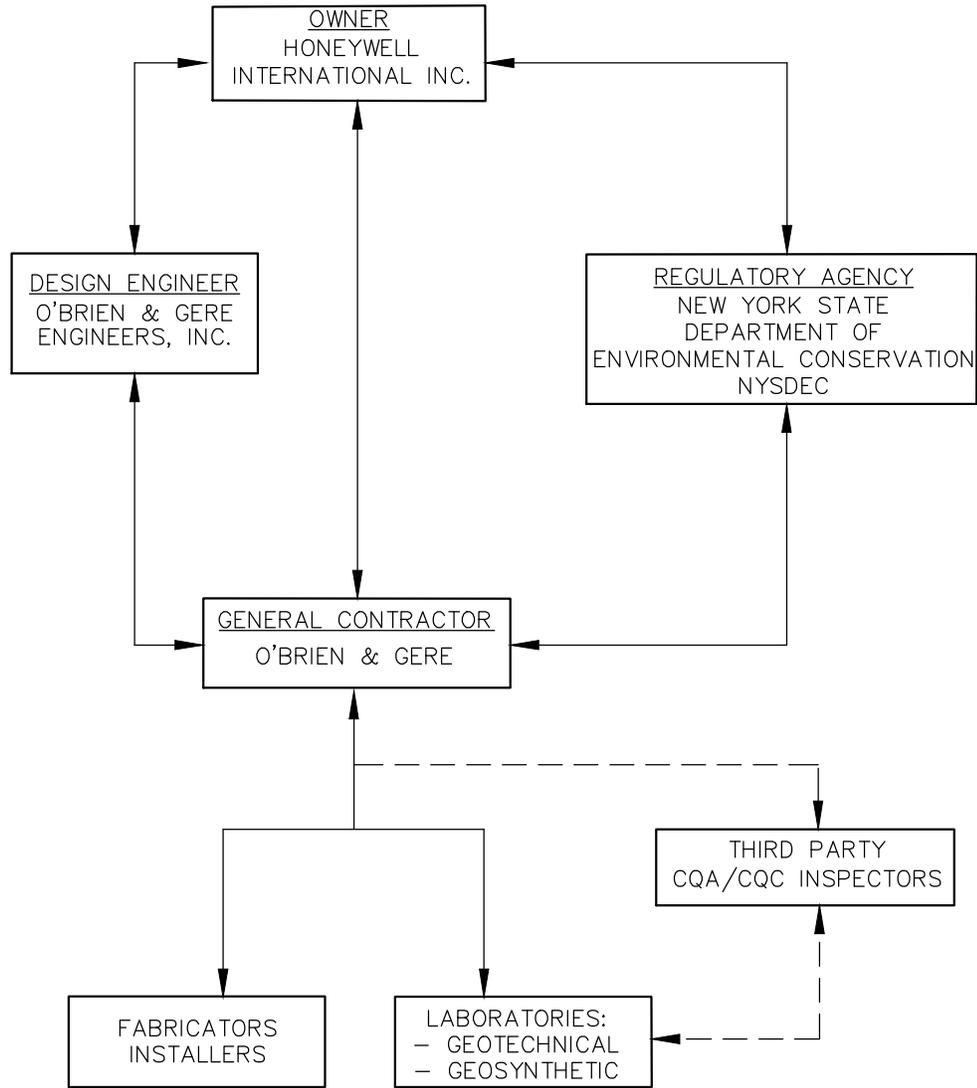
Honeywell and their authorized representatives (*i.e.*, O'Brien & Gere) at any time may make changes in the Work by making alterations therein, by making additions thereto, or by omitting Work therefrom. Honeywell shall not, however, make changes to the design during construction connected to the environmental remedy without first reviewing the proposed change with the NYSDEC and receiving the agency's approval to proceed.

Honeywell and their authorized representatives may authorize minor changes in the Work which do not alter the character, quantity, or cost of the Work as a whole. These changes may be accomplished by a Field Directive or Field Modification form.

5.2 INSPECTION AND CORRECTION OF WORK

O'Brien & Gere shall observe the progress and quality of the executed Work to evaluate, in general, if the Work is proceeding in substantial compliance with the design plans and technical specifications. Work that fails to conform to Contract Drawings or Technical Specifications shall be repaired or replaced.





LINES OF COMMUNICATION

NOT TO SCALE

HONEYWELL INTERNATIONAL INC.
WASTEBEDS 1-8 INTEGRATED IRM

LINES OF COMMUNICATION

1163.47228
OCTOBER 2012



Submittal List

**Appendix A
Preliminary Submittal List**

SPEC NUMBER	SPECIFICATION NAME	DESCRIPTION
01300	Shop Drawings and Samples	Shop drawings and data for equipment, materials, and other items for which Shop Drawings, layouts, or samples
		Each shop drawing shall include project name and contract number, manufacturer of equipment, notation as to whether original submittal or resubmittal, date received by Subcontractor from manufacturer or vendor, and date submitted to Contractor
		Each shop drawing shall be accompanied by a transmittal letter indicating the item or items submitted
		A minimum of five copies of drawings, catalog data, and similar items
02008	Project Photographs	Aerial photographs printed as 8"x10" and three sets each in electronic .jpg format Each print shall have -photograph number, date taken, project name and number and
02603	Leakage Tests	Test Reports include tester's name, date, time, duration, type of test
02631	Fiberglass Reinforced Plastic Pipe	Drawings and manufacturer's data of the pipe, joints, and fittings showing compliance with the specification
		Manufacturer's certification that all materials comply with the applicable requirements of the referenced standards and the specification
02731	Lined Structures	Gasket material product information
		Manufacturer's product information
		Manufacturer's certification that all materials furnished is in compliance with the applicable requirements of the spec
02277	Geotextile Separation Fabric	Manufacturer's certification that all materials furnished are in compliance with the applicable requirements of the spec
		Samples of geotextile separation fabric
02278	Geotextile Stabilization Fabric	Manufacturer's certification that all materials furnished is in compliance with the applicable requirements of the spec
		Samples of geotextile stabilization fabric
02292	High Tensile Strength Geotextile Cushion	Manufacturer's certification indicating compliance with the physical properties and manufacturing requirements stated in the specification
02293	LLDPE Geomembrane	Resin Supplier must submit:
		Certification that the polyethylene resin is in compliance and meets or exceeds the requirements specified in the spec that it is free of contaminants
		Certification that all resin is from the same manufacturer
		Origin, identification, and production date(s) of the raw materials used to manufacture the geomembrane

9/28/2012

I:\Honeywell.1163\47228.Wb-1-8-Integrat\Docs\Reports\100% Design\CQAPP\Appendices\FINAL WB 1-8 Submittal List.xls

**Appendix A
Preliminary Submittal List**

02293 (cont'd)	LLDPE Geomembrane	Copy of quality control certificates of raw materials used to manufacture the geomembrane
		Reports of tests conducted to verify the quality of the raw materials will be provided as shown in the spec showing the density, melt flow index, and oxidative induction time
		Manufacturer Submittals include:
		Certification of production capacity and schedule availability to meet the contract
		Manufacturer quality control program manual and copy of manufacturer quality control certificates
		Certified test results for all material properties specified
		Certification that no reclaimed polymer, no more than 2% recycled material, and no work off material is added to the virgin resin during the manufacture of the geomembrane
		Certification of geomembrane formulation of at least 97% of polyethylene resin, the balance being carbon black and additives; and certification that no fillers, extenders, or other materials are added into the formulation
		Certification of chemical and physical resistance of the geomembrane to materials it may come in contact with
		Fabricator Submittals include:
		Quality control program manual and copy of quality control certificates
		Certified seam test results
		Two samples of typical fabricated seams and a list of seam properties, minimum seam values, and test methods employed
		Geomembrane thickness measurements
		Installer Submittals include:
		Quality control program manual including, but not limited to installation procedures, field seaming procedures, procedures for repair, and documentation procedures
		Two samples of typical field seams and a list of seam properties, minimum seam values, and test methods employed
Resumes of the qualifications of the installation supervisor and personnel performing field seaming operations for this project		

**Appendix A
Preliminary Submittal List**

02293 (cont'd)	LLDPE Geomembrane	Proposed geomembrane panel layout showing proposed locations of field seams to be installed. The Installer shall inform the Engineer of any changes in field seam locations
		Daily seam strength test values for peel adhesion and seam shear strength
		Weekly update copies of the as-built drawings supplied to the Subcontractor and Engineer
		Notification of any equipment or material problems within eight hours of the occurrence and the proposed course of corrective action
		Samples of all report/documentation forms
		Summary log of all field quality control work completed by the Installer
		Certification by both the Installer and Fabricator that the material installation is complete and in accordance with the specifications
		Statement of Warranty
		Contractor Submittals include:
		Direct shear laboratory qualifications
		CQC Geosynthetic Laboratory Submittals include:
		Quality control program manual
		Qualification Submittals include:
		Manufacturer qualification of having successfully manufactured at least ten million square feet of the proposed geomembrane
		CQC Geosynthetic laboratory qualification showing compliance with the requirements of the specification
		Qualification Submittals include:
		Certified test results from the independent laboratory on all seams shall be submitted prior to acceptance of the seam
02298	Uniaxial Geogrids	Manufacturer's certification that all materials furnished are in compliance with the applicable requirements of the referenced Standards and the specification
		Manufacturer's installation requirements
		Samples of any materials shall be submitted at the Engineer's request
		The Subcontractor shall provide the Engineer with six sets of the installation drawings showing the proposed location of all geogrid material together with connection details
		The Subcontractor shall submit actual test results for tension/creep, durability/aging, construction damage, and control

**Appendix A
Preliminary Submittal List**

02298 (cont'd)	Uniaxial Geogrids	The manufacturer shall provide certification that all resin used to produce the geogrid is classified as high density polyethylene and is capable of withstanding direct exposure to sunlight for 120 days with no measureable deterioration as determined by ASTM D4355
02299	Triaxial Geogrids	<p>Manufacturer's certification that all materials furnished are in compliance with the applicable requirements of the referenced Standards and the spec</p> <p>Manufacturer's installation requirements</p> <p>Samples of any materials shall be submitted at the Engineer's request</p> <p>The Subcontractor shall provide the Engineer with six sets of the installation drawings showing the proposed location of all geogrid material together with connection details</p> <p>The Subcontractor shall submit actual test results for tension/creep, durability/aging, construction damage, and control</p> <p>The manufacturer shall provide certification that all resin used to produce the geogrid is classified as high density polyethylene and is capable of withstanding direct exposure to sunlight for 120 days with no measurable deterioration as determined per ASTM D4355</p>
02622	Cured-In-Place Pipe	<p>Provide product data describing conformance to ASTM codes of the pipe liner material</p> <p>The Subcontractor shall calculate the original design flow capacity of the sections of sewer to be lined and new design flow capacity after construction using the supplied slope information from the Contract Drawings and a minimum Manning's "n" value of no less than 0.024 for pre-construction flow capacity and 0.015 for post-construction flow capacity (CIPP felt liner and GRP liner) or as recommended by the liner manufacturer. The Contractor will keep these calculations on file and will submit a letter certifying that the rehabilitated sewer has a non-surcharged capacity equal to or greater than existing pipe</p> <p>Provide manufacturer's detailed installation procedures. The Contractor shall abide by these procedures for the installation of the liner.</p> <p>Detailed Flow Diversion/Control Plan including pump and force main size, location and capacity (if used)</p> <p>Detailed Project Schedule</p> <p>Detailed Maintenance and Protection of Traffic Plan</p> <p>If a GRP UV cured liner is used, the Subcontractor shall provide 3rd party test results that document styrene residual levels are within acceptable defined levels without flushing.</p>

**Appendix A
Preliminary Submittal List**

02622 (cont'd)	Cured-In-Place Pipe	Installation records
		Method of cure water handling and disposal
		Manufacturer's certification that all materials furnished are unaffected by groundwater with the concentrations of the chemical constituents listed in Attachment A of this specification.
		Manufacturer will provide the following:
		Calculations (stamped by a NYS Professional Engineer) shall be prepared in accordance with ASTM F1216 using conditions specified in the spec (fully deteriorated gravity pipe condition, Flexural Moduli = 400,000 psi; factor of safety = 2.0; groundwater elevation equal to the surface elevation in each section; long term modulus of elasticity based upon 50 years of continuous loading)
		Flexural properties from a minimum of five previous projects to show that the flexural modulus obtained in the field matches that used in the design calculations
		Third party verification of long term modulus value used in design calculations at time of submittal
		The Contractor will keep these calculations on file and submit a letter to the Engineer certifying that the proposed liner meets the minimum structural requirements
02768	CCTV	CCTV Inspection Project Schedule
		Two sets of color video DVD of the televised sewers and structures
		Two sets of typewritten television inspection logs
03300	Cast-in-Place Concrete	Product data for each type of manufactured material and product indicated, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing materials, bonding agents, water-stops, and others
		Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, bent bar diagrams, arrangement, and support of concrete reinforcement. Include special reinforcing required for openings through concrete structures
		Documentation for the concrete mix design in accordance with Section 4 of ACI 301 including required laboratory test reports for concrete materials and mix design

Appendix A
Preliminary Submittal List

<p>03300 (cont'd)</p>	<p>Cast-in-Place Concrete</p>	<p>Material certificates in lieu of material laboratory test reports as permitted by ACI. Material certificates shall be signed by manufacturer, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements</p>
		<p>Proposed method of concrete curing</p>
		<p>Manufacturer's literature for admixtures used in concrete mix</p>
		<p>Name and location of concrete supplier</p>
<p>03410</p>	<p>Structural Precast Concrete</p>	<p>Product data (for each type of product indicated)</p>
		<p>Design mixtures (for each precast concrete mixture. Include compressive strength tests)</p>
		<p>Design Modifications (If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings)</p>
		<p>Design Calculations (Submit structural analysis and design calculations stamped by a professional engineer licensed in the State of New York)</p>
		<p>Qualification Data (for fabricator)</p>
		<p>Welding certificates</p>
		<p>Material Certificates from the manufacturer including cementitious materials, reinforcing materials and pre-stressing tendons, admixtures, bearing pads, and structural-steel shapes and hollow structural sections)</p>
		<p>Material Test Reports (for aggregates)</p>
		<p>Shop drawings (Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement. Detail fabrication and installation of precast structural concrete units).</p>
		<p>Shop drawings should provide the following:</p>
		<p>Indicate joints, reveals, and extent and location of each surface finish</p>
		<p>Indicate separate face and backup mixture locations and thicknesses</p>
		<p>Indicate welded connections by AWS standard symbols. Show size, length, and type of each weld.</p>
		<p>Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.</p>
		<p>Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction</p>
<p>Include and locate openings larger than by 10 inches (250 mm)</p>		

Appendix A
Preliminary Submittal List

03410 (cont'd)	Structural Precast Concrete	Indicate location of each precast structural concrete unit by same identification mark placed on panel
		Indicate relationship of precast structural concrete units to adjacent materials
03901	Manhole and Catch Basin Rehabilitation	Manufacturer's descriptive data fully describing each product, including solids by volume and VOC content
		Manufacturer's certification that all materials furnished are in compliance with the applicable requirements of the referenced standard, this specification and compatible with the constituents listed in Schedule 1.
		Full technical application, surface preparation and installation information.
		Touch-up surface preparation and coating requirements
		Manufacturer standard construction details, drawings, and requirements for horizontal/vertical transitions, structural cracks, lining system termination, termination at drain, and pipe outlets for the specified coating systems.
		Color charts illustrating range of colors and textures available for selection, if applicable, and differential colors to be used between alternative coats.
		If alternate products are proposed, appropriate ASTM testing results, as determined by the Engineer, shall be submitted to the Engineer for review.
		Material Safety Data Sheets (MSDS) for each product proposed that includes recommendations on handling and storage.
09800	Special Coatings	Manufacturer's descriptive data fully describing each product, including solids by volume and V.O.C. content
		Manufacturer's certification that all materials furnished are in compliance with the applicable requirements of the referenced standards and this specification
		Manufacturer's application instructions
		Technical application, surface preparation and installation information
		Touch-up surface preparation and coating requirements
		Manufacturer standard Construction Details, Drawings and requirements for Horizontal/Vertical Transitions, Structural Cracks, Lining System Termination, Termination at Drain, and Pipe Outlets for the specified coating systems.
		Color charts illustrating range of colors (and textures) available for selection, if applicable, and differential colors to be used between alternative coats.
09900	Field Painting	Manufacturer's descriptive data fully describing each product to include solids by volume and V.O.C. ratings

9/28/2012

I:\Honeywell.1163\47228.Wb-1-8-Integrat\Docs\Reports\100% Design\CQAPP\Appendices\FINAL WB 1-8 Submittal List.xls

**Appendix A
Preliminary Submittal List**

09900 (cont'd)	Field Painting	Manufacturer's certification that all materials furnished are in compliance with the applicable requirements of the referenced standards and this specification
		Manufacturer's applications instructions
		Color charts illustrating range of colors (and textures) available for selection
15013	Tests on Pumping Equipment	NONE
15060	Hangers Supports and Restraints	Product data (for each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated)
		Shop Drawings (Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details)
		Welding Certificates (copies of certificates for welding procedures and operators)
15075	Mechanical Identification	For each product specified submit manufacturer's catalog sheets and specifications showing its compliance with this specification and the referenced standards
		Samples of symbols and abbreviations, letter size, color for coding, and a complete list of legend wording proposed for mechanical identification. Do not order or purchase identifications materials until samples have been reviewed
		Manufacturer's installation instructions
17010	Instrumentation	Product Data ("Catalog cuts" and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data. Label each data sheet with the tag ID assigned to the instrument)
		Shop Drawings (Electrical wiring diagrams)
		Manufacturer Instructions (Installation instructions)
		Closeout Submittals as follows:
		Operation and Maintenance Manuals (Installation instructions, configuration and setup instructions, quick start guides, user manuals)
		Warranty Documentation (start data, duration, conditions, manufacturer contact information, local vendor or support representative contact information)
		As-built drawings
		Software (vendor, manufacture, and contractor supplied)
26 00 00	Electrical	One complete shop drawings for all electrical equipment described in "Electrical," "Communications," "Electronic Safety and Security," and "Utilities" Sections of the spec.

9/28/2012

I:\Honeywell.1163\47228.Wb-1-8-Integrat\Docs\Reports\100% Design\CQAPP\Appendices\FINAL WB 1-8 Submittal List.xls

**Appendix A
Preliminary Submittal List**

26 00 00 (cont'd)	Electrical	Compliance Statement for each submittal listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of the Specification, and proposed nonconformities. Provide short description of minor nonconformities, and detailed explanation of other nonconformities
	Preconstruction submittals, including proposed substitutions, supplier and manufacturer qualifications and experience, construction scheduling	
	Shop Drawings, including equipment drawings with a complete bill of materials and supporting manufacturer's catalog data. One separate and complete shop drawing submittal for all the equipment specified in each Section is required	
	Product Data, marked to indicate precisely which items are proposed for this project. One complete and separate Product Data submittal for all the equipment and materials described in each Section requiring a product data submittal.	
	Samples, labeled by name, Specification Section and sub-clause, and mounted on sample boards	
	Design Data, including manufacturer's design calculations, where specified	
	Test Reports, including prototype tests, factory tests, field tests, acceptance tests, and functional tests. A test report is required for each specified test.	
	Certificates, including seismic qualification certification, welding certificates, factory training certificates for manufacturer's representatives	
	Manufacturer's Installation Instructions, including unloading, hoisting, rigging, short term storage, long term storage, method of field assembly, and other installation instructions	
	Manufacturer's Field Reports, including inspections and training records	
	Operation and Maintenance Manuals, including manufacturer's standard published literature and specially prepared descriptions of operation	
	Closeout Submittals, including black line paper copy of Record Drawings marked in red illustrating changes during construction	
	Spare Parts and Special Tools List	
	Record Drawings (Maintain a full size paper set of "black-line" working drawings throughout the project, and carefully record in red ink the locations and sizes of each major piece of electrical equipment, as well as manholes, hand holes, and cut bank routing, to scale. Upon Substantial Completion of the work, deliver the marked-up set of prints to the Engineer.	

9/28/2012

I:\Honeywell.1163\47228.Wb-1-8-Integrat\Docs\Reports\100% Design\CQAPP\Appendices\FINAL WB 1-8 Submittal List.xls

**Appendix A
Preliminary Submittal List**

26 00 00 (cont'd)	Electrical	Operation and Maintenance Manuals. Each Manual shall include the following:
		List of all O&M Manuals in the front of each manual
		Table of Contents for each manual and each binder
		Copy of each of the following (Preconstruction Submittals, Shop Drawings, Product Data, Design Data, Test Reports, Certificates, Manufacturer's Instructions, Manufacturer's Field Reports, Operation and Maintenance Data, Closeout Submittals, Panel board directories (as-built))
26 05 19	Low-Voltage Electrical Power Conductors & Cables	Product data (for each type of product specified, including catalog data, technical specifications, evidence of UL listing, and evidence of manufacturer's certification to ISO 9000:2000 or an equivalent quality management system certification acceptable to the Engineer)
		Qualifications and experience proposal for the electrical testing firm
		Electrical Acceptance Test reports
		Operation and maintenance data is not required, however, reviewed shop drawing submittals are required to be included for the record in the Operation and Maintenance Manuals
26 05 33	Raceway and Boxes for Electrical Systems	Product Data (for surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets)
		Shop drawings (include plans, sections, details, and attachments to other work)
		For handholes and boxes, include duct entry provisions (including locations and duct sizes), frame and cover design, grounding details, and dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
		Qualification Data (for professional engineer and testing agency)
		Source quality-control test reports
26 05 43	Underground Ducts and Raceways for Electrical Systems	Shop drawings including general arrangement, dimensions and weights and a complete bill of materials listing all components, supplemented by manufacturer's catalog data for the following:
		Duct banks (red die, duct (conduit) spacers, buried cable warning tape, reinforcing steel, concrete mix)
		Manholes (precast manhole drawings, cast iron frames and covers, cable racks and support arms, and cable saddles with insulators)
		Handholes (precast handhole drawings, cast iron frames and covers, cable racks and support arms, and cable saddles with insulators)

**Appendix A
Preliminary Submittal List**

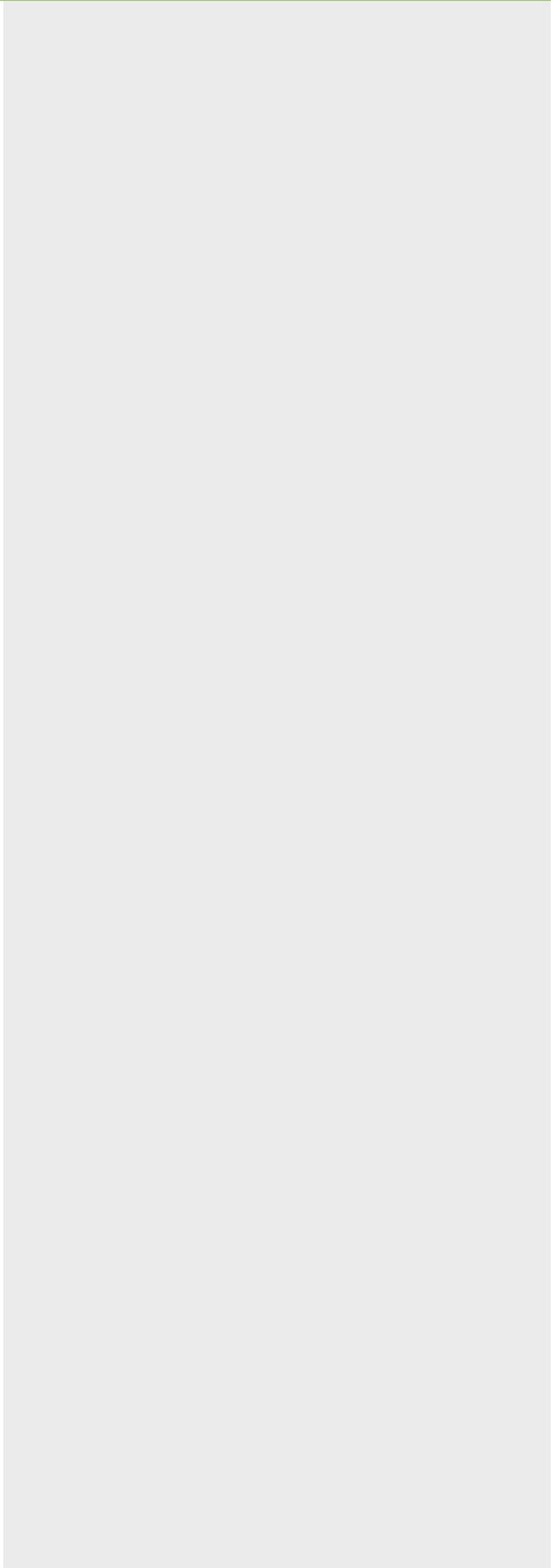
26 05 43 (cont'd)	Underground Ducts and Raceways for Electrical Systems	Pre-cast concrete structural design drawings shall be signed and sealed by a registered professional structural engineer licensed in the state where the manholes and handholes will be installed
		Submit field test reports for the concrete field test results, mandrel test results, and grouting test report)
		Submit qualifications and experience for concrete testing firm
26 05 53	Identification for Electrical Systems	Product data
		Complete list of all engraved nameplates
		Sample of each of the following:
		Engraved equipment nameplate
		Computer-generated label
		Wire-markers
		Safety signs
Laminated instrument tags		
26 21 00	Low-Voltage Electrical Service Entrance	Product data ("Catalog cuts" and spec sheets marked to specifically indicate the service equipment and materials proposed for this project)
		Certificates (copy of the inspection certificates from the AHJ, and copy of the inspection certificate from the electrical utility company)
		Test Reports for equipment and materials specified in other Sections
		Manufacturer Instructions for handling, storing, installing, operating, and maintaining service equipment and materials
		Field Quality Control Submittals (copy of the inspection certificate from the AHJ and copy of the inspection certificate from the electrical utility company)
		Closeout Submittals (operation and maintenance manuals for service equipment and utility service provider contact information)
31 01 01	Earthwork	Sheeting and bracing drawings stamped and signed by a licensed PE in the State of the project, if sheeting and bracing is required
		A written Control of Water Management Plan, if removal of water is required
		A representative list of satisfactory similar operations, including contact names and telephone numbers, if well point dewatering is required
31 05 14	Select Fill	Name and location of source of each material
		Samples and test reports of each material

**Appendix A
Preliminary Submittal List**

31 05 14 (cont'd)	Select Fill	Test results include Particle Size Analysis, Organic Content Analysis (Type H, E, and L passing #40 Sieve), pH Analysis (Type H, E, and L passing #40 Sieve), and Modified Proctor
		Affidavit from owner stating the source material is clean
		Laboratory analytic data (Part 375-6.8 and 40 CFR 261.20)
31 22 19	Topsoil and Seeding	Location of source and data (pH, organic matter, particle size distribution) for off-site soil
		Affidavit from owner stating the source material is clean
		Laboratory analytic data (Part 375-6.8 and 40 CFR 261.20)
		Latin name, source and content data for seed mixes, plants, and trees. Data for each container of seed used shall be submitted.
		Should hydro-seeding be used, the Contractor shall submit all data including material and application rates
		Submit certificates from plant nursery stock supplier for each group of live plant stock required, stating botanical name, common name, and origin, age date of packaging, and name and address of supplier
		Invoices for all plants and seed procured for the project shall be submitted
		Source and content data for organic mulch
31 23 00	Excavation and Fill	In-place density test
		Moisture-density relationship of the backfill material determined by ASTM D1557 with compaction curves for full range of materials
31 23 01	Structural Excavation & Fill	In-place density test
		Moisture-density relationship of the backfill material determined by ASTM D1557 with compaction curves for full range of materials
31 24 00	Embankment	Proposed testing laboratory
		Source of off-site materials
		Compaction curves for all materials to be used
32 31 13	Chain Link Fence	Manufacturer's certification that all materials furnished are in compliance with the applicable requirements of the referenced standards, the spec, and Contract Drawings
		Product Data ("Catalog cuts" and specification sheets indicating details of fence and gate construction, fence height, post spacing, dimensions and unit weights of framework and concrete footing details marked to specifically indicate the materials proposed for this project)

Appendix A
Preliminary Submittal List

32 31 13 (cont'd)	Chain Link Fence	Certificates (submit manufacturer's affidavit stating compliance with all applicable provisions of all ASTM specifications specified)
		Qualifications Statements (provide statement indicating fence installer has five years experience in installing the specified fence and gate)
33 00 01	Pipeline Installation	Manufacturer's certificates that all materials furnished are in compliance with the applicable requirements of the referenced standards and the spec. Layout drawings are required for pipelines to be installed within structures, showing the locations including the support system, sleeves and appurtenances



40 CFR 261.20

***Table 1 - Maximum
Concentration of
Contaminants for the
Toxicity Characteristic***

**Table 1 - Maximum Concentration of Contaminants for the Toxicity Characteristic
40 CFR 261.20**

EPA HW No. ¹	Contaminant	CAS No. ²	Regulatory Level (mg/L)
D004	Arsenic	7440-38-2	5
D005	Barium	7440-39-3	100
D018	Benzene	71-43-2	0.5
D006	Cadmium	7440-43-9	1
D019	Carbon tetrachloride	56-23-5	0.5
D020	Chlordane	57-74-9	0.03
D021	Chlorobenzene	108-90-7	100
D022	Chloroform	67-66-3	6
D007	Chromium	7440-47-3	5
D023	o-Cresol	95-48-7	4200
D024	m-Cresol	108-39-4	4200
D025	p-Cresol	106-44-5	4200
D026	Cresol	1319-77-3	4200
D016	2,4-D	94-75-7	10
D027	1,4-Dichlorobenzene	106-46-7	7.5
D028	1,2-Dichloroethane	107-06-2	0.5
D029	1,1-Dichloroethylene	75-35-4	0.7
D030	2,4-Dinitrotoluene	121-14-2	30.13
D012	Endrin	72-20-8	0.02
D031	Heptachlor (and its epoxide)	76-44-8	0.008
D032	Hexachlorobenzene	118-74-1	30.13
D033	Hexachlorobutadiene	87-68-3	0.5
D034	Hexachloroethane	67-72-1	3
D008	Lead	7439-92-1	5
D013	Lindane	58-89-9	0.4
D009	Mercury	7439-97-6	0.2
D014	Methoxychlor	72-43-5	10
D035	Methyl ethyl ketone	78-93-3	200
D036	Nitrobenzene	98-95-3	2
D037	Pentachlorophenol	87-86-5	100
D038	Pyridine	110-86-1	35
D010	Selenium	7782-49-2	1
D011	Silver	7440-22-4	5
D039	Tetrachloroethylene	127-18-4	0.7
D015	Toxaphene	8001-35-2	0.5
D040	Trichloroethylene	79-01-6	0.5
D041	2,4,5-Trichlorophenol	95-95-4	400
D042	2,4,6-Trichlorophenol	88-06-2	2
D017	2,4,5-TP (Silvex)	93-72-1	1
D043	Vinyl chloride	75-01-4	0.2

Notes:

¹Hazardous waste number.

²Chemical abstracts service number.

³Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.

⁴If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 mg/l.

Regulatory Limit obtained from 40 CFR Part 261.2

6 NYCRR Part 375.68
Table 375-6.8(a) -
Unrestricted Use Soil
Cleanup Objectives

Table 375-6.8(a) - Unrestricted Use Soil Cleanup Objectives
6 NYCRR Part 375-6.8

Parameter	CAS No.¹	NYSDEC Part 375 Unrestricted Use² (mg/kg)
Volatile Organic Compounds		
1,1,1-TRICHLOROETHANE	71-55-6	0.68
1,1-DICHLOROETHANE	75-34-3	0.27
1,1-DICHLOROETHENE	75-35-4	0.33
1,2,4-TRIMETHYLBENZENE	95-63-6	3.6
1,2-DICHLOROETHENE	95-50-1	1.1
1,2-DICHLOROETHANE	107-06-2	0.02
1,3,5-TRIMETHYLBENZENE	108-67-8	8.4
1,3-DICHLOROETHENE	541-73-1	2.4
1,4-DICHLOROETHENE	106-46-7	1.8
1,4-DIOXANE	123-91-1	0.1
2-BUTANONE (MEK)	78-93-3	0.12
ACETONE	67-64-1	0.05
BENZENE	71-43-2	0.06
n-BUTYLBENZENE	104-51-8	12
CARBON TETRACHLORIDE	56-23-5	0.76
CHLOROETHENE	108-90-7	1.1
CHLOROFORM	67-66-3	0.37
CIS-1,2-DICHLOROETHENE	156-59-2	0.25
ETHYLBENZENE	100-41-4	1
HEXACHLOROETHENE	118-74-1	0.33
METHYL ETHYL KETONE	78-93-3	0.12
METHYL TERT-BUTYL ETHER	1634-04-4	0.93
METHYLENE CHLORIDE	75-09-2	0.05
n-PROPYLBENZENE	103-65-1	3.9
sec-BUTYLBENZENE	135-98-8	11
tert-BUTYLBENZENE	98-06-6	5.9
O-XYLENE	95-47-6	0.26
TETRACHLOROETHENE	127-18-4	1.3
TOLUENE	108-88-3	0.7
TRANS-1,2-DICHLOROETHENE	156-60-5	0.19
TRICHLOROETHENE	79-01-6	0.47
VINYL CHLORIDE	75-01-4	0.02
XYLENES, M & P	179601-23-1	0.26
XYLENES, TOTAL	1330-20-7	0.26
Semivolatile Organic Compounds		
ACENAPHTHENE	83-32-9	20
ACENAPHTHYLENE	208-96-8	100
ANTHRACENE	120-12-7	100
BENZO(A)ANTHRACENE	56-55-3	1
BENZO(A)PYRENE	50-32-8	1
BENZO(B)FLUORANTHENE	205-99-2	1
BENZO(G,H,I)PERYLENE	191-24-2	100
BENZO(K)FLUORANTHENE	207-08-9	0.8
CHRYSENE	218-01-9	1
DIBENZO(A,H)ANTHRACENE	53-70-3	0.33
DIBENZOFURAN	132-64-9	7
FLUORANTHENE	206-44-0	100
FLUORENE	86-73-7	30
INDENO(1,2,3-CD)PYRENE	193-39-5	0.5
m-CRESOL	108-39-4	0.33
NAPHTHALENE	91-20-3	12
o-CRESOL	95-48-7	0.33
p-CRESOL	106-44-5	0.33
PENTACHLOROPHENOL	87-86-5	0.8
PHENANTHRENE	85-01-8	100
PHENOL	108-95-2	0.33
PYRENE	129-00-0	100
Pesticides/PCBs		
2,4,5-TP Acid (Silvex)	93-72-1	3.8
4,4'-DDD	72-54-8	0.0033
4,4'-DDE	72-55-9	0.0033
4,4'-DDT	50-29-3	0.0033
ALDRIN	309-00-2	0.005
ALPHA-BHC	319-84-6	0.02
BETA-BHC	319-85-7	0.036
CHLORDANE (ALPHA)	5103-71-9	0.094
DELTA-BHC	319-86-8	0.04
DIELDRIN	60-57-1	0.005
ENDOSULFAN I	959-98-8	2.4

**Table 375-6.8(a) - Unrestricted Use Soil Cleanup Objectives
6 NYCRR Part 375-6.8**

ENDOSULFAN II	33213-65-9	2.4
ENDOSULFAN SULFATE	1031-07-8	2.4
ENDRIN	78-20-8	0.014
GAMMA-BHC (LINDANE)	58-89-9	0.1
HEPTACHLOR	76-44-8	0.042
Polychlorinated Biphenyls	1336-36-3	0.1
Metals		
ARSENIC	7440-38-2	13
BARIUM	7440-39-3	350
BERYLLIUM	7440-41-7	7.2
CADMIUM	7440-43-9	2.5
CHROMIUM, Hexavalent	16065-83-1	1
CHROMIUM, Trivalent	18540-29-9	30
COPPER	7440-50-8	50
Total CYANIDE	57-12-5	27
LEAD	7439-92-1	63
MANGANESE	7439-96-5	1600
Total MERCURY	7439-97-6	0.18
NICKEL	7440-02-0	30
SELENIUM	7782-49-2	3.9
SILVER	7440-22-4	2
ZINC	7440-66-6	109

Notes:

¹Chemical abstracts service number.

²NYSDEC Part 375-6.8(a) Unrestricted Use Soil Use Cleanup Objectives (2006)