

# Quality Assurance Plan

Phase II MSW Area Closure  
& Photovoltaic System Project  
Hartford Landfill

Connecticut Resources  
Recovery Authority  
Hartford, Connecticut

March 14, 2013



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QUALITY ASSURANCE PLAN  
Phase II MSW Area Closure & PV System Project  
Hartford Landfill  
Hartford, Connecticut

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## 1.0 INTRODUCTION

The Connecticut Resources Recovery Authority (CRRRA) intends on closing the Municipal Solid Waste/Interim Ash Disposal Area (the "MSW Area") of the Hartford Landfill located at 180 Leibert Road in Hartford, Connecticut. This document serves as a Quality Assurance Plan (QAP) specifically developed for the proposed closure construction activities of the Phase II (eastern) area at the landfill. This document accompanies and is consistent with the Closure Plan (last revised January 2007) and subsequent amendment (dated July 2011) for this landfill.

In general, closure construction activities will consist of constructing an impermeable barrier with associated access roads and storm water control features. To facilitate the desire to incorporate a grid-connected solar photovoltaic "PV" renewable energy system into the planned closure of the Hartford Landfill, CRRRA undertook a far-reaching review of available technologies. At the conclusion of this comprehensive review, CRRRA determined that an alternative capping system had the best potential to support a renewable energy system. The two alternative capping systems selected for detailed analysis included:

- *Closure Turf™ Alternate* – a proprietary synthetic turf system manufactured by Agru-America, Inc. This system would allow for the use of rigid PV panels affixed to a ground mounted racking system.
- *Exposed TPO Alternate* – an exposed geomembrane cap using Thermoplastic Polyolefin (TPO). This system would allow for the use of rigid PV panels affixed to a ground mounted racking system or flexible, thin-film PV panels chemically adhered to the membrane.

One of these alternative capping systems, which have been approved by the Connecticut Department of Environmental Protection (CTDEEP), will be used to close the Phase II (eastern) portion of the Hartford landfill.

This QAP is intended to provide guidance for control of construction quality aspects of the proposed landfill closure activities. This document outlines specific duties of the Quality Assurance Consultant (QAC) and construction contractor, and procedures for documenting and reporting that the closure activities have been conducted in general conformance with the CT DEEP-approved plans, specifications, and applicable regulations. Specific details of proposed construction quality assurance/quality control activities will be presented in the general requirements, technical specifications and final design drawings included in the Request for Proposals (RFP). These sections will comprise the "contract documents" for the project. These documents should be consulted should questions arise or omissions be discovered in this QAP. *Table 1* summarizes the reporting and testing requirements for the major tasks and materials for this project.

## 2.0 RESPONSIBILITY AND AUTHORITY

### 2.1 General

Quality assurance consists of implementing a planned system of activities to assure closure construction occurs as specified in the contract documents. Implementing quality assurance activities for this project involves applying standards and procedures outlined in the contract documents to assure the closure construction meets or exceeds the performance criteria. The



following paragraphs outline the organization of the project participants and their responsibilities, meetings, and testing/submittal requirements.

## 2.2 Project Organization and Responsibilities

The construction phase of the project involves coordination between five participants:

- CT DEEP
- CRRA
- Engineer
- Quality Assurance Consultant
- Construction Contractor

Each participant has a responsible role in implementing the proposed closure activities. A project organization chart has been provided as *Figure 1* and shows the general lines of communication between the parties as described below:

### 2.2.1 Connecticut Department of Energy and Environmental Protection

The role of the CT DEEP in this project is to review and approve, as appropriate, documents submitted in connection with the closure contract, and assess whether or not the closure is being constructed in conformance with the Connecticut General Statutes (CGS) Section 22a-208 and RSCA Section 22a-209.

The closure of the landfill is to be completed in accordance with the terms and conditions established in the Authorization for Closure (Authorization). It is anticipated that the terms and conditions of the Authorization will reference the CT DEEP-approved landfill closure plan and engineering drawings, and require the CRRA to submit this QAP for CT DEEP approval on or before sixty days prior to commencing the construction activities. No closure construction activities will be undertaken until the CT DEEP issues approval of the QAP.

### 2.2.2 CRRA

CRRA will be the Authorization Holder. Therefore, CRRA is responsible for completing construction activities in accordance with the terms and conditions of the Authorization. Closure activities will be substantially completed by the date specified in the Authorization. CRRA will solicit bids and ultimately hire a qualified contractor who will complete the construction work. Alternatively, CRRA may act as the Contractor for all or part of the closure activities. CRRA will also retain the services of a Quality Assurance Consultant who will oversee the implementation of the Quality Assurance Plan.

### 2.2.3 Engineer

The Engineer for the project will be an experienced civil engineer, licensed by the State of Connecticut. The responsibilities of the Engineer during construction will be detailed in the contract documents. Generally, the Engineer will make visits to the site at intervals appropriate to the various stages of construction in order to observe the progress and quality of the work completed by the Contractor. The Engineer will provide clarifications and interpretations of the contract documents, have the responsibility to authorize minor variations



in the work that are compatible with the CT DEEP-approved closure plans, and have the authority to reject defective work. The Engineer may, at his or her discretion, test materials at random or observe quality control testing as it is being performed.

CRRA retained Fuss & O'Neill as Engineer to prepare the closure plan including draft technical specifications, engineering drawings and the QAP. After receiving the Authorization, Fuss & O'Neill will finalize the technical specifications, construction drawings and assemble the Contract Documents. Fuss & O'Neill will function as the Engineer and report to CRRA at least during the bidding phase of the construction.

#### 2.2.4 Quality Assurance Consultant

The Quality Assurance Consultant (QAC) for the project will be an experienced civil engineer, licensed by the State of Connecticut. The individual or firm serving as the QAC will have a track record of successful landfill closures within the state. The QAC is responsible for coordinating the activities as presented in this QAP and will report to CRRA. The responsibilities of the QAC include:

- Providing written certification to the CT DEEP that sedimentation and erosion controls have been installed (provided prior to initiating construction)
- Reviewing and approving submittals made by the construction contractor
- Documenting construction and QAC activities
- Coordinating independent testing services where applicable
- Preparing a final closure certification report upon completion of the landfill closure activities

The QAC and the Engineer may be filled by one and the same entity.

#### 2.2.5 Construction Contractor

The Construction Contractor is the individual or entity who will complete the proposed closure construction work. Pursuant to the contract documents, the Construction Contractor is referred to as the "Contractor" who will enter into an agreement with the Owner to successfully complete the work.

The Contractor is responsible for supervising and directing the work and solely responsible for the means, methods, techniques, sequences and procedures of construction in accordance with the contract documents. The Contractor is responsible for maintaining and supervising all safety precautions and programs and compliance with all applicable laws. The Contractor also maintains the record documentation, including those annotations made to the construction documents that reflect minor changes to the proposed work.

The Contractor is responsible for providing material submittals to the QAC in a timely manner for review prior to installation. He or she is also responsible for performing soil and geomembrane testing on capping materials as required to determine compliance with the



project specifications. A soil testing laboratory and a geomembrane testing laboratory approved by the QAC will be retained by the Contractor to provide the Contractor testing and reporting services. These documents will be submitted to the QAC to review for conformance with the requirements of the Contract Documents.

### 2.2.6 Land Surveyor

The Land Surveyor retained by the Construction Contractor will be a professional land surveyor who is legally qualified to practice in the State of Connecticut and who is experienced in providing land-surveying services of the kind required. The selected Land Surveyor will have a minimum of two years experience in construction surveying layout and preparation of as-built surveys in accordance with the specified horizontal and vertical control requirements.

## 2.3 Project Meetings

Project meetings are proposed throughout the course of the project. Meetings may or may not involve all the parties listed in the QAP. The intent of the meetings will be to establish lines of communication to report, control and resolve problems that could affect the quality of the work. The following meetings are proposed as part of this project.

### 2.3.1 Pre-Construction Meeting

Prior to any work being undertaken at the site, a meeting with the Owner, Contractor, Engineer, QAC, and CT DEEP will be held to establish a working understanding among the parties and to discuss the schedules listed in the contract documents (e.g., progress schedule and schedule of shop drawings). Other topics that will be discussed include the procedures for handling shop drawings, processing of applications for payment, and maintaining project record documents.

### 2.3.2 Project Progress Meetings

Progress meetings will be held bi-weekly (or more frequently as needed) at the site with the Owner, Contractor, Engineer, QAC and CT DEEP, as necessary, for the purposes of understanding the project's construction and administration progress. Meeting notes will be prepared and distributed to the attendees within five days.

### 2.3.3 Daily Meetings

Contractor will conduct daily "tailgate meetings" with the crew leaders, subcontractors, QAC, and owner, as required, for the purpose of reviewing daily construction schedule and resolving outstanding construction issues.

### 2.3.4 Corrective Action Meetings

Significant conditions adverse to quality may be identified during the course of the construction work by one or more of the parties involved with the project. The condition reported to be adverse will be analyzed by the reporting party to determine if it represents a significant condition adverse to quality. If determined to be significant, the Owner will then perform an analysis to determine if corrective action is required, and if necessary, hold a



meeting with the QAC, Contractor and others, as appropriate, to discuss the proper course of action.

### 3.0 OBSERVATION AND TESTING

#### 3.1 General

Quality control includes testing and final observation of materials and workmanship before and during construction to assess compliance of the materials and workmanship with the final engineering design plans and specifications.

Detailed descriptions of the character and quality of material submittals, workmanship, and observation of the work will be presented in the contract documents. Technical specifications presented in the contract documents detail submittals, specific testing requirements and laboratory testing protocols in accordance with the American Society of Testing Materials (ASTM), the Connecticut Department of Transportation (ConnDOT) Standard Specifications for Roads, Bridges and Incidental Construction (Form 816), and other recognized standards. The Contractor's, QAC's and Owner's responsibilities concerning tests and observations, as well as correction, removal or acceptance of defective work will be presented in the Standard General Conditions of the Construction Contract presented in the contract documents.

##### 3.1.1 Project Submittals

The Contractor will provide the QAC project submittals for review and approval in accordance with the contract documents. Before providing the project submittals, the Contractor will have determined and verified that the items contained in the submittal are acceptable for its intended use. The QAC will perform a timely review of the material submittal. Submittals determined to be deficient will be returned to the Contractor for corrections. Approved submittals will be returned to the Contractor for his use in maintaining the project record documents. Project record documents, which include a compilation of approved submittals and marked-up (i.e., red-lined) copies of the construction drawings and specifications, will be furnished to the QAC and Owner in connection with final payment at the time of contract closeout.

##### 3.1.2 Testing and Reporting Requirements

There are testing and reporting requirements to verify the chemical and physical characteristics of materials and statements supporting the quality control of workmanship. Refer to the technical specifications for more detailed descriptions of the work to be performed and the testing/submittals required.

#### 3.2 Disruption and Grading of Landfill Materials

This work will consist of the excavation, deposition, and compaction of existing on-site materials within the limits of the landfill necessary to prepare a suitable base for constructing the cap. The Contractor will provide odor control measures as needed including limiting areas of disturbance, covering exposed waste in a timely fashion, and/or applying odor control agents.





The Contractor will notify the OAC in writing one week prior to any excavation, disruption, or removal of deposited material, and submit an Odor Control Plan which will describe in narrative form proposed procedures in the event that odor control is required.

### 3.3 Cap Base Material

The following submittals, required for cap base material imported by the Contractor, will be made part of the quality control program prior to placing the cap base material layer:

A materials certificate stating that cap base material meets the technical specification prior to delivery of soil to the site. If material is obtained from more than one source, then a materials certificate will be submitted from each source.

- A grain size analysis (gradation), modified proctor test report, permeability test report, interface friction angle test report (for cap base/liner interface) and internal friction angle test report.
- RCRA 8 metals, PCB's, VOC's, SVOC's, Chlorinated Pesticides, ETPH analyses analytical testing reports.

The following testing, required of the Contractor, will be made part of the quality control program during placement of the cap base material layer:

- Compaction test reports immediately following field testing of material. Field testing will be measured with a Nuclear Density Gauge at a frequency of six tests per acre.
- Measurements of the cap base material thickness taken following compaction every 100 feet on center via Depth Test Holes.
- Grain size, modified proctor, permeability, interface friction angle(for cap base/liner interface), and internal friction angle test reports at a rate of at least once per 5,000 cubic yards of material delivered.
- Submit RCRA 8 metals, PCB's, VOC's, SVOC's, Chlorinated Pesticides, ETPH analyses analytical testing reports for Cap Base Material obtained at the source prior to delivery of the material to the landfill, and at a rate of at least once per 10,000 cubic yards delivered.

### 3.4 Geomembrane

This section is applicable for the installation of TPO geomembrane as well as the installation of Super Gripnet® geomembrane, which is a part of the Closure Turf™ system. The following submittals, required for geomembrane supplied by the Contractor, will be made part of the quality control program prior to placing the geomembrane:

- Brand information and Manufacturer Literature, including manufacturer's quality control test results for the batch and lot numbers of material supplied to the project.



- Product data, shop drawings, samples, calculations and details for each product or material used.
- Warranties for geomembrane material and installation workmanship.
- Installation contractor's name, qualifications, and project descriptions.
- Installation construction contractor superintendent's name and qualifications.
- Proposed panel layout drawing.
- Quality Control Plan

The following submittals shall be provided on a daily basis during the course of geomembrane installation:

- Cap base material layer surface conformation form signed by the installation contractor and the QAC representative.
- Trial seam test results.
- Destructive seam testing results.
- Vacuum testing results.
- Air testing results.

The following submittal shall be provided at the completion of the project.

- As-built panel layout record drawing indicating panel locations, numbers and repair locations.
- Installation Certificate from the installer documenting that the closure system has been installed in accordance with the manufacturer's instructions and warranty requirements.

### 3.5 Geocomposite

The following submittals, required for geocomposite supplied by the Contractor, will be made part of the quality control program at least 10 days prior to delivery of materials to the site:

- A sample of the proposed geocomposite
- Certification that the material meets the required specifications



### 3.6 Underdrains

The Contractor shall submit to the Engineer product data sheet and certification that the materials (perforated and solid-wall pipe and fittings, filter fabric sock, geotextile) meet the required specifications at least 10 days prior to delivery of materials to the site.

### 3.7 Geotextiles

The Contractor shall submit to the Engineer samples of the proposed geotextiles, and certification that the material meets the required specifications, at least 10 days prior to delivery of materials to the site.

### 3.8 Sand Ballast

The Contractor shall submit to the Engineer samples of the proposed sand ballast, and certification that the material meets the required specifications, at least 10 days prior to delivery of materials to the site.

The following testing, required of the Contractor, will be made part of the quality control program during placement of the cap base material layer:

- Submit measurements of the Sand Ballast thickness taken following installation, at a frequency of 20 measurements per acre, randomly determined by the Engineer.
- Submit RCRA 8 metals, PCB's, VOC's, SVOC's, Chlorinated Pesticides, ETPH analyses analytical testing reports for Sand Ballast obtained at the source prior to delivery of the material to the landfill, and at a rate of at least once per 10,000 cubic yards delivered.

### 3.9 Drainage Sand Layer

The following submittals, required for Barrier Protection Soil supplied by the Contractor, will be made part of the quality control program prior to and during placement of the Barrier Protection Soil:

- A materials certificate stating that cover material meets the technical specification as well as a grain size, permeability, modified proctor, interface friction (for sand/geocomposite interface) and internal friction angle test analysis prior to delivery of soil to the site. If material is obtained from more than one source, then the items will be submitted from each source.
- Grain size analysis (gradation), permeability analysis, modified proctor, interface friction angle and internal friction angle test reports at a rate of at least once per 5,000 cubic yards of material delivered.
- Submit RCRA 8 metals, PCB's, VOC's, SVOC's, Chlorinated Pesticides and ETPH analytical testing reports for Drainage Sand obtained at the source prior to delivery of the material to the landfill, and at a rate of at least once per 10,000 cubic yards delivered.



- Measurements of the barrier protection sand thickness taken following compaction (Two passes with a Caterpillar D-6 bulldozer) every 100 feet on center.
- Compaction test reports immediately following field testing of material. Field testing will be measured with a Nuclear Density Gauge at a frequency of six tests per acre. (Note: this testing is for record purposes only)

### 3.10 Vegetative Support Material

The following submittals, required of the Contractor, will be made part of the quality control program prior to and during placement of the vegetative support soil:

- For each source prior to delivery of the material to the site, a certified test report and certificate of conformance with the technical specification for vegetative support material, including grain size, organic content, deleterious material, cation exchange capacity, pH, mineral and plant-nutrient content, pesticide analysis, herbicide analysis, RCRA 8 metals analysis, and ETPH analysis.
- Submit certified test reports with grain size and organic content, deleterious material analyses, cation exchange capacity, mineral and plant-nutrient content, and pH at a rate of at least one per 5,000 cubic yards of material delivered.
- Submit RCRA 8 metals, PCB's, VOC's, SVOC's, Chlorinated Pesticides, Herbicides and ETPH analytical testing reports for vegetative support material at a rate of at least one per 10,000 cubic yards delivered or one per source if less than 10,000 cubic yards is obtained from any one source.
- Submit a certificate of conformance and product information for the fertilizer prior to delivery to the site.
- Submit a certificate of conformance and product information for the mulch prior to delivery to the site.
- Measurements of the vegetative support material thickness taken following final grading every 100 feet on center.

### 3.11 Turf Establishment

The following submittals, required of the Contractor, will be made part of the quality control program prior to commencement of turf establishment activities:

- A materials certification and copies of catalog cut sheets for review and acceptance for Inorganic Soil Amendments, Organic Soil Amendments, Seed, and erosion control blankets reflecting that they comply with the specifications.
- A hydroseed procedure and application rates for approval that includes the number of pounds of wood fiber mulch and tackifier to be used per one hundred (100) gallons



water. This statement will also specify the number of square feet of seeding that can be covered with the quantity of solution in the hydroseeder.

- Full and complete written maintenance instructions for proper care and development of seeded areas.

The following testing, required of the Contractor, will be made part of the quality control program during placement of the cap base material layer:

- Submit RCRA 8 metals, PCBs, VOCs, SVOCs, Chlorinated Pesticide, herbicide, and ETPH analytical testing reports for Organic Soil Amendments at a rate of at least one per 10,000 cubic yards delivered or one per source if less than 10,000 cubic yards is obtained from any one source.

### 3.12 Riprap

Prior to delivery of the riprap to the site, material certification of conformance with the specifications and one riprap sample per source meeting the requirements in the specification will be submitted.

### 3.13 Crushed Stone

A material certification of conformance with the specifications and a grain size analysis (gradation), one per source, will be submitted prior to delivery of the material to the site.

### 3.14 Gravel Surfacing, Bituminous Concrete Base and Subbase Materials

The following submittals, required for gravel surfacing, road base and subbase materials imported by the Contractor, will be made part of the quality control program prior to placing the material:

- A materials certificate stating that material meets the technical specification prior to delivery of soil to the site. If material is obtained from more than one source, then a materials certificate will be submitted from each source.
- A soil classification, grain size analysis (gradation), and modified proctor test results.
- RCRA 8 metals, PCB's, VOC's, SVOC's, Chlorinated Pesticides, ETPH analyses.

The following testing, required of the Contractor, will be made part of the quality control program during placement of the gravel surfacing, road base and subbase material layers:

- Soil classification, grain size analysis, and modified proctor test reports at a rate of at least once per 5,000 cubic yards of material delivered.
- Submit RCRA 8 metals, PCB's, VOC's, SVOC's, Chlorinated Pesticides, ETPH analytical testing reports for each material obtained at the source prior to delivery of the material to the landfill, and at a rate of at least once per 10,000 cubic yards delivered.



- Compaction test reports immediately following field testing of material. Field testing will be measured with a Nuclear Density Gauge at a frequency of one per 2,000 square feet of roadway per layer.

### 3.15 Bituminous Concrete

The Contractor shall submit job-mix design and material certification for each type of bituminous concrete and auxiliary material indicated to the Engineer at least 10 days prior to delivery of materials to the site.

Submit In-place density test results to the Engineer at a rate of one per 1,000 square yards of bituminous pavement installed.

### 3.16 Portland Cement Concrete

The Contractor shall submit job-mix design and material certification for each type of Portland cement concrete and product indicated to the Engineer at least 10 days prior to delivery of materials to the site.

Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof. Submit to the Engineer for testing.

### 3.17 General Fill

The following submittals, required of the Contractor, will be made part of the quality control program prior to delivery of the material to the site:

- A material certification of conformance with the specifications, a grain size analysis (gradation), classification, and a modified proctor analysis, one per source, internal friction angle test reports.
- RCRA 8 metals, PCB's, VOC's, SVOC's, Chlorinated Pesticides, ETPH analyses analysis, one per source.

The following testing, required of the Contractor, will be made part of the quality control program during placement of General Fill:

- Grain size analysis, classification, modified proctor analysis, and internal friction angle testing, one per 5,000 CY delivered to the site.
- Submit RCRA 8 metals, PCB's, VOC's, SVOC's, Chlorinated Pesticides, ETPH analytical testing reports, one per 10,000 CY delivered to the site.
- Compaction test results at a frequency of six per acre per lift, reported daily as placed and compacted.



### 3.18 Geogrid

The Contractor shall submit to the Engineer product data sheet, shop drawings, samples, and certification that the materials) meet the required specifications at least 10 days prior to delivery of materials to the site.

- Submit inventory tickets for each source and each batch delivered to the site.
- Installation Certificate from the installer documenting that the closure system has been installed in accordance with the manufacturer's instructions and warranty requirements.

### 3.19 Miscellaneous

The Contractor shall submit to the Engineer product data sheet and certification that the materials meet the required specifications at least 10 days prior to delivery of materials to the site (including silt fence, catch basin inserts, Floc Logs, warning tape, landfill limit marker, chain link fence and gates, Landfill Gas Piping).

## 4.0 REPORTING AND DOCUMENTATION

### 4.1 General

Documentation consists of the design drawings, approved submittals, addenda, change orders, written clarifications, and all other data required by the contract documents. In addition, documentation prepared by the QAC will include daily field reports, independent laboratory test results (where applicable), and photographs of pertinent phases of the construction.

### 4.2 Project Record Documents

As specified in the contract documents, record documents will be maintained by the Contractor in a safe place at the site and will be annotated to show changes made during construction. The documents will be made available to the Owner and QAC for reference during construction. Upon final completion of the work, the project record documents will be delivered to the QAC for the Owner in connection with final payment.

### 4.3 Final Certification Report

The QAC will prepare a report that documents the closure was conducted in general conformance with the approved plans and specifications. The report will include copies of daily field reports, testing results and as-built plans. The report will be submitted to the CT DEEP upon completion of the landfill closure activities.

### 4.4 As-Built Drawings

In accordance with RCSA 22a-209-13(f), the CRRA will submit to the CT DEEP as-built site drawings certified by a professional engineer licensed in the State of Connecticut that grading and closure have been completed as specified in the approved closure plan. The as-built drawings will be submitted to the CT DEEP within ninety (90) days of completing the landfill closure. The drawings and a detailed description of the landfill will be recorded in the land records of the City of Hartford and a certified copy of the recording will be forwarded to the CT DEEP.



## TABLES



**TABLE 1  
TESTING/REPORTING SUMMARY**

Construction Task/Product	Test/Submittal	Frequency
Landfill Disruption/ Regrading	Odor Control Plan	Once: one week prior to disruption
Cap Base Material	Materials certification & Origin	One per source: prior to delivery
	Gradation, classification permeability, modified proctor interface friction angle and internal friction angle reports	One per source prior to delivery & one per 5,000 CY delivered
	RCRA 8 metals, PCBs, VOCs, SVOCs, Chlorinated Pesticides & ETPH analyses	One per source prior to delivery & one per 10,000 CY delivered
	Compaction test results	6 per acre
	Cap base Depth Test Holes	100' on center
Geomembrane	Material Quality Control Certificates and Manufacturer's factory QC results	Per delivery: Prior to installation
	Product Data, Shop Drawings, Calculations & Details (each product/material)	Prior to installation
	Warranties: Material and Workmanship	Prior to installation
	Installation contractor qualifications	Prior to installation
	Installation superintendent qualifications	Prior to installation
	Proposed panel layout drawing	Prior to installation
	Cap base surface conformation form	Daily prior to work
	Samples	As requested by the QAC
	Trial seam test results	Daily
	Destructive seam test results	One per 1,000 linear feet
	Daily Examination Reports	Daily
	Vacuum test results	Daily
	Air test results	Daily
Installation Certificate & Record Drawings	Subsequent to Installation	
Geocomposite	Material sample, certification	Prior to delivery
Underdrains	Product data sheet and material certification (Perforated and solid-wall pipe and fittings, filter fabric sock, geotextile)	Prior to installation
Geotextiles	Material certification and sample	One per geotextile specified: Prior to installation
Sand Ballast	Gradation, classification & permeability	One per source prior to delivery & one per 5,000 CY delivered
	RCRA 8 metals, PCBs, VOCs, SVOCs, Chlorinated Pesticides & ETPH analyses	One per source prior to delivery & one per 10,000 CY delivered
	Materials certification & Product Information	One per source: prior to delivery
	Sand ballast thickness	20 per acre; randomly determined by Engineer
Drainage Sand	Grain Size (Gradation), classification, permeability, modified proctor, interface friction angle and internal friction angle reports	One per source prior to delivery & one per 5,000 CY delivered
	Compaction test results	6 per acre
	RCRA 8 metals, PCBs, VOCs, SVOCs, Chlorinated Pesticides & ETPH analyses	One per source prior to delivery & one per 10,000 CY delivered
	Drainage Sand Depth Test Holes thickness	100' on center
	Material Certification for soil	One per source: prior to delivery
Vegetative Support Material	RCRA 8 metals, PCBs, VOCs, SVOCs, Chlorinated Pesticides, Herbicides & ETPH	One per source prior to delivery and one per 10,000 CY delivered



Construction Task/Product	Test/Submittal	Frequency
	Grain size analysis, organic content, deleterious material, pH, cation exchange cap., mineral and plant-nutrient content and internal friction angle test report	One per source prior to delivery, and one per 5,000 CY delivered
	Fertilizer Certification	Prior to delivery
	Mulch Certification	Prior to delivery
	Vegetative Support Material thickness	100' on center
	Material certification and catalog cuts for Inorganic Soil Amendments, Organic Soil Amendments, Seed, erosion control blankets	Prior to installation
Turf Establishment	Hydroseed procedure, application rates	Prior to application
	Organic Soil Amendment RCRA 8 metals, PCBs, VOCs, SVOCs, Chlorinated Pesticides, Herbicides & ETPH analyses	One per source prior to delivery
	Maintenance instructions	Prior to installation
	Material certification and sample	Prior to installation
Riprap	Material certification, Origin, Sample & Grain Size (Gradation)	One per source: prior to delivery, and one per 5,000 CY delivered prior to installation
Crushed Stone	Material certification, grain size analysis (Gradation), Classification, modified proctor analysis	For each type of material, one per source: prior to delivery, and one per 5,000 CY delivered
Gravel Surfacing, Bituminous Concrete Base, and Subbase Material	RCRA 8 metals, PCBs, VOCs, SVOCs, Chlorinated Pesticides & ETPH analyses	One per source prior to delivery and one per 10,000 CY delivered
	Compaction test results	One per 2,000 square feet per layer
	Job Mix Design	Prior to installation
Bituminous Concrete	Material Certificates (Bituminous Concrete, Auxiliary Materials including Pavement Marking Paint)	Prior to installation
	In-place density test results	One per 1,000 square yards
	Job Mix Design	Prior to installation
Portland Cement Concrete	Material Certificates for each product used.	Prior to installation
	Composite Samples of each day's pour	One per daily pour.
	Material certification & Origin, grain size analysis (gradation), modified proctor analysis, internal friction angle reports	One per source: prior to delivery, and one per 5,000 CY delivered
General Fill	Grain size analysis (Gradation), classification, modified proctor analysis, and internal friction angle testing	One per source prior to delivery & one per 5,000 CY delivered
	RCRA 8 metals, PCBs, VOCs, SVOCs, Chlorinated Pesticides & ETPH analyses	One per source prior to delivery & one per 10,000 CY delivered
	Compaction test results	6 per acre
	Material certification, Shop Drawings, Sample, Inventory Tickets, Installation Certification)	One per source: prior to Delivery
Geogrid	Product Data, Manufacturer Certificates of Compliance, and sample	Prior to installation
Miscellaneous	Product Data & Manufacturer Certificates of Compliance (Silt Fence, Catch Basin Inserts, Floc Logs, Warning tape, Landfill Limit Marker, Chain Link Fence & Gates, Landfill Gas Piping)	Prior to installation



## FIGURES

# Project Organization Chart

**Quality Assurance Plan  
Phase II MSW Area Closure  
& Photovoltaic System Project  
Hartford Landfill  
Hartford, Connecticut  
March 2013**

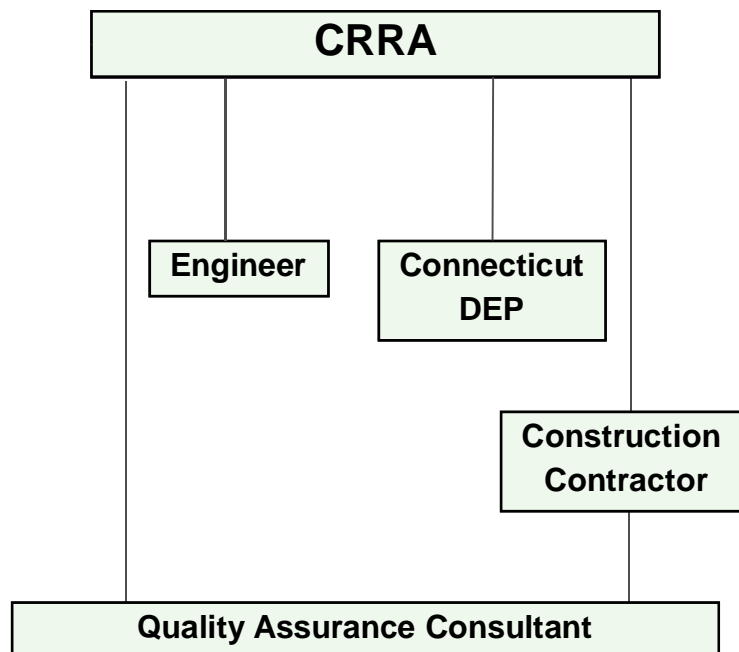


Figure 1