Superfund Records Center
SITE: Central Landfill
BREAK: 8.3
OTHER: 547496

FIVE-YEAR REVIEW REPORT FOR CENTRAL LANDFILL SUPERFUND SITE PROVIDENCE COUNTY, RHODE ISLAND

Prepared by

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Region I
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Date

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LIST OF ACRONYMS

AOC	Area of Containment
ARAR	Applicable or Relevant and Appropriate Requirement
AWQC	Ambient Water Quality Criteria
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
COPC	Constituent of Potential Concern
DNAPL	Dense Non-Aqueous Phase Liquid
EMP	Environmental Monitoring Plan
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ESD	Explanation of Significant Differences
FS	Feasibility Study
GAC	Granular Activated Carbon
gpd	gallons per day
gpm	gallons per minute
HSHCS	Hot Spot Hydrodynamic Containment System
HHRA	Human Health Risk Assessment
LFG	Landfill Gas
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg/L	milligram per liter
NBC	Narragansett Basin Commission
NCP	National Contingency Plan
NPL	National Priorities List
NRWQC	National Recommended Water Quality Criteria
O&M	Operations and Maintenance
OU	Operable Unit
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic aromatic hydrocarbons
PEC	Probable Effects Concentration
PCB	Polychlorinated biphenyl
PEL	Permissible Exposure Level
POTW	Publically Owned Treatment Works
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RIDEM	Rhode Island Department of Environmental Management
RIRRC	Rhode Island Resource Recovery Corporation
RIPDES	Rhode Island Pollutant Discharge Elimination System
RISWMC	Rhode Island Solid Waste Management Corporation
ROD	Record of Decision
SOW	Statement of Work
SVOC	semi-volatile organic compound
TDS	Total Dissolved Solids
TEC	Threshold Effects Concentration
µg/Kg	micrograms per kilogram
µg/L	micrograms per liter
UVox	Ultraviolet-oxidation
VOC	volatile organic compound

EXECUTIVE SUMMARY

This is the third five-year review for the Central Landfill Superfund Site (the "Site"). The triggering action for this statutory review was the signature date of September 26, 2008 on the previous five-year review report. The five-year review is required since hazardous contamination remains at the Site above levels that allow for unlimited use and unrestricted exposure. EPA prepared this five-year review, with technical assistance from AECOM and GZA GeoEnvironmental, Inc., in accordance with the EPA Comprehensive Five-Year Review Guidance, OSWER No. 9355.7-03B-P.

The Site is a 154-acre area within the Central Landfill, an active waste disposal facility in Johnston, Rhode Island. Central Landfill is owned by the Rhode Island Resource Recovery Corporation (RIRRC) and is the largest waste disposal facility in Rhode Island. The Site consists of two operable units, Operable Unit 1 (OU1) and Operable Unit 2 (OU2). OU1 includes the entire 154-acre Site and is comprised of the 121-acre Phase I Landfill area and the 33-acre Phase II and III Landfill expansion areas. The OU2 Study Area included 1,333 acres surrounding, but not including, the 154-acre OU1 Site.

The June 1994 Record of Decision (ROD) for OU1 specified a multi-component source control remedy, including capping the landfill; hydraulic containment and treatment of contaminated groundwater that was migrating out of the hot spot area of the landfill (an area of Phase I in which DNAPL was present); implementing institutional controls on groundwater use within RIRRC property; evaluation of the landfill gas collection and combustion system; and long-term monitoring of groundwater, surface water, and air. Pursuant to a ROD issued for OU2 in September 2002, no further action was required beyond the OU1 source control remedy.

The OU1 remedy was implemented in accordance with the requirements of the 1994 ROD, as modified by the 2005 Explanation of Significant Differences (ESD), however, the long-term monitoring program shows that concentrations of contaminants in groundwater at the compliance boundary exceed the groundwater performance standards for certain Site Contaminants of Concern (COCs). The remedy is currently protective because institutional controls prevent exposures. EPA Region 1 expects that the hydraulic containment system will be modified pursuant to the anticipated ESD that is being prepared concurrently with this five-year review report. The remedy, as will be discussed in the ESD, is expected to be protective because 1) the integrity of the cap and the landfill gas collection system will be maintained during the construction of the Phase VI landfill on top of OU1, and 2) the new hydraulic containment and treatment systems will be constructed such that the OU1 groundwater contaminant plume is prevented from migrating beyond the compliance boundary.

Note: This five-year review is for the Central Landfill Superfund Site only. As described above, the Superfund Site consists of only a portion of the Central Landfill (that is, Phases I, II and III of the Landfill). This review does not provide an evaluation of or conclusions for the entire Central Landfill.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Central Landfill		
EPA ID: RID980520183		
Region:1	**State:**RI	**City/County:** Johnston/Providence

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency:EPA **If "Other Federal Agency" was selected above, enter Agency name:**
Author name (Federal or State Project Manager): Claire Willscher
Author affiliation:EPA Region 1
Review period: February 2013–September 2013
Date of site inspection: April 23, 2013
Type of review: Statutory
Review number:3
Triggering action date: September 26, 2008
Due date *(five years after triggering action date)*:September 26, 2013

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU-2 is protective of human health and the environment.

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	Issue Category: Remedy Performance			
	Issue: The Phase VI expansion of the active landfill will ultimately bury the existing OU1 hydraulic containment and groundwater treatment systems under 150 feet of waste and will force operation of those systems to cease			
	Recommendation: RIRRC to: design and install new extraction well(s) to adequately capture OU1 plume; determine treatment requirements for water from new extraction well(s) and relocate or replace existing groundwater treatment system, as necessary; locate and install additional monitoring wells to assess the extraction network, containment, compliance with performance standards, and treatment effectiveness.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	9/30/15

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	Issue Category: Remedy Performance			
	Issue: It has not yet been determined if the source of the metals in the Upper Simmons Reservoir sediments is or is not Site-related			
	Recommendation: RIRRC to complete study that is underway to determine whether these metals are or are not from OU1			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	9/30/14

Protectiveness Statement(s)

Operable Unit:	*Protectiveness Determination:*
OU1	Short-term Protective

Protectiveness Statement:
The OU1 remedy is protective of human health and the environment in the short-term, but may not be protective in the long-term. Long-term protectiveness is reliant upon the: design and installation of the relocated hydraulic containment system to adequately capture the OU1 plume; determination of treatment requirements for water from the new extraction well(s) and the relocation or replacement of the existing groundwater treatment system, as necessary; location and installation of additional monitoring wells to assess the extraction network, containment, compliance with performance standards and treatment effectiveness; assessment of the Phase V underdrain treatment system; and, completion of the study to determine the extent of OU1 contribution to metals in the USR sediment.

Sitewide Protectiveness Statement (if applicable)

Protectiveness Determination:
Short-term Protective

Protectiveness Statement:
The OU1 remedy and OU2 no further action decision are protective of human health and the environment in the short-term, but may not be in the long-term since groundwater at the compliance boundary exceeds groundwater performance standards for certain Site COCs and the levels of metals in the Upper Simmons Reservoir may present a long-term ecological risk, but may not be Site related. Long-term protectiveness is reliant upon the: design and installation of the relocated hydraulic containment system that adequately captures the OU1 plume; determination of treatment requirements for water from the new extraction well(s) and the relocation or replacement of the existing groundwater treatment system, as necessary; location and installation of additional monitoring wells to assess the extraction network, containment compliance with groundwater performance standards and treatment effectiveness; assessment of the Phase V underdrain treatment system; and, completion of the study to determine the extent of OU1 contribution to metals in the USR sediment.

SECTION 1.0 INTRODUCTION

The purpose of five-year reviews is to determine if the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

EPA is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, as amended (CERCLA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121(c) states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

Section 300.430(f)(4)(ii) of the NCP, within the Code of Federal Regulations (CFR), states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

This third five-year review for the Central Landfill Superfund Site (Site) is required by statute because the selected remedy for OU1 and the no further action decision for OU2 result in hazardous substances, pollutants, or contaminants remaining on the Site above levels that would allow for unlimited use and unrestricted exposure. The triggering action for this statutory review was the completion of the second five-year review for the Site on September 26, 2008.

SECTION 2.0 SITE CHRONOLOGY

A Site chronology is presented in the following table, which lists significant Site events and the associated date or duration.

Chronology of Site Events	
Event	**Date**
Part of Site used as a sand and gravel quarry/stone operation	1952 through 1955
Site operated as a refuse burning dump	1955 through 1962
Large volumes of liquid industrial wastes disposed of in "Hot Spot" area	mid to late 1970s
The Rhode Island Solid Waste Management Corporation (RISWMC), now the Rhode Island Resource Recovery Corporation (RIRRC) purchased the Site from the Silvestri Brothers	June 1980
EPA issued RISWMC an Administrative Order to produce a proposal for monitoring, sampling, testing, analysis, and reporting at the Central Landfill	June 1984
RIDEM and RISWMC enter into Consent Agreements to remedy violations of state Rules and Regulations for Solid Waste Management Facilities	August 1984
Final listing on EPA National Priorities List (#269)	June 1986
EPA Issues Consent Order to the RISWMC for Performance of OU 1 RI/FS	April 1987
Completion of Remedial Investigation for OU1	March 1993
Completion of Feasibility Study for OU1	December 1993
OU1 Record of Decision is signed	June 1994
Consent Decree entered by Federal Court for OU1	May 1996
100% Final Cap Design approved by EPA	November 1997
Start of on-Site construction at OU1 (date that triggers a five-year review)	August 1998
Completion of Remedial Investigation for OU2	March 2001
OU2 Record of Decision is signed	September 2002
First Five-Year Review Completed	September 2003
Explanation of Significant Differences issued to remove requirement to treat Hot Spot groundwater on-site with UV oxidation	September 2005
OU1 Cap Construction Completed	November 2005

Chronology of Site Events	
Event	**Date**
Pre-Final Inspection of OU1 Cap by EPA	November 2005
100% Hydraulic Containment and Groundwater Treatment System Design approved by EPA, with Comments	September 2006
Operation of Hydraulic Containment and Groundwater Treatment System Begins	September 2006
Pre-Final Inspection of Hydraulic Containment and Groundwater Treatment System Design by EPA	September 2006
Preliminary Closeout Report Issued by EPA	September 2006
Second Five-Year Review Completed	September 2008
Phase VI Landfill license issued by RIDEM	February 2011
Upper Simmons Reservoir Data Summary and Work Plan approved by EPA	June 2011
Relocated Hot Spot Hydrodynamic Containment System Drilling Work Plan conditionally approved by EPA	November 2012

SECTION 3.0 BACKGROUND

3.1 Physical Characteristics

The Central Landfill Superfund Site (Site) is a 154-acre area within the Central Landfill, an active waste disposal facility located on a 610-acre parcel at 65 Shun Pike in Johnston, Rhode Island (Figure 1). Central Landfill is owned by the Rhode Island Resource Recovery Corporation (RIRRC) [formerly known as the Rhode Island Solid Waste Management Corporation (RISWMC)] and is the largest waste disposal facility in Rhode Island, servicing the majority of communities in the state.

The Site consists of two operable units, Operable Unit 1 (OU1) and Operable Unit 2 (OU2). OU1 includes the entire 154-acre Site and is comprised of the 121-acre Phase I Landfill area (Phase I) and the 33-acre Phase II and III landfill areas (Figure 2). Note that the acreage for each of these areas includes only the footprint of that area beyond its overlap onto previously-filled Phase(s); for example, waste deposited in the Phase II and III areas actually has an aerial extent of almost 80 acres, since it includes the 33-acre footprint plus a 48-acre overlap onto Phase I. The OU2 Study Area included about 1,333acres surrounding, but not including, the 154-acre OU1 Site (see Figure 2).

3.2 Land and Resource Use

The Central Landfill has been owned and operated by RIRRC since 1980. Prior to 1980, the Site was owned by the Silvestri Brothers. From 1952 to 1955, a portion of the Site was used as a combination sand and gravel/quarry stone operation. From 1955 to 1962, the Site was operated as a refuse burning dump. The Site has been used as a solid waste disposal area since 1962.

Phase I was the original licensed landfill at the Site. By the time the OU1 ROD was signed, landfilling in Phase I was complete (June 1993), and the landfill had been expanded into the Phase II area. By 1997, landfilling had begun in the Phase III area. Since these two expansion areas overlapped the west side of Phase I, they had to be considered in the remedy for Phase I. The Phase I landfill (121 acres) is unlined. The remaining Phases have a double baseliner or double composite baseliner and leachate collection systems.

When Central Landfill needed to expand beyond Phase III in 2000, the Phase IV landfill, with a footprint of 44 acres, was developed to the southwest of OU1. Phase V, with a footprint of 32 acres, was subsequently developed to the southeast of OU1 in 2004. Both of these expansion areas overlapped onto the southern side of OU1. Since Phases IV and V are now nearly full, a 153-acre Phase VI expansion area is being developed. The Phase VI expansion was licensed by the Rhode Island Department of Environmental Management (RIDEM) in February 2011. Approximately 103 acres of this expansion will lie to the east of Phase I, and the remainder will overlap the eastern slope of OU1 (Figure 2).

The RIRRC-owned parcel on which the Central Landfill (including the 154 acres of OU1) and the associated facilities are located encompasses about 610 acres. Most of the land that closely surrounds OU1 is dedicated to landfill-related activities. To the south, most of the land between OU1 and Shun Pike is occupied by active landfill areas (Phases IV and V), sedimentation ponds, the landfill perimeter road, the relocated Cedar Swamp Brook, and four landfill gas-related facilities including a landfill gas (LFG) treatment and compression facility, an ultra low emissions LFG flare, an enclosed LFG flare, and a secondary LFG-to-energy plant.

To the east of OU1, the landfill-related facilities include the former primary LFG-to-energy plant (inactive and planned to be demolished in 2013), RIRRC administrative offices, and facilities related to vehicle maintenance, materials recycling, waste tipping, leachate treatment, and OU1 groundwater treatment. The new LFG-to-energy plant is located on the south side of Shun Pike opposite the landfill entrance.

Fewer landfill-related operations and facilities are located to the north and west of OU1. They include materials stockpiles, areas used for production and storage of compost, and sedimentation ponds.

In addition to the 610-acre parcel occupied by the landfill and related facilities, RIRRC owns other parcels that

bring the total holdings to about 1,300 acres. The total holdings include a large tract of undeveloped land to the west; a buffer zone of undeveloped land along Central Avenue to the north; and undeveloped buffers between the landfill and Apple Tree Lane (to the northeast) and Old Pocasset Road (to the east). The other parcels also include miscellaneous undeveloped and developed parcels to the east of the landfill parcel, including an undeveloped strip of land along the north shore of the Upper Simmons Reservoir and several properties with buildings on Shun Pike opposite the landfill entrance.

Beyond the RIRRC-owned land, the Site is surrounded by rural and suburban residential development, commercial/industrial properties, and undeveloped land. The nearest residential properties are north of the Site, to the north of Central Avenue; and northeast of the Site, on Apple Tree Lane and Old Pocasset Road. A large area of commercial and industrial development exists to the east of the landfill. The Rhode Island State Energy Center, a gas-fired (formerly Florida Power and Light) power plant, is one of main entities in that area. Properties along the south side of Shun Pike and Green Hill Road, to the south of OU1, include closed landfills and commercial/industrial facilities, with occasional residences farther west on Shun Pike.

The Upper and Lower Simmons Reservoirs are located southeast of the Site and were part of the OU2 Study Area. The Almy Reservoir, located northeast of the Site, was also included in the OU2 Study Area. These reservoirs are designated as Class B surface waters by RIDEM, which means that they are designated for fish and wildlife habitat and recreational activities and are not suitable for use as a drinking water supply.

The majority of the groundwater within the OU2 Study Area has been classified by RIDEM as GA (suitable for drinking water without treatment). The groundwater below the Site is classified as GC - suitable for certain waste disposal purposes for active landfill phases, and as GB for closed landfill phases. RIDEM has also established a GB buffer around the waste disposal areas that extends 100 feet upgradient and 500 feet downgradient or the distance to the nearest receiving water body from a landfill, whichever is closer. GB groundwater aquifer areas are defined as groundwater resources which may not be suitable for public or private drinking water use without treatment due to known or presumed degradation.

The approximately 1,300-acre property owned by RIRRC is mostly fenced on the north, east, and south sides. The western boundary is mostly unfenced, and the large undeveloped western portion of the RIRRC property is occasionally used by hunters or other trespassers traveling on foot. Vehicular access is limited to gated roadways off Shun Pike and Central Avenue. The property is under constant patrol by RIRRC security personnel. Land uses within the RIRRC-owned property are not likely to change significantly in the future.

3.3 History of Contamination

During the mid to late 1970s, an approximately ½-acre area, located within the unlined Phase I landfill, was used by the Silvestri Brothers for disposal of large volumes of liquid industrial waste. This area is referred to as the hot spot. According to RIDEM waste manifests, industrial wastes were accepted and disposed of in the hot spot during the period of December 1976 through May 1979. Between January 1978 and May 1979, industrial waste manifests were submitted to RIDEM. The manifests indicate that wastes disposed of at the Site included aqueous solutions of latex waste, acid waste, corrosive waste, water soluble oils, and waste solvents such as methylene chloride, toluene, 1,1,1-trichloroethane, and tetrachloroethylene. Limited information was available concerning the types and quantities of wastes that were disposed of prior to January 1978 because neither federal nor state hazardous waste regulations were in effect at that time.

Between May 1979 and February 1981, approximately 10 acres in the northeast portion of the Site received large volumes of untreated liquid sewage sludge. That area was subsequently covered with about fifteen feet of landfill debris and daily soil cover.

In 1984, the Site was proposed for inclusion on EPA's National Priorities List (NPL). In June 1984, EPA issued an Administrative Order to RISWMC pursuant to the authority granted to EPA under Section 3013 of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6934. The Order required RISWMC to produce a proposal for monitoring, sampling, testing, analysis, and reporting at the Central Landfill. The Order was based on EPA's determination that the landfill may have presented a substantial hazard to human health and the environment. The Site was added to the NPL in June 1986.

3.4 Initial Response

In 1986, RIRRC, in conjunction with the RIDEM and the Town of Johnston, initiated a project to provide public drinking water to area residents. The project was completed in 1990.

A landfill gas to energy facility was constructed at the Site in 1990. This facility was expanded in stages until it included 13 engine generator sets - nine at the Main (Waukesha) Plant, and four at the Stage 2 (Caterpillar) Plant. Recently the Waukesha plant was replaced with a combined-cycle turbine generation plant.

RIRRC expended approximately $23,000,000 acquiring residentially-zoned property located within 1,000 feet of the licensed landfill area and offered residents within the next 1,000 feet the option of selling their property to the RIRRC. This property acquisition was mandated by the Rhode Island State Legislature.

In April of 1987, after the Site was listed on the NPL, EPA and RIRRC entered into a Consent Order to perform a remedial investigation and feasibility study (RI/FS). Field work for the RI began in January 1986 and was completed in November 1991. The RI was completed in March 1993. During the field investigations, the project was divided into Operable Units 1 and 2. The FS for OU1 was completed in December 1993. Field work for the OU2 RI was conducted between June 1992 and July 1998 and also in December 2000. The OU2 RI, including the baseline risk assessment report, was completed in March 2001.

3.5 Basis for Taking Action

The following paragraphs summarize the contaminants detected at the Site as part of the OU1 RI.

3.5.1 Groundwater

Several volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), and inorganics were detected in groundwater samples collected around the perimeter of the landfill area. Groundwater in the vicinity of the hot spot area contained much higher levels of VOCs and SVOCs. Groundwater samples from wells close to the 610 acre property line contained only slightly elevated levels of a few VOCs, SVOCs, and inorganics.

3.5.2 Soil

VOCs, SVOCs, pesticides, and metals were detected in soil samples collected from locations downgradient of the Site. Compounds that were considered constituents of potential concern (COPCs) for the human health risk assessment included several polycyclic aromatic hydrocarbons (PAHs) and metals.

3.5.3 Sediment

VOCs, SVOCs, pesticides, polychlorinated biphenyls (PCBs), and metals were detected in sediment samples from locations in the Almy and Upper Simmons Reservoirs, Cedar Swamp Brook, Quarry Stream, associated wetlands areas, and the four on-Site landfill sedimentation ponds that existed at the time. Compounds that were considered COPCs included several PAHs and metals.

3.5.4 Surface Water

VOCs, SVOCs, pesticides/PCBs, and metals were detected in one or more surface water samples from locations in the Almy and Upper Simmons Reservoirs, Cedar Swamp Brook, Quarry Stream, associated wetland areas, and the four landfill sedimentation ponds. Compounds that were considered COPCs included one VOC, one pesticide, and several metals.

3.5.5 OU1 Risk Evaluation

A human health risk assessment (HHRA) was performed for the Site in 1993 by CDM Federal Programs Corporation (CDM FPC, 1993). The risk assessment concluded that there were no complete exposure pathways for human receptors under Site conditions at that time, but that there were complete exposure pathways under hypothetical future use conditions. The OU1 HHRA concluded that there were no significant risks associated with exposure to estimated future concentrations in the surface waters of the Upper Simmons and Almy Reservoirs; however, the HHRA indicated that there was insufficient data to completely characterize the human health risks associated with recreational use of these two water bodies. The OU1 HHRA also concluded that there is potential future risk to human health from ingestion and dermal contact with groundwater beyond the toe of the landfill but within the RIRRC-owned property. The source of this groundwater contamination was determined to be the 121-acre Phase I landfill of the Central Landfill. These conclusions formed the basis of the selected remedy for OU1, which focused on capping the solid and industrial hazardous wastes and containing the source of groundwater contamination.

3.5.6 OU2 Risk Evaluation

The HHRA for OU2 concluded that contaminants present in soil, surface water, and sediment within the OU2 Study Area and in groundwater outside of the RIRRC-owned property do not pose a significant risk to human health. The HHRA assumed that residents downgradient of the Site were not and will not be using groundwater as a drinking water source, since institutional controls were required as part of the OU1 remedy.

The Ecological Risk Assessment (ERA) for OU2 concluded that there was no significant risk to aquatic biota including fish, planktonic and epiphytic organisms, and benthic organisms in the Upper and Lower Simmons Reservoirs from contaminants present in surface water and sediments. The ERA also concluded that there were no significant indirect impacts to fish and wildlife that depend on those species for food. These determinations were the basis for the decision that no further remedial action was needed for OU2.

SECTION 4.0 REMEDIAL ACTION

4.1 Remedy Selection

This section outlines the OU1 remedy and the OU2 no further action decision.

4.1.1 Operable Unit 1

The EPA Record of Decision (ROD) for OU1 of the Site was signed in June 1994. The remedial action objectives (RAOs) listed in the ROD are:

- Minimize the effects of landfill contaminants on groundwater quality; specifically, reduce to a minimum the amount of precipitation allowed to leak through the waste column and infiltrate to the groundwater;
- Eliminate potential future risks to human health through direct contact with landfill contaminants by maintaining a physical barrier;
- Minimize migration of contaminants in groundwater so that groundwater is not injurious to the aquatic ecological system of receiving water bodies (Upper Simmons Reservoir, Cedar Swamp Brook, and Almy Reservoir);
- Minimize risks to human health associated with potential future consumption of and direct contact with groundwater;
- Comply with state and federal applicable or relevant and appropriate requirements (ARARs); and
- Minimize potential impacts of implementing the selected source control alternative on adjacent surface waters and wetlands.

The selected source control remedy for OU1 of the Site, as identified in the ROD, consisted of the following components:

- Constructing a multi-layer RCRA C cap over the existing 121-acre Phase I area and incorporating the existing 32 acres of RIDEM approved cap on the side slopes;
- Hydraulic containment and treatment of groundwater in the hot spot area of the landfill and discharging the treated groundwater to either on-site surface water or the Cranston Waste Water Treatment Plant;
- Implementing deed restrictions on groundwater use and land development within property owned by RISWMC;
- Initiating a long-term program of sampling and analysis of groundwater, surface water, and air;
- Conducting a detailed evaluation of the existing landfill gas collection and combustion system; and
- Installing a chain link fence to prevent access.

As stated in the ROD, the selected remedy uses a combination of capping and containment of groundwater to prevent or minimize the release of hazardous substances from the 121-acre Phase I area to the groundwater. Over time, these two components of the remedy are expected to 1) prevent groundwater that has contaminant concentrations exceeding Maximum Contaminant Levels (MCLs), non-zero Maximum Contaminant Level

Goals(MCLGs), or risk-based standards from migrating beyond the compliance boundary; and 2) prevent the degradation of surface waters below surface water standards.

4.1.2 Operable Unit 2

The ROD for Central Landfill OU2 was issued by EPA in September 2002. The ROD concluded that because the baseline risk assessments for OU2 revealed no unacceptable human health or ecological risks related to the Site, no further remedial actions other than those required by the OU1 ROD were necessary.

4.2 Remedy Implementation

In a Consent Decree (CD) entered in May 1996, RIRRC agreed to perform and pay for the Remedial Design/Remedial Action (RD/RA) and operation and maintenance for the Site. The design and implementation of the remedial actions for OU1 are discussed below, by component. The remedial actions have been completed, and a Preliminary Close-Out Report was issued for the Site by EPA in September 2006.

4.2.1 Construction of the Landfill Cap

Following the completion of preliminary investigations, the landfill cap was designed in 1996 and 1997. The capping of the 121-acre Phase I area included the construction of approximately 88 acres of new cap and the incorporation of a 33-acre RIDEM-approved cap that had been previously constructed. The OU1 cap was completed in November 2005.

4.2.2 Hydrodynamic Containment and Treatment Systems

The OU1 ROD and the RD/RA Statement of Work (SOW) for the May 1996 CD describe the performance standards for the source control remedy for the Site as "prevent groundwater that has contaminant concentrations exceeding MCLs and non-zero MCLGs from migrating beyond the compliance boundary ... or; in the absence of MCLs or non-zero MCLGs, prevent groundwater that has contaminant concentrations above levels that are protective of human health from migrating beyond the compliance boundary" and "prevent the prevent degradation of surface waters below surface water standards."

Between July 2003 and April 2004, monitoring wells were installed through the Phase I landfill upgradient, within, and downgradient of the hot spot. Downgradient wells were installed along the presumed axis of the contaminated groundwater plume. An extraction well, MW03-ML11, was also installed in the hot spot area. Through the conduct of pumping tests and groundwater modeling, it was predicted that the single extraction well operating at a rate of 3.3 gallons per minute (gpm) would contain contaminated groundwater as required. The Hot Spot Hydrodynamic Containment System (HSHCS), which consists of the single extraction well located in the hot spot area, began operating in September 2004.

From September 2004 to April 2007, the HSHCS treatment system used granular activated carbon (GAC) to treat the extracted groundwater prior to discharge to the on-site leachate pretreatment facility. RIRRC undertook a bench-scale test of an ultraviolet-oxidation (UVox) system (Calgon Rayox System) in conjunction with Calgon Corporation in the spring of 2005. The results demonstrated that there were significant technical issues and cost limitations associated with the implementation of UVox at the Site. RIRRC submitted a Publicly Owned Treatment Works (POTW) Discharge Assessment/Evaluation Explanation of Significant Difference (ESD) Support Evaluation in July 2005. EPA issued an ESD in September 2005 that eliminated the requirement to treat the extracted groundwater using an on-site UVox system, and allowed for direct discharge to the Cranston Waste Water Treatment Plant.

The 100% Design for the HSHCS (GZA 2006) was approved by EPA in September 2006 (EPA 2006). In April 2007, the temporary GAC treatment system was replaced with a 4-tray QED EZ-Tray air-stripper in accordance with the approved design. At the request of the City of Cranston Department of Public Works, the air-stripper was followed by the GAC system to polish the effluent. In December 2008, the City of Cranston Department of Public Works Director sent a letter to RIRRC stating that the carbon filtration system was no longer required for the HSHCS (City of Cranston, 2008). Consequently, in January 2009, the GAC system was removed from the treatment train.

The HSHCS currently consists of extraction well MW03-ML11 (189 feet deep); a QED Environmental Systems Model AP-3 compressed air-driven submersible pump that pumps at a rate of approximately 3-gallons per minute; conveyance piping, from the pumping well to the treatment system, consisting of approximately 270 feet of above-ground, 2-inch diameter SCH 80 polyvinyl chloride (PVC) pipe; a groundwater treatment system, consisting of a stabilization tank, particulate filters, and the shallow tray air-stripper; and conveyance piping from the treatment system to the on-Site leachate pretreatment system. The extracted groundwater is discharged, with RIRRC's other industrial and sanitary discharges, to the City of Cranston sewage treatment plant.

It was originally anticipated that the air-stripper would only be required as a contingency treatment system when the combined RIRRC industrial wastewater flows were less than 160,000 gallons per day. Under those flow conditions, the dilution of the contaminated groundwater by the other flows was insufficient to keep the concentration of total toxic organics below the discharge limit of 2.13 mg/L. However, due to constraints associated with the leachate treatment system, RIRRC's total industrial wastewater treatment system flow rate has consistently been less than 160,000 gallons per day (gpd); therefore, all extracted groundwater has been treated with the air stripper prior to discharge.

4.2.3 Institutional Controls

In August 2001, RIRRC filed a Declaration of Covenants and Environmental Protection/Conservation Easement on property it owns. The Covenant prohibits the use of groundwater except for remediation purposes, prohibits the installation of groundwater wells or the use of existing groundwater wells, and prohibits the alteration of the groundwater flow in any way.

The Town of Johnston adopted a Town ordinance in February 2003 that, among other things, prohibits the use of groundwater wells and prohibits the Building Inspector from issuing permits for the construction of groundwater wells in any location where access to Town public water is available and where the well or proposed well is located in certain described areas, including where groundwater has been classified by the State as GAA non-attainment, GA non-attainment, GB, GB non-attainment, or GC; and where it is located in the OU2 areas recommended for institutional controls. As a result, the Town ordinance prohibits the use of groundwater anywhere at the Site and in the OU2 areas recommended for institutional controls.

4.2.4 Long-Term Groundwater and Surface Water Monitoring

Long-term monitoring of groundwater and surface water is conducted to address the requirements of the 1996 CD for OU1. Groundwater and surface water monitoring are performed on a quarterly basis. The details of the OU1 monitoring programs are described in the Environmental Monitoring Plan (EMP, GZA GeoEnvironmental, March 2004a). In addition to the OU1 monitoring requirements, the EMP addresses nearly all monitoring requirements for the entire 610-acre landfill operation at Central Landfill.

The EMP was last updated in 2004. Since the OU1 extraction system and the associated monitoring wells were installed in 2006, the monitoring of those wells is described, conducted, and reported separately from the other EMP programs. The groundwater monitoring associated with the demonstration of compliance for the Hot Spot Hydraulic Containment System is also performed quarterly.

4.2.5 Evaluation of the Landfill Gas Collection and Combustion Systems

The performance standards for emissions to air, specified in the 1996 OU1 Consent Decree (CD), require that the RIRRC demonstrate that any releases to the ambient air from any component of the source control remedy at the Site do not result in an unacceptable human health risk and comply with all federal and state ARARs. The Statement of Work (SOW) included in the OU1 CD requires that a Demonstration of Compliance (DOC) Report be submitted, detailing how the performance standards are and/or will be achieved and maintained for OU1. RIRRC finalized a DOC Work Plan in October 2004 (GZA 2004) that described methods both for demonstrating OU1 compliance with ARARs and for evaluating ambient air to demonstrate that the air emissions from OU1 of the Site, through the landfill gas collection and combustion system, do not pose an unacceptable risk to individuals. Ambient air modeling and risk assessment methods were presented in this plan, along with a schedule for submission of an ambient air evaluation and dispersion modeling report, separate from the DOC Report. RIRRC finalized this separate report in 2005 that contained landfill gas generation rate estimates, point source and

fugitive emission concentrations, and exposure point concentrations developed for on-site and off-site exposures. These exposure point concentrations were then used in a risk assessment, completed in 2006 (GZA 2006a). The evaluation concluded that the gas collection and combustion system was in compliance with state and federal regulations for OU1 of the Site, and the risk assessment concluded that the air emissions, specific to OU1 of the Site, from the combustion facility presented no risks to human health.

The DOC Report, which includes copies of all relevant documents pertaining to the evaluation, was submitted to EPA in August 2009. The DOC Report provides methods for demonstrating on-going compliance with air ARARs. EPA provided written comments on the DOC Report in February 2011, and RIRRC provided responses to EPA in January 2012. EPA provided minor additional comments on the comment responses in April 2012 and indicated that the comments could be addressed in the final DOC Report. The Final Demonstration of Compliance Report is expected to be submitted to EPA in 2013.

To support this five-year review, RIRRC collected a landfill gas sample from the Phase I Main Header at a location prior to entering the now inactive Waukesha Plant. This data was evaluated as part of this five-year review by comparison to the data used in the 2005 and 2006 submittals (see Section 6.4.4).

Note that additional air sampling is conducted throughout the entire Central Landfill area to satisfy other regulatory requirements; these data were not reviewed as part of this five-year review.

4.3 System Operations and Maintenance (O&M)

Operation and Maintenance (O&M) Plans were prepared for the OU1 landfill cap and for the HSHCS (approved by EPA in November 2011). Since the OU1 cap and the landfill gas management systems are intimately connected to active landfill-related operations, the O&M for those components of the remedy have been incorporated into larger O&M documents. The O&M Plan for the HSHCS has been retained as a separate document, since that system is not integrated into other active landfill operations.

4.3.1 Landfill Cap O&M

The routine OU1 cap maintenance activities include cutting of vegetative growth twice per year, and monthly inspections of the storm water control systems (riprap benches, downchutes, and perimeter channels) with the removal of plant growth accumulated sediments as needed.

4.3.2 HSHCS O&M

The HSHCS O&M Plan was most recently updated in June 2010. The Plan includes a regular schedule of inspection and maintenance required to insure adequate functioning of the HSHCS. Maintenance activities are documented in a log which is kept in the HSHCS treatment building and are reported in the monthly progress reports submitted to EPA.

The O&M for the HSHCS is currently performed by a subcontractor, but RIRRC is planning to take over the O&M by summer 2013. RIRRC anticipates that after they take over the O&M, a subcontractor will continue to perform the monitoring and reporting for the system.

4.3.3 O&M Costs

A summary of annual O&M Costs is provided in the table below.

Environmental Monitoring for OU1/Phase I Landfill	**Annual Cost**
Sampling and Analysis	$60,000
Data Validation, Data Entry and Quality Control	$24,000
Monthly Groundwater Elevation Survey	$6,000
Data Management, Evaluation and Reporting	$38,000
SUBTOTAL	**$128,000**
O&M of the Hot Spot Hydrodynamic Containment System	

Labor	$124,000
Electrical Subcontractor Costs	$3,000
Routine Pump Removal and Replacement Support	$17,000
Other Subcontractors	$11,000
SUBTOTAL	**$155,000**
Cap Maintenance	
Cap Maintenance, Mowing and Erosion Repair	$60,000
SUBTOTAL	**$60,000**
TOTAL	**$343,000**

Note: The environmental monitoring costs include the HSHCS monitoring as well as the OU1 portion of the site-wide Environmental Monitoring Plan.

SECTION 5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

At the time the second Five-Year Review report was published (September 2008), the physical components of the remedial action had been completed and were operating. No additional remedial construction activities have occurred since the last review.

The last Five-Year Review identified four issues that required follow-up actions. Those issues and the actions taken since the last Review are discussed below.

5.1 Issue 1: The Phase VI Landfill Expansion

The proposed 153-acre Phase VI Landfill expansion will have a footprint of approximately 103 acres to the east of OU1 and will overlap the eastern side of the Phase I landfill by about 50 acres. During the 2008 five-year review, it was recognized that in addition to its potential impacts on the Phase I cap, the proposed Phase VI expansion would require relocation of the Waukesha gas to energy plant, the Hot Spot Hydraulic Containment System (HSHCS) treatment system, and possibly the extraction well itself. The 2008 Five Year Review included a recommendation that RIRRC evaluate the Phase VI impacts to the OU1 remedy and propose a plan for minimizing those impacts. This recommendation has been completed as described below.

Since the last five year review, the Phase VI expansion has been designed, and in April 2010, a Landfill License Application was submitted, and RIDEM issued the Phase VI Landfill License in February 2011.

In the 50-acre area where Phase VI will overlie Phase I, the design preserves the integrity of the OU1 cap, which will serve as the secondary liner for the Phase VI leachate collection system in the overlap area. The design also includes collection of LFG from the Phase I overlap area to prevent LFG buildup under the Phase VI baseliner. Subsequent to presenting the Phase VI design in the April 2010 license application, RIRRC proposed changes to the LFG collection system in the Phase I overlap area. These changes were presented in the Phase VI Modification-Landfill Gas Collection System Design, Rhode Island Resource Recovery Corporation Landfill Johnston, Rhode Island (SCS Engineers, October 13, 2011).

The former LFG-to-energy (Waukesha) plant, which is within the Phase VI footprint, has been abandoned and is scheduled for demolition in 2013, after the equipment has been removed and the building has been decontaminated. The new turbine LFG-to-energy plant has been constructed at 40 Shun Pike and is expected to start commercial operations by mid 2013.

Under the current design, the thickness of Phase VI refuse at the HSHCS extraction well will eventually be approximately 150 feet. Based on RIRRC's experience with LFG extraction wells, extending any extraction well (LFG or groundwater) on the landfill more than 20 feet vertically is problematic, due to uneven waste settlement, which can pinch the well and create an obstruction. Therefore, extending the existing extraction well upward as Phase VI is filled is considered to be impracticable. Drilling a replacement well after Phase VI refuse placement is complete would also be problematic because of the depth of waste and the presence of the OU1 cap and Phase VI baseliner. Due to the difficulties in maintaining the existing extraction well during active landfilling in Phase VI or installing a replacement well when landfilling is complete, RIRRC recommended that, in lieu of pumping from the hot spot area, the extraction well be moved downgradient to the toe-of-slope of the waste management area, in the area where the proposed Phase VI Landfill and the existing Phase V Landfill intersect.

Following technical reviews and discussions, EPA Region 1 and RIDEM expect that the hydraulic containment system will be relocated near the toe-of-slope of the waste management area described above. It is anticipated that the relocated extraction well (or wells) and the Phase V underdrain will adequately contain the OU1 contaminated groundwater plume to achieve the performance standards for the overall remedy in the OU1 ROD provided that additional well installations and groundwater testing are

performed to demonstrate that containment is achieved. The existing hydraulic containment system in the hot spot area will be decommissioned after the relocated containment system is demonstrated, through an evaluation conducted by RIRRC, subject to EPA's approval, in consultation with RIDEM, to achieve full capture of the entire groundwater plume and the capability to achieve groundwater and surface water performance standards within a reasonable timeframe. The relocation of the hydraulic containment system to the toe-of slope of the waste management area (as described above) would be a significant change from the OU1 ROD-required groundwater containment system, but it would not fundamentally alter the overall remedy. Therefore, EPA Region 1 currently expects to issue an Explanation of Significant Differences (ESD) decision document to implement this revision to the OU1 remedy.

A Work Plan for drilling, well installation, and groundwater testing to support relocation of the extraction well (or wells) was prepared by RIRRC (see Figure 4). The plan was conditionally approved by EPA and RIDEM in November 2012. The Work Plan is currently being finalized and RIRRC anticipates that implementation of the Work Plan will begin in fall 2013.

The Phase VI landfill expansion will also require relocation of the HSHCS treatment system. It is currently anticipated that the existing system, which is mounted in a Conex storage box, will be capable of providing any required treatment and will simply be moved to a location near the new extraction well(s). The requirements for the treatment system for the new extraction well(s) will be determined by the contaminant concentrations in the extracted water (which are expected to be lower than those in the existing HSHCS extraction well) and by the water quality requirements dictated by a new wastewater management system that RIRRC is developing.

Currently, the effluent from the HSHCS treatment system (average flow of about 4,300 gpd) flows to RIRRC's leachate treatment plant (average flow of about 280,000 gpd), and the combined effluents are discharged to the City of Cranston Publically Owned Treatment Works (POTW). However, RIRRC is in the process of constructing a new leachate treatment plant and is changing its POTW service provider from the City of Cranston to the Narragansett Bay Commission (NBC). The new leachate treatment plant will use a sequencing batch reactor system, which will provide flexibility for treatment for organics in the combined waste stream. The new leachate treatment plant is anticipated to be in operation in 2015.

Construction is nearly complete on a new force main and gravity sewer that will convey the combined effluent to its connection point with the NBC sewage collection system at the intersection of Central Avenue and Atwood Avenue. When connected to the NBC system, the RIRRC combined wastewater flow will receive final treatment at the NBC Fields Point wastewater treatment facility in Providence.

It is anticipated that construction for the Phase VI landfill expansion will begin in spring 2014, and that waste disposal in Phase VI will begin in 2015. However, the east slope of Phase I (onto which Phase VI will overlap) is not in the initial Phase VI disposal area, so waste placement in the hot spot area may not begin until 2016.

When the OU1 ROD was written, Cedar Swamp Brook flowed along the southern border of OU1 and emptied into sedimentation pond ("Pond") 2. During the Phase IV expansion, the segment of the channel in that area had been moved to the south, so that water from upstream flowed around the southern side of Phase IV. Once the channel passed Phase IV, it turned north and rejoined the original brook channel just south of OU1, which still discharged to Pond 2. When the Phase V expansion occurred, it was again necessary to move the brook channel. A new channel was created to the south of the Phase V footprint. This channel conveyed the upstream waters (which had previously been re-routed around the southern side of Phase IV) past Phase V, past the southern side of Pond 2, beneath Shun Pike, and on to the Upper Simmons Reservoir.

While the new channel solved the problem of re-routing Cedar Swamp Brook around Phase V, it was also desired to preserve the function of the original brook channel beneath Phase V as a groundwater discharge/collection feature. Therefore, the streambed was filled with stone, to create an underdrain that would control groundwater levels beneath Phase V and continue to collect contaminated groundwater

from OU1 (see Figure 2). The underdrain, like the former stream channel, was configured to discharge to Pond 2.

With the Phase I landfill capped and the extraction well designed to contain the OU1 contaminated groundwater plume in the source (hot spot) area, it was reasonable to assume that the discharge of OU1 contaminants to the underdrain would eventually cease or decline to concentrations that would not impair surface water quality downstream of Pond 2. However, with the anticipated relocation of the extraction system to the toe-of-slope, the discharge of the western part of the OU1 plume to the underdrain may continue, since the capture zone of the relocated extraction system may not extend far enough to the west.

The effects of the underdrain discharge on the functioning of Pond 2 as a detention pond were being evaluated by RIDEM as part of the RIPDES program at the same time that the potential impacts of relocating the extraction system were being evaluated. Since the underdrain contributes excessive concentrations of ammonia and iron to Pond 2, RIDEM required that the discharge from the underdrain be captured, treated to remove ammonia and iron, and discharged to the re-routed Cedar Swamp Brook instead of to Pond 2. To comply with the RIPDES permit, the system (which was being constructed as of spring 2013) will consist of flow equalization; precipitation to remove iron by aeration and caustic addition; settling of iron solids; and biological treatment through a sand filter to oxidize ammonia-nitrogen. The designer of the system has predicted that, in addition to ammonia and iron, the system will treat four primary organic contaminants (chlorobenzene, benzene, 1,4-dichlorobenzene, and phenol, the first three of which are Site contaminants of concern (COCs)). Chlorobenzene, benzene, and 1,4-dichlorobenzene are expected to be removed by volatilization, aeration, and biodegradation. Phenol is expected to be removed by biodegradation and potentially by sorption to biomass in the sand filter. A RIPDES permit is required for the discharge, and EPA will require sampling for all Site COCs, including the three described above, to confirm that the surface water performance standards are met and surface water quality in Cedar Swamp Brook is not impaired.

5.2 Issue 2: Replacement Wells for Long-Term Groundwater Compliance Monitoring Network

Many of the OU1 groundwater monitoring wells, including all wells that were located along the southern toe of Phase I, had to be abandoned when the Phase V expansion occurred. The 2008 Five Year Review included a recommendation that RIRRC propose an update to the long-term groundwater monitoring network. This recommendation has been completed as described below.

Three new pairs of overburden and shallow bedrock monitoring wells (MWP5-1A/B through MWP5-3A/B) were drilled at the toe of the Phase V landfill in 2004. Although those wells were constructed primarily for Phase V monitoring, they were also located in the area where the eastern part of the OU1 groundwater plume emerged from beneath the landfill.

Water quality data from the three MWP5 well clusters confirmed one of the conclusions from the monitoring of the OU1 wells in the Phase V area, which was that an eastern part of the OU1 plume migrates toward Pond 2 in the shallow bedrock and overburden just to the west of Pond 3. However, data from the OU1 monitoring wells that had formerly existed farther to the west in the Phase V expansion footprint had shown, before they were abandoned, that the OU1 plume was also present in shallow bedrock and overburden farther to the west. That western part of the plume had apparently discharged to Cedar Swamp Brook prior to its relocation during the Phase V expansion. The western part of the plume now discharges to the stone-filled underdrain that was built in the brook channel to preserve its hydraulic function as a groundwater discharge feature. That conclusion is based on the presence of OU1 contaminants in the discharge (sampling location SW-4) from the underdrain into Pond 2, and Site hydrology.

The additional well installations and groundwater testing that are to be conducted downgradient of the landfill toe-of-slope for the anticipated relocation of the OU1 extraction system will also serve to establish the expanded monitoring well network that will be needed to confirm adequate groundwater plume

capture and attainment of performance standards. The Work Plan, which includes the drilling of several deep boreholes, geophysical testing, groundwater sampling, and monitoring well installations has, as mentioned above, been conditionally approved by EPA with RIDEM's concurrence. RIRRC anticipates that implementation of the Work Plan will begin in fall 2013.

5.3 Issue 3: Lower Metals Detection Limits for Surface Water

The 2008 Five Year Review included a recommendation that RIRRC amend the Environmental Monitoring Program to provide lower detection limits for surface waters. This recommendation has been completed as described below.

Following the 2008 Five Year Review report, RIRRC conducted an evaluation of the detection limits that were being achieved for analyses of metals in surface water samples collected as part of the OU1 monitoring program. The objective was to determine if its laboratory subcontractor could implement different analytical methods to achieve detection limits at or below the applicable ambient water quality criteria (AWQC). As a result of this evaluation, EPA determined that RIRRC should adopt the reporting limits associated with Contract Laboratory Procedure (CLP) Statement of Work ISM01.3 (ICP-MS) for surface water analyses.

5.4 Issue 4: Lead and Copper Concentrations in Upper Simmons Reservoir Sediments

The second Five Year Review report identified increasing concentrations of lead and copper in samples of sediments collected from the Upper Simmons Reservoir as an issue to be addressed at the Site, and included the recommendation that RIRRC propose a study to determine the cause for these increases. The recommendation has been completed as described below, and the study was still in progress at the time this report was being prepared.

RIRRC prepared an Upper Simmons Reservoir Data Summary and Work Plan in April 2009. After several iterations, a Revised Work Plan was approved by EPA and RIDEM in June 2011. The final Work Plan included: 1) the collection and laboratory testing of eight sediment samples from storm water control structures (e.g., downchutes and sedimentation ponds) and Cedar Swamp Brook; 2) the collection and laboratory testing of surface water from five locations within the storm water control structures and Cedar Swamp Brook during dry weather; and 3) three rounds of composite storm water sampling and analysis from 14 locations around the Central Landfill.

The sediment sampling and dry weather sampling were completed in June 2011, and the first storm water sampling event was performed in October 2011. Following the first storm water sampling event, the sampling protocols were changed to add two sampling locations and include the filtering and preservation of individual metals sample aliquots upon collection. The second storm water sampling event was performed in September 2012. EPA has requested an evaluation of the data from the first two sampling events prior to the final sampling event and the conclusion of the study. The evaluation was still in progress at the time that this report was being prepared.

SECTION 6.0 FIVE-YEAR REVIEW PROCESS

This section describes the activities performed during the five-year review process and provides a summary of findings.

6.1 Administrative Components

The Central Landfill five-year review team was led by Claire Willscher of EPA, Remedial Project Manager for the Site. Gary Jablonski (Principal Engineer, RIDEM), Emily Zimmerman (Community Involvement Specialist, EPA), Rick Sugatt (Risk Assessor, EPA), Kevin Pechulis (Attorney, EPA) as well as personnel from AECOM and GZA GeoEnvironmental were on the review team.

6.2 Community Notification and Involvement

In May 2013, EPA issued a press release announcing that five-year reviews were being performed at 16 Superfund Sites in New England, including Central Landfill. Soon after the approval of this Five-Year Review report, a press release will be issued for these same 16 Superfund Sites as well as a fact sheet specific to Central Landfill. The Five-Year Review report will be available to the public at the following Site repositories:

Marian J. Mohr Memorial Public Library
1 Memorial Drive
Johnston, RI 02919

EPA – Region 1 (New England) Records Center
5 Post Office Square
Boston, Massachusetts 02109

Rhode Island Department of Environmental Management Office of Waste Management
235 Promenade Street
Providence, RI 02908-5767

6.3 Document Review

This five-year review included a review of relevant documents for both Operable Units including the RODs, 2005 ESD, the Consent Decree for OU1, and O&M and data monitoring plans and reports. Attachment C is a list of documents that were reviewed or are cited in this report.

6.4 Data Review

This section describes the results of the review of groundwater, surface water, sediment, and air quality monitoring data.

6.4.1 Groundwater Monitoring

Groundwater monitoring has been conducted on an approximately quarterly basis since 1980. Two separate OU1-related groundwater monitoring programs are currently implemented at the Site. One of the programs is focused on the monitoring wells within the Phase I landfill footprint and within the OU1 contaminated groundwater plume. This monitoring is associated with the demonstration of compliance for the HSHCS. The other program includes wells beyond the landfill footprint that are within or upgradient of the OU1 contaminated groundwater plume. This second program, which is integrated with

numerous other required monitoring programs at Central Landfill, is designed to assess the overall performance of the remedy. The results from both programs are discussed together in this report, since both programs produce data that is used to assess the performance of the remedy.

The evaluation of data in this report covers the monitoring period from January 2008 to January 2013. Note that the data was collected after pumping started in the hot spot area in September 2004. The following section describes both the comparison of contaminant concentrations to MCLs as well as data trend analysis for samples collected from select locations.

The MCL exceedances for groundwater monitoring conducted over this five-year period were only reviewed as part of this report. Each exceedance was evaluated statistically by calculating the lower confidence limit (LCL) for the five-year data set (i.e., January 2008 through January 2013) at a 95% confidence level and comparing that directly to the MCL.

Trends in contaminant concentrations with respect to time were evaluated using Sen's Test for trends. Trend analyses were run at a 95% confidence level and were evaluated over the same five-year period described above (January 2008 to January 2013).

Groundwater elevation contours from August 2008 are shown on Figure 3. Long-term groundwater monitoring has shown that the shape of the piezometric surface is reasonably consistent over time (see Table 1). The August 2008 groundwater elevation data is presented on Figure 3 because a larger data set (i.e., more wells providing broader areal coverage) was available in August 2008. A large number of wells were permanently abandoned between 2008 and 2013 to accommodate future construction of the Phase VI Landfill.

Upgradient Wells

Monitoring wells considered to be hydraulically upgradient with respect to OU1 include MW-M, WE85-16, WE85-18, MW02-30, MW90-31A, MW95-51, MW95-52, and WE87-ML5A. MW03-55 is within OU1 but upgradient of the hot spot area. Five metals (arsenic, beryllium, cadmium, lead and thallium) and one VOC (benzene) were reported at concentrations above MCLs in samples collected from up-gradient locations. Of the six parameters, only the MCL exceedances for beryllium in wells MW95-51 and WE87-ML5A were statistically significant (see Table 2). Beryllium is a COC for OU1, but its occurrence in upgradient wells suggests that its source may be native soils and bedrock.

Nine constituents had statistically significant trends (see Table 3). Lead, nitrate, and zinc showed statistically significant increasing trends in sample data from locations MW03-55 and MW90-31A. Data from four locations (MW03-55, MW90-30, MW95-51 and MW95-52) had statistically significant decreasing trends for one or more of the following parameters: beryllium, nitrate, ammonia, beryllium, iron, and manganese.

Downgradient Wells

Wells within the footprint of Phase I that are downgradient of the hot spot area include MW03-56, MW03-ML11, MW03-ML12 (A to E), and MW03-ML 14 (A to G). Wells outside the footprint and downgradient of OU1 include MW02-B/B1 (abandoned for the Phase V expansion), MWP5-1 (A&B), MWP5-2 (A&B), MW99-28BR, MW99-29BR and NELF-22 (A&B).

For the downgradient wells within the Phase 1 footprint, there were 17 VOCs, seven metals, and one water quality parameter that exceeded MCLs in one or more samples. A statistical evaluation of VOC MCL exceedances in samples collected from MW03-56 (well installed through hot spot) and MW03-ML11 (groundwater extraction well) showed that 19 of the 22 MCL exceedances were statistically significant. Thirty of the 52 MCL exceedances detected in groundwater plume centerline wells MW03-ML12 (A through E) and MW03-ML14 (A through G) were also statistically significant.

However, the downgradient wells within the Phase 1 footprint had 26 statistically significant decreasing

trends and one increasing trend. Most notable are the decreasing trends in COCs in the samples from monitoring wells MW03-56 and MW03-ML12D, which are just downgradient of the hot spot area. The width of the plume near the hot spot is not well defined but is estimated to be about 400 feet. Based on data from the multi-level wells just downgradient of the hot spot, the plume extends from the water table, which is approximately at the top of bedrock, to a depth about 200 feet below the bedrock surface.

Sample results from downgradient locations beyond the OU1 footprint showed exceedances of MCLs for six VOCs and three metals. The contaminants with statistically significant exceedances are benzene, chlorobenzene, vinyl chloride and beryllium. Twenty-five statistically significant decreasing trends were observed in these downgradient wells, as well as two increasing trends. Most of the decreasing trends were for metals and water quality parameters. A statistically significant decreasing trend for chlorobenzene was identified in samples from wells MW99-29BR and MWP5-1B. This indicates that the HSHCS is capturing at least a portion of the contaminated groundwater plume. The two increasing trends were both for the water quality parameter total dissolved solids (TDS).

Monitoring from existing as well as now-abandoned wells showed that when the plume reaches its discharge points at Pond 2 and the underdrain (that follows the former course of Cedar Swamp Brook under Phase V of the landfill), it is about 1,200 feet wide. Data from a former deep well cluster in this area suggests that the plume is limited in depth to the overburden and shallow bedrock as it approached its discharge points. The drilling program for the installation of the new extraction and monitoring wells will extend into the deeper bedrock to confirm the previously-gathered data.

1,4-Dioxane

The compound 1,4-dioxane is known to be used both as a solvent and as a stabilizer for various chlorinated solvents, especially for 1,1,1-trichloroethane (1,1,1-TCA), which was identified as a COC in the OU1 ROD. In January 2013, 1,4-dioxane was added to the list of analytes for the HSHCS treatment system monitoring. This compound was also added to the groundwater monitoring program starting in February 2013. The results from the samples collected from the HSHCS treatment system in January may be unreliable; however, in February and March 2013, the raw groundwater from the extraction well had 1,4-dioxane concentrations of 800 µg/L and 610 µg/L. Samples collected from the air-stripper effluent at the same time had concentrations of 590 µg/L and 610 µg/L. Air-stripping is not expected to result in any significant removal of 1,4-dioxane from the water.

At the time of preparation of this report, monitoring results for 1,4-dioxane in groundwater (other than the extraction well) were not yet available. Monitoring will continue for 1,4-dioxane and the reevaluation of the treatment system (as described above) will consider 1,4-dioxane.

Groundwater Evaluation Conclusions

The groundwater quality in the OU1 area has improved with time due to a combination of factors, including the HSHCS, the landfill cap, and potentially some natural attenuation. However, groundwater with concentrations of COCs above groundwater performance standards still exists throughout the entire OU1 contaminated groundwater plume. The effects of the operation of the HSHCS for about nine years are currently most evident in samples from groundwater monitoring wells close to the hot spot area. However, groundwater samples collected at the downgradient edge of the waste management area show that concentrations are also declining farther downgradient in the plume but have not achieved cleanup levels beyond the landfill edge.

Collection of contaminated groundwater at the hot spot has had a positive impact on downgradient groundwater quality with time. However, the HSHCS is not fully containing the shallow portion of the contaminated groundwater plume. Further capture could potentially be achieved by installing an additional extraction well within the hot spot area; however, as explained in Section 5.0 of this report, due to technical issues presented by the Phase VI landfill expansion, RIRRC is currently proposing that the existing hydraulic containment system be moved from the hot spot area to the toe-of-slope of the waste management area, in the area where the proposed Phase VI Landfill and the existing Phase V Landfill

intersect.

6.4.2 Surface Water Monitoring

The objectives of the surface water monitoring are to: 1) measure the effect of capping the Phase I landfill and operation of the HSHCS on the concentrations of contaminants migrating from the OU1 area to surface water locations; and 2) ensure that the surface water performance standards for OU1 are achieved.

Surface water samples are collected at nine locations each quarter. Surface water samples for the analyses of metals, except for iron, are filtered with a 0.45 micron filter prior to analysis. Since some locations are dry on a seasonal basis, not all locations are sampled during each monitoring event.

Two of the locations are upstream of OU1 - one near the headwaters of the Quarry Stream designated SW-1A, and the second on Cedar Swamp Brook at the outlet from a water body known as the "swimming hole" designated SW-1B. Four of the monitoring points (SW-A, SW-B and SW-C, and SW-7) are downstream locations along Cedar Swamp Brook. SW-7 is the last sampling point on the brook before it flows under Shun Pike and into the Upper Simmons Reservoir.

The other three locations are related to Pond 2. SW-6 is the outlet from Pond 3, which drains into Pond 2. SW-5 is the outlet from Pond 2, which forms a small stream that flows into the Upper Simmons Reservoir. SW-4 is the discharge of the Phase V stone trench underdrain into Pond 2. Since SW-4 no longer represents water quality in a surface water body, it is discussed separately from the other surface water data.

Annual monitoring reports that include the results from the surface water sampling are prepared by RIRRC and submitted to both EPA and RIDEM. As required by the EMP, the reports include comparisons between contaminant concentrations and National Recommended Water Quality Criteria (NRWQC) as well as the Rhode Island Ambient Water Quality Criteria (RIAWQC); statistical evaluation (Lower Confidence Limit - LCL) of parameters that exceed NRWQC/RIAWQC; evaluation of time series plots for statistical trending in contaminant concentrations using Sen's Test for trends; and an evaluation of seasonality and outliers.

Since OU1 is capped, the primary means by which OU1 would degrade surface water is through the discharge of contaminated groundwater to surface water bodies. Pond 2 is a primary discharge point for the OU1 plume, and chlorobenzene (a primary plume contaminant) is often detected in its outflow (SW-5). Occasional detections of Chlorobenzene in the outflow from Pond 3 (SW-6) suggest that it may also periodically receive discharge from the OU1 plume. However, Ponds 2 and 3 are manmade sedimentation ponds, designed to detain storm water and remove contaminants before the water flows off-site and into waters of the State. In the OU2 risk assessment, the sedimentation ponds were included as feeding and foraging areas but not as habitat areas. Therefore, only data from the Pond 2 outlet (SW-5) and from the most downstream point on Cedar Swamp Brook (SW-7) are considered for this evaluation.

The evaluation of the impacts of OU1 on surface water quality is further complicated by the fact that the surface waters that are downgradient of OU1 are also downgradient or downstream of numerous other potential sources of contamination. As a result, degradation of surface water downstream of the Site at SW-5 and SW-7 does not necessarily demonstrate that the remedy is not functioning properly. For example, Pond 2 receives discharge directly from the eastern part of OU1 plume which is sometimes reflected in its outflow (SW-5). However, Pond 2 also receives the discharge from the Phase V underdrain (SW-4), which captures the western part of the OU1 plume as well as contaminated groundwater from filled areas and closed landfills to the south, along both sides of Shun Pike. Furthermore, even after the underdrain discharge (SW-4) is diverted out of Pond 2 (scheduled to begin in summer 2013), Pond 2 will still receive storm water runoff from several areas, including the active landfill area in Phase V and most of the roadways and paved surfaces in the eastern and southeastern part of

the Central Landfill property. Therefore, as stated above, surface water quality degradation can result from numerous sources other than OU1.

Cedar Swamp Brook is probably not a discharge point for any significant part of the OU1 plume. It does receive the discharges from sedimentation ponds that capture runoff from much of the northern, western, and southwestern parts of the landfill. Where its elevation is below groundwater levels, Cedar Swamp Brook may also receive contaminated groundwater from filled areas and closed landfills to the south along Shun Pike.

Comparison to Surface Water Quality Standards

No VOCs exceeded the RIAWQC or NRWQC at SW-5 or SW-7 during the last five years. Chlorobenzene is periodically detected in samples from SW-5 at low concentrations. SW-5 is the outlet from Pond 2, which is a discharge point for groundwater from OU1. Pond 2 also receives discharge from the Phase V underdrain (SW-4) which, like Pond 2, is a discharge point for contaminated groundwater from OU1. The concentrations of chlorobenzene at SW-5 are often higher than average in the February round, probably due to a decrease in volatilization as well as a reduction in storm water inputs to Pond 2 during the colder winter months.

Between January 2008 and January 2013, arsenic, iron and thallium were detected at SW-5 at concentrations that were demonstrated to be statistically significant exceedances of both NRWQC and RIAWQC benchmarks, based on the LCL comparison described above (see Table 4). At SW-7, arsenic and beryllium showed statistically significant exceedances of benchmarks.

Iron and thallium are not OU1 COCs. The presence of these two metals at SW-5 may be related to the discharge from the Phase V underdrain. These two metals also exceeded the benchmarks at SW-6, which is the outlet from Pond 3 into Pond 2.

As shown in Table 4, the NRWQC and RIAWQC benchmarks are significantly different in the cases of arsenic and beryllium. The lower NRWQC of 0.14 µg/L for arsenic (human health criterion for the consumption of organism only) was exceeded at all stations. The arsenic concentrations at SW-5 also exceeded the higher RIAWQC of1.4 µg/L, however, since that benchmark was also exceeded at upstream locations SW-6 and SW-C, the extent to which OU1 contributes arsenic is not clear. Beryllium exceeded the lower RIAWQC of 0.17 µg/L (chronic freshwater aquatic life criteria) at SW-7. This benchmark, like the NRWQC of 0.14 µg/L for arsenic, is at or below the reporting limits for many of the surface water analyses. Beryllium is often detected in background wells at the Site, and the exceedance of the RIAWQC at SW-7 may or may not be related to OU1.

In the last five-year review, concentrations of copper and lead were shown to have increasing trends in sediments in the Upper Simmons Reservoir. Since surface water samples are filtered prior to analysis, the concentrations of these metals in surface water samples may not be highly correlated to sediment concentrations in the reservoir. Nonetheless, the copper and lead results for surface water were evaluated in comparison to the ambient water quality criteria. Copper, which is not a COC at the Site, was detected at concentrations above the water quality criterion (8.6 µg/L, based on an assumed hardness of 96 mg/L) at the upstream location SW-1A, in the discharge from Pond 3 (SW-6), and in the discharge from Pond 2 (SW-5). The exceedances were not statistically significant. Lead, which is a COC at the Site, has sporadically exceeded the water quality criterion (2.4 µg/L, based on an assumed hardness of 96 mg/L) at SW-5 and SW-7, as well as at the upstream sampling locations. Like copper, the exceedances of the criterion for lead were not statistically significant.

Contaminant Trend Evaluation

A trend evaluation was performed on surface water sample results, similar to the groundwater evaluation, using Sen's test for trends on the last five years of surface water testing results from 2008 to 2013. No statistically significant trends in contaminant concentrations were revealed.

Surface Water Evaluation Conclusions

Surface water samples were collected and analyzed from eight locations (excluding SW-4, which is discussed below) for VOCs, metals and water quality parameters. Measured contaminant concentrations were below state and federal water quality criteria for all Site contaminants of concern (COCs), except arsenic and beryllium. The extent to which these exceedances are related to OU1 will continue to be investigated as the new OU1 extraction system is constructed and activated, and the discharges of the OU1 plume to surface waters decrease. The ESD, which is being prepared concurrently with this report, will establish numerical surface water performance standards.

Phase V Stone Trench Underdrain (SW-4) Evaluation

The sampling station identified as SW-4 was originally located in Cedar Swamp Brook where it flowed into Pond 2 and represented a surface water body. In 2003, the lower reach of the Cedar Swamp Brook was relocated to the south to make way for the construction of the Phase V Landfill (see Figure 2). At that time, a stone filled trench (approximately 20 feet wide and 4 feet thick) was installed within the former brook channel to 1) maintain groundwater levels beneath the Phase V landfill at their pre-brook relocation elevations, and 2) contain the OU1 contaminant plume within its previously defined boundaries. It was anticipated that groundwater contaminants from the OU1 Landfill would be observed in the Phase V underdrain discharge.

SW-4 now represents a groundwater discharge from an underdrain below the Phase V Landfill that discharges to an engineered sedimentation pond (Pond 2). As a result, the groundwater discharge at SW-4 is compared to MCLs. Four parameters (arsenic, benzene, chlorobenzene and thallium) in samples from SW-4 exceeded MCLs (see Table 5). Arsenic, benzene and chlorobenzene are OU1 COCs, but thallium is not. None of the exceedances were statistically significant when an LCL evaluation was conducted.

Four statistically significant trends were found in contaminant concentrations. The concentrations of chromium and copper were found to be increasing, while the concentrations of iron and manganese were found to be decreasing.

The discharge from the underdrain (represented by SW-4) is scheduled to be diverted out of Pond 2 in June 2013. The water will be collected, treated, and discharged to the relocated Cedar Swamp Brook.

6.4.3 Sediment Monitoring

Acetone was the only VOC detected in sediment in the Upper Simmons Reservoir at a concentration above the consensus-based Threshold Effects Concentration (TEC). Based on an evaluation of trends, the concentrations of acetone in sediments appear to be stable at all locations, not varying significantly since the beginning of the monitoring program in 1999 (see Table 6). Chlorobenzene is a primary COC for the site. Chlorobenzene data collected in the Upper Simmons Reservoir since 1999 indicates an overall downward trend in concentrations, which are well below the sediment screening benchmark (TEC of 291 µg/Kg).

For the five-year period of review (2008 through 2013), seven inorganic analytes exceeded the TEC at sediment sampling locations in the Upper Simmons Reservoir - cadmium, chromium, copper, arsenic, lead, nickel and zinc (see Table 6). For arsenic, lead, nickel and zinc, at least one sample also exceeded the consensus-based Probable Effects Concentration (PEC). Lead exceedances were most widespread. Concentrations of lead exceeded the PEC in at least one sample from all but one of the sampling locations, and in four samples from SED-18.Arsenic concentrations exceeded the PEC three times at one location (SED-19). Zinc and nickel concentrations exceeded the PEC in just one sample each, from SED-18 and SED-15, respectively.

The sediment metals data for the Upper Simmons Reservoir collected between 1999 and 2003 indicated a generalized upward trend in lead concentrations in samples collected from SED-15, 16 and 17;

however; concentration trends were not apparent during the five year periods from 2003 to 2008 or during the current period of 2008 to 2013. Based on data collected since 1999, sediment copper concentrations appear to be relatively steady between 50 and 100 mg/kg, below the PEC of 149 mg/Kg.

The 2001 OU2 RA included chronic whole sediment toxicity tests for samples collected in 1998 from the Upper and Lower Simmons Reservoirs. The results from those toxicity tests were used to support the conclusion in the OU2 RA of no significant risk to benthic (bottom dwelling) invertebrates; however, concentrations of arsenic, copper, lead, nickel, and zinc in the recently collected samples are higher than the concentrations present in the five 1998 toxicity test samples (all of which were found to be non-toxic). Therefore, the results for the 1998 study cannot be used to evaluate whether current concentrations of these metals may be toxic to benthic invertebrates.

The majority of the detected concentrations of arsenic, copper, and lead in the samples from 2008 to 2012 exceed the TECs; however, of the 35 sediment samples from that period that were analyzed, only three had arsenic concentrations above the PEC; only 11 had lead concentrations above the PEC; and none of the copper concentrations exceeded the PEC. Nickel and zinc were detected in only one sample at a concentration that exceeded the PEC. The sources of these metals are currently unknown. The ongoing study of contamination of USR sediments will determine the extent to which OU1 contributes to the inorganic contaminants in the Upper Simmons Reservoir.

6.4.4 Air Monitoring

To support this five-year review, RIRRC completed a review of the 2006 OU1 Air Pathway Human Health Risk Assessment (Air Pathway HHRA) (see Attachment D). In 2012, a landfill gas sample was collected from the Phase I Main Header at a location just prior to where it enters the now inactive Waukesha Engine Plant. Relative changes in concentrations of landfill gas constituents between 2006 and 2012 and the landfill gas generation rates for OU1 were evaluated. This evaluation showed gas generation rates have declined significantly since 2006 and should continue to decline, since Phase I stopped accepting waste in 1993. The same six carcinogens, methylene chloride, tetrachloroethylene, trichloroethylene, tetrahydrofuran, vinyl chloride and benzene, were evaluated in both the 2006 and the 2012 data. Of the six, three (methylene chloride, tetrachloroethylene, and trichloroethylene) were detected in 2006, but not in 2012. Two of the six (tetrahydrofuran and vinyl chloride) were detected at significantly lower concentrations in the 2012 LFG sample. Benzene concentrations increased between 2006 and 2012, but that increase was largely offset by the decrease in landfill gas generation.

6.5 Site Inspection

A Site inspection was conducted by AECOM on April 23, 2013 to support the evaluation of the remedy for the five-year review. The Site Inspection Checklist associated with Central Landfill is included in Attachment E. Photos taken during the Site inspection are included in Attachment F and show that the landfill cover, security, and operational systems appear to be functioning properly and are well-maintained.

No evidence of trespassing was observed at the time of the inspection. RIRRC security personnel were observed at the entrance gate and patrolling the Site. Gates at points of vehicular access to the RIRRC property other than the main entrance were closed and locked.

The vegetation on the cap appeared to be in good condition. ATV tracks were observed on the east side of the OU1 cap; they are apparently the result of off-road travel by LFG extraction system personnel. Also, at the time of the inspection, there was vegetation in the swales/downchutes that requires removal. Discussion with Site personnel determined that this is part of scheduled spring maintenance that has yet to be performed. The vegetation did not appear to be limiting the flow of water.

One downchute on the north side of Phase I showed evidence of significant differential settling. Due to the stone mat used to create this downchute, repair of the settlement would be difficult. Flow of water

does not appear to be impacted, and there is no evidence of damage to the geomembrane. Therefore, no corrective action is deemed necessary at this time.

6.6 Interviews

Three interviews were conducted regarding the five-year review at Central Landfill - Mr. William Anderson, RIRRC Engineering Manager; Mr. Douglas McVay, Chief, Office of Air Resources, RIDEM; and, Officials from the Town of Johnston, including Mayor Polisena, Mayor, Town of Johnston, Bernard Nascenzi, Johnston Building Official, and Arnold Vecchione, Johnston Director of Public Works. Summary forms for each of the interviews are included in Attachment G.

SECTION 7.0 TECHNICAL ASSESSMENT

This section discusses the technical assessment of the implemented remedy and provides answers to the three questions posed in the EPA Guidance (USEPA, 2001).

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes; for the landfill cap, landfill gas extraction system, and institutional controls.

No; for the current hydraulic containment system.

The Phase I landfill is capped, preventing direct contact with waste and minimizing infiltration of precipitation. A vapor extraction system removes landfill gas and vapors from beneath the OU1 cap, and those gases are treated and combusted at gas-to-energy plants or flares. The gas extraction system, in combination with the OU1 landfill cap, minimizes emissions of landfill gas to the atmosphere and subsurface migration of landfill gas outside the OU1 landfill footprint. Recently, settlement has been noted around an LFG extraction well. The operator of the LFG system was notified, and adjustments were made (e.g., the area was covered with fine-grained soil and gas wells in the area were shut off). Temperature monitoring indicated that a hot spot was present near the well; however, with the wells off and the area covered with soil, temperatures declined. At the time that this Five-Year Review report was prepared, construction plans for the repair of the liner were in preparation.

The current hydraulic containment and treatment system has been operating in the hot spot area for about nine years. The long-term groundwater monitoring program shows that concentrations of contaminants in the groundwater plume have decreased, but groundwater beyond the toe-of-slope of the waste management area exceeds groundwater performance standards for certain Site COCs. EPA Region 1 currently expects that the hydraulic containment system will be modified pursuant to an ESD that will likely be signed along with this Five-Year Review report such that the hydraulic containment system will be relocated to the toe-of-slope of the waste management area. It is expected that the relocated extraction well (or wells), in conjunction with the Phase V underdrain, will adequately contain the OU1 contaminated groundwater plume and achieve the performance standards for the overall remedy in the OU1 ROD provided that additional well installations and groundwater testing are performed to demonstrate that containment is achieved.

The residual portion of the OU1 groundwater plume that is not currently contained by the HSHCS consists of an eastern part and a western part. The eastern part of the OU1 groundwater plume discharges to manmade sedimentation ponds, which in turn discharge to the Upper Simmons Reservoir (USR). The western part discharges to the Phase V underdrain, which in turn drains to the Sedimentation Pond 2 followed by the USR. In surface waters prior to discharge to the USR, measured contaminant concentrations were below state and federal water quality criteria for all Site COCs, except arsenic and beryllium. The extent to which these exceedances are related to OU1 will continue to be investigated as the new OU1 hydraulic containment system is constructed and activated, as will be documented in the forthcoming ESD, and the discharge of the OU1 plume to surface waters is expected to decrease. The forthcoming ESD is expected to specify numerical surface water performance standards.

The required institutional controls are currently in place and functioning as intended. The institutional controls include a Town of Johnston ordinance that prohibits the use of groundwater wells and prohibits the Building Inspector from issuing permits for the construction of groundwater wells in any location where access to Town public water is available and where the well or proposed well is located in the OU2 areas recommended for institutional controls. Also, RIRRC filed a Declaration of Covenants and Environmental Protection/Conservation Easement on property it owns, which prohibits the use of groundwater except for remediation purposes, prohibits the installation of groundwater wells or the use of existing groundwater wells, prohibits the alteration of the groundwater flow in any way, and prohibits any activities that would interfere with the integrity of the cap. The property owned by RIRRC is largely fenced, vehicular entry is limited to secured roadways, and the property is guarded by RIRRC security personnel at all times.

Sediment sampling in the USR, which is not required by the OU1 ROD, but is part of the state-mandated monitoring for the entire Central Landfill, has shown occasional exceedances of screening benchmark concentrations (i.e., Probable Effects Concentrations) for several metals. No trends in the concentrations of any of the sediment analytes were identified for the five-year period. The study to determine if the concentrations of metals in the Upper Simmons Reservoir sediments are related to OU1 is still ongoing.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

Yes. Although there have been changes in risk assessment practice and toxicity values since the RODs were issued, the changes do not affect the protectiveness of the remedy because current and future exposures to residents are being prevented by institutional controls restricting groundwater extractions for potable use. EPA Region 1 expects to prepare an ESD concurrently with this FYR that will revise certain groundwater performance standards, some of which are risk-based, and specify numerical surface water performance standards.

The following human health risk assessments have been conducted for the Site:

- The OU1 Human Health Baseline Risk Assessment by CDM FPC in 1993,
- The OU2 Human Health and Ecological Risk Assessment, contained in the Central Landfill Operable Unit 2 Remedial Investigation Report Johnston, Rhode Island, prepared by GZA in 2001, and
- The Final Human Health Risk Assessment, Operable Unit 1 Landfill Gas Collection and Control System, prepared by GZA in concert with Menzie-Cura and Associates in February 2006.

The OU1 human health risk assessment (CDM FPC, 1993) evaluated potential risks to nearby residents associated with the hypothetical potable use of groundwater. In addition, the 1993 risk assessment included the evaluation of risks associated with recreational use of the Upper Simmons Reservoir and the Almy Reservoir. The risks to residents via potable use of groundwater exceeded the USEPA target risk limits. The estimated risks to recreational users associated with exposures at the Upper Simons Reservoir and the Almy Reservoir did not exceed the USEPA target risk limits. As a result of the groundwater exceedance, the OU1 landfill was closed with a RCRA subtitle C double barrier cap, and the HSHCS was put in place to contain contaminated groundwater.

The OU2 human health risk assessment (GZA, 2001) evaluated potential risks associated with contaminant concentrations found in the OU2 Study Area under baseline conditions. This risk assessment evaluated risks to local residents via groundwater intake, soil contact (ingestion, dermal contact, and fugitive dust inhalation), and sediment and surface water contact (ingestion and dermal contact). In addition, the risk assessment evaluated risks for facility workers via sediment and surface water contact and recreational use of the Almy Reservoir, sedimentation Ponds, Cedar Swamp Brook, Quarry Stream and the Upper Simmons Reservoir. While both the OU1 and the OU2 risk assessments included evaluation of potential risks associated with the recreational use of the Upper Simmons Reservoir and the Almy Reservoir, the evaluation presented in the OU2 risk assessment was considered to supersede that presented in the OU1 risk assessment because the OU2 assessment was based on measured (versus modeled) contaminant concentrations and was conducted in accordance with the most recent guidance and toxicity values available at the time. The estimated Site-related risks for all identified receptors in the OU2 human health risk assessment were within acceptable USEPA target risk limits.

The OU2 ecological risk assessment (ERA) evaluated potential risks to the natural community within OU2 resulting from exposure to contaminants migrating from the OU1 landfill (GZA, 2001). The ERA for the OU2 Study Area focused on groundwater migration from OU1 to Cedar Swamp Brook and the Upper and Lower Simmons Reservoirs as the primary exposure pathways. Protection of aquatic life within the on-site sedimentation basins was not considered a significant concern due to limited habitat value. Exceedances of protective benchmarks were measured in sediment and surface waters for a number of COPCs.

However, results of toxicity tests performed on surface water and sediment samples from the Upper and Lower Simmons Reservoirs (showing no significant toxicity), combined with bioavailability (AVS/SEM) considerations for sediments and qualitative surveys of biota, led to a conclusion of no significant risk to aquatic biota from Site-related contaminants.

Foodchain models evaluating the risk of exposures of great blue heron to surface water and sediment COPCs showed higher risk in Lower Simmons Reservoir than Upper Simmons Reservoir or the streams and sedimentation ponds. This result provided evidence that the OU1 landfill has relatively low potential to contribute to risk to wildlife receptors, since the Lower Simmons Reservoir is hydrologically further downstream than the other habitats evaluated. Foodchain models also evaluated the risk of exposures of terrestrial receptors including American robin, meadow vole and short-tailed shrew to COPCs in soils and found no significant risk from exposure to COPCs for wildlife that feed within the wooded areas surrounding the landfill property.

Based on these analyses, it was concluded in the ERA that there were no significant toxic effects on invertebrates and no significant adverse effects indicated by foodchain modeling results to higher level foodchain receptors in the OU2 Study Area. Based on these evaluations, the ERA concluded that the contaminants in the OU2 Study Area did not present a significant risk of harm to ecological receptors.

The 2006 OU1 landfill gas risk assessment evaluated risks to residents, landfill workers, and Site workers who might be exposed to ambient air concentrations of chemicals emitted in landfill gases. The estimated risks, associated with OU1, did not exceed the acceptable USEPA target risk limits. To support this five-year review, RIRRC completed a review of the 2006 OU1 Air Pathway Human Health Risk Assessment (Air Pathway HHRA) for the Central Landfill. As described in Sections 4.2.5 and 6.4.4, this review concluded that the conclusions of the 2006 OU1 Risk Assessment are still valid.

Updates to Human Health Risk Assessments

Toxicity values have changed since the 1993 risk assessment was performed for OU1. Changes in toxicity values for the following COCs would potentially increase the cancer risk associated with the exposures to groundwater evaluated for OU1: benzene, 1,1-dichloroethane, trichloroethene, 1,2,4-trichlorobenzene, and chromium. Changes in toxicity values for the following COCs would potentially increase the noncancer hazard associated with the exposures to groundwater evaluated for OU1: benzene, methylene chloride, toluene, trichloroethene, vinyl chloride, 1,4-dichlorobenzene, napththalene, beryllium, chromium, cyanide, nitrates and vanadium. Several OU1 COCs have risk-based groundwater performance standards as established in the OU1 ROD; the numerical performance standards for groundwater should be updated. EPA Region 1 expects to prepare an ESD concurrently with this five-year review that will revise certain groundwater performance standards, some of which are risk-based. However, these changes do not affect the current protectiveness of the remedy because source control measures and institutional controls prevent exposures.

In addition, toxicity values have been updated for a number of constituents evaluated in the 2001 and OU1 2006 risk assessments. Updates to the following COCs would potentially increase the noncancer hazard or cancer risk associated with exposures associated with OU1, as assessed in the 2001 and 2006 risk assessments: 1,4-dichlorobenzene, benzene, carbon tetrachloride, chloroform, tetrachloroethylene, trichloroethylene, bis(2-ethylhexyl) phthalate, aluminum, arsenic, barium, beryllium, cadmium, iron, nickel, thallium and vanadium. However, a review of the data included in these risk assessments show that the changes to these toxicity values do not affect the conclusions of the human health risk assessments or the protectiveness of the remedy.

There have also been multiple changes to EPA's risk assessment methodology since the 1993 risk assessment. As noted above, the source control measures and institutional controls prevent exposures and therefore changes in methodology do not affect the current protectiveness for OU1. Changes in methodology will be accounted for in revised risk-based groundwater performance standards included in the ESD which is expected to be issued at the same time as this five-year review.

However, changes in methodology are relevant for review of the 2001 and 2006 OU1 risk assessments.

In 2004, USEPA issued the Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). In accordance with this guidance, oral toxicity values for certain compounds need to be adjusted by a chemical-specific factor (fraction of contaminant absorbed in gastrointestinal tract in the critical toxicity study) to be used for evaluating risks via the dermal pathway. The omission of the adjustment in the 2001 risk assessment would result in underestimation of potential risks associated with dermal exposure. However, a review of the data included in these risk assessments show that the inclusion of the chemical-specific factor would not have affected the conclusions of the 2001 risk assessment.

In 2005 USEPA issued the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, which requires the inclusion of an early-life cancer risk for compounds with a mutagenic mode of action, including PAHs and vinyl chloride. The early-life assessment can increase the cancer risk associated with exposure for older children by up to three-fold. However, this difference does not affect remedy protectiveness since the contribution to the cumulative risk in the 2001 risk assessment by these compounds is limited - increasing the risk for the media with these compounds three-fold would not result in an exceedance of USEPA risk criteria. The 2006 risk assessment included this evaluation in the calculations for vinyl chloride risks.

Since the 2001 and 2006 human health risk assessment, EPA has published the Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) (January 2009) (RAGS F). However, updates presented in RAGS F would not change the risk conclusions made in the 2001 and 2006 risk assessment.

The 1993 ROD did not evaluate the vapor intrusion pathway, however in 2012 EPA determined that, based on information presented in various technical reports, the contaminated plume originating from the Site is unlikely to be flowing in close proximity to RIRRC-owned buildings and therefore the vapor intrusion pathway is incomplete. If information is generated in the future that suggests that this pathway is complete this pathway should be reevaluated.

Updates to Ecological Risk Assessment

With respect to the ecological risks, the ecological risk assessment (ERA) for Central Landfill (Section 9.0 of the OU2 RI, GZA, 2001) was conducted using methodology that would generally comply with current EPA risk assessment guidance. The primary discrepancies between current guidance and previous guidance exist in the areas of benchmarks and toxicity values utilized. There are also minor differences in the recommended toxicity testing approaches and in the factors used in wildlife modeling. There are no newly promulgated standards, relevant to the site ERA, which bear on the protectiveness of the remedy. Exceedances of water quality criteria related to compliance monitoring are discussed in other sections of this report.

No COCs in surface water were selected as posing risk to aquatic receptors in the ERA. However, as noted in the second Five-Year Review, there have been some changes to the toxicity data used to evaluate ecological risks for chlorobenzene. The new chronic Tier II aquatic life criteria is 47 µg/L, and the new acute criteria is 420 µg/L. Measured chlorobenzene concentrations in surface water are two to four times less than the chronic (47 µg/L) criterion. Therefore, this change does not affect the protectiveness of the remedy.

The second Five Year Review report identified increasing concentrations of lead and copper in samples of sediments collected from the Upper Simmons Reservoir. No clean-up levels for lead and copper were established for sediments in the ERA, as there were no COCs identified in the ERA as contributing to significant risk in the reservoirs. For both lead and copper, sediment concentrations exceeded the screening benchmarks in both reservoirs in the ERA screening of COPCs. However, lead was screened out as a COPC in the ERA in sediment, as the maximum concentration in the data set used for screening was calculated to be below the selected background. Copper was initially selected in the ERA as a COPC, since the maximum observed value was higher than both the selected benchmark and the maximum observed concentration in the background samples. However, as discussed above, the results of the toxicity testing led to the conclusion that there was no significant risk to aquatic organisms in the

Upper or Lower Simmons Reservoirs.

The screening values used in the ERA to screen sediment COPCs were the Lowest Effect Levels (LELs) from the Ontario Ministry of the Environment (Persaud, et al., 1993) for lead and copper. These values are conservative and compare to those routinely used currently in screening sediments, which include the consensus-based PEC and TEC values (MacDonald et al., 2000). Maximum concentrations of lead reported in the Simmons Reservoirs in the ERA were below the PEC value for lead (128 mg/kg) but above the TEC of 35.8 mg/kg. Similarly, maximum concentrations of copper reported in the Simmons Reservoirs in the ERA were below the PECs value for copper of 149 mg/kg and above the TEC value of 31.6 mg/kg.

In conclusion, although target cleanup levels were not selected for OU2 based on the evaluation of risk in the ERA, and although the methods used to perform the ERA differ from current methods and guidance, the remedy remains protective of ecological receptors at this time. Higher lead and copper concentrations in sediment have been measured in recent compliance monitoring sampling. Continued evaluation of monitoring data is appropriate to ensure that concentrations of contaminants in Site media continue to be protective of ecological receptors.

There have also been changes to the Applicable or Relevant and Appropriate Requirements (ARARs) and To-Be-Considereds (TBCs) since the OU1 ROD was signed. However, these changes do not affect the protectiveness of the remedy. These changes are summarized below:

Change to Federal MCLs since OU1 ROD

As documented in the first five-year review (2003), the MCL for arsenic was revised downward from 50 µg/L to 10 µg/L as a result of an amendment to the Safe Drinking Water Act. The OU1 ROD identified MCLs as Relevant and Appropriate for the purpose of measuring the performance of the OU1 remedy. The groundwater performance standard for the source control remedy, as stated in the OU1 ROD, is to "prevent groundwater that has contaminant concentrations exceeding MCLs and non-zero MCLGs from migrating beyond the compliance boundary ... or; in the absence of MCLs or non-zero MCLGs, prevent groundwater that has contaminant concentrations above levels that are protective of human health from migrating beyond the compliance boundary." The September 2005 Explanation of Significant Differences (ESD) reflected the change in the MCL for arsenic. Because ICs prohibit the use of groundwater, the remedy remains protective.

RIDEM Groundwater Quality Rules

The Groundwater Quality Standards identified in the current RIDEM Groundwater Quality Rules are generally equivalent to the MCLs for COCs identified in the OU1 ROD, with the exception of naphthalene. An MCL does not exist for naphthalene; however, the current RIDEM Groundwater Quality Standard for naphthalene is 100 µg/L. The OU1 ROD identified a risk-based performance standard of 1,500 µg/L for naphthalene. The more stringent RIDEM Groundwater Quality Standard for naphthalene is relevant and appropriate for measuring the performance of the cap, but does not affect the current protectiveness of the remedy because ICs prohibit the use of groundwater.

Changes to Surface Water Performance Standards since OU1 ROD

The OU1 ROD identified Federal AWQC (now called National Recommended Water Quality Criteria, NRWQC) and RIDEM water quality criteria as ARARs for preventing the degradation of surface waters below surface water standards. The OU1 ROD did not, however, specify numeric performance standards for surface water. EPA Region 1 staff expect to issue an ESD that will specify numeric standards for surface water based upon the ARARs described in the OU1 ROD, and EPA Region 3 Freshwater Screening Benchmarks or EPA Nutrient Ecoregional Criteria, which are to-be-considered (TBCs) under EPA guidance. The issuance of an ESD with numeric standards for surface waters will not affect the protectiveness of the remedy; rather, it will merely clarify the performance standards that must be met.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes. The sediment monitoring data for the Upper Simmons Reservoir indicates that there is the possibility of ecological effects from concentrations of lead that are above the consensus-based PEC of 128 mg/kg. A study is currently underway, as recommended in the previous Five-Year Review report, to determine if OU1 is or is not the source of elevated lead and copper concentrations in the Upper Simmons Reservoir sediments.

SECTION 8.0 ISSUES

Based on the activities conducted during this Five Year Review, the issues identified in the Table below have been noted.

Issues	Affects Protectiveness (Y/N)	
	Current	Future
The Phase VI expansion of the active landfill will ultimately bury the existing OU1 hydraulic containment and groundwater treatment systems under 150 feet of waste and will force operation of those systems to cease	N	Y
It has not yet been determined if the source of the metals in the Upper Simmons Reservoir sediments is or is not Site-related	N	Y

SECTION 9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In response to the issues noted above, the following recommendation and follow-up actions are proposed for the site:

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
The Phase VI expansion of the active landfill will ultimately bury the existing OU1 hydraulic containment and groundwater treatment systems under 150 feet of waste and will force operation of those systems to cease	RIRRC to: design and install new extraction well(s) to adequately capture OU1 plume; determine treatment requirements for water from new extraction well(s) and relocate or replace existing groundwater treatment system, as necessary; locate and install additional monitoring wells to assess the extraction network, containment, compliance with performance standards and treatment effectiveness.	RIRRC	EPA, RIDEM	9/30/15	N	Y
It has not yet been determined if the source of the metals in the Upper Simmons Reservoir sediments is or is not Site-related	RIRRC to complete study that is underway to determine whether these metals are or are not from OU1	RIRRC	EPA, RIDEM	9/30/14	N	Y

SECTION 10.0 PROTECTIVENESS STATEMENTS

OU1 Protectiveness Statement

The OU1 remedy currently protects human health and the environment, as described below. However, in order for the remedy to be protective in the long-term, the following actions, as described below, need to be taken.

The OU1 source control remedy required construction of a cap over the Phase I landfill. The Phase I landfill is capped, preventing direct contact with waste and minimizing infiltration of precipitation. A vapor extraction system removes landfill gas and vapors from beneath the OU1 cap, and those gases are treated and combusted at gas-to-energy plants or flares. The gas extraction system, in combination with the OU1 landfill cap, minimizes emissions of landfill gas to the atmosphere and subsurface migration of landfill gas outside the OU1 landfill footprint. A review of Phase I landfill gas data, collected to support this five-year review, shows that the OU1 remedy remains protective of human health in terms of air quality.

The OU1 remedy also required the implementation of institutional controls and the construction of a hydraulic containment system. Institutional controls for the Site currently prevent exposure to or ingestion of contaminated groundwater from the Site. The Site and surrounding areas are served by public water. A hydraulic containment and treatment system has been operating in the hot spot area for about nine years. The concentrations of contaminants in the contaminated groundwater plume have decreased, but groundwater beyond the toe of the slope of the waste management area exceeds groundwater performance standards for certain Site COCs. EPA Region 1 expects that the hydraulic containment system will be relocated near the toe-of-slope of the waste management area. It is anticipated that the relocated extraction well (or wells) and the Phase V underdrain will adequately contain the OU1 contaminated groundwater plume to achieve the performance standards for the overall remedy in the OU1 ROD.

The residual portion of the OU1 groundwater plume that is not captured by the current containment system discharges to manmade sedimentation ponds, which in turn discharge to the Upper Simmons Reservoir (USR), or to the Phase V underdrain, which discharges to Sedimentation Pond 2 and then the USR. In downstream surface waters, prior to discharging to the USR, measured contaminant concentrations were below state and federal surface water quality criteria for all Site COCs, except arsenic and beryllium. The extent to which these exceedances are related to OU1 will continue to be investigated as the new OU1 hydraulic containment system is constructed and activated, to be documented in the forthcoming ESD, and the discharges of the OU1 plume to surface waters decrease.

Sediment sampling in the USR, which is not required by the OU1 ROD, but is part of the state-mandated monitoring for the entire Central Landfill, has shown occasional exceedances of screening benchmark concentrations (i.e., Probable Effects Concentrations) for several metals. Studies are on-going to determine the extent to which OU1 contributes or not to the levels of metals in USR sediments.

Long-term protectiveness is reliant upon the:

- Design and installation of the relocated hydraulic containment system to adequately capture the OU1 plume;
- Determination of treatment requirements for water from the new extraction well(s) and the relocation or replacement of the existing groundwater treatment system, as necessary;
- Location and installation of additional monitoring wells to assess the extraction network, containment, compliance with performance standards, and treatment effectiveness;
- Assessment of the Phase V underdrain treatment system; and,
- Completion of the study to determine the extent of OU1 contribution to metals in the USR sediment.

OU2 Protectiveness Statement

The OU2 no further action decision is protective of human health and the environment. OU2 did not require any remedial actions beyond those called for in the OU1 remedy. At this time no further actions are required for OU2.

Site-Wide Protectiveness Statement

The OU1 remedy and OU2 no further action decision currently protect human health and the environment. However, long-term protectiveness is reliant upon the following actions being taken:

- Design and installation of the relocated hydraulic containment system to adequately capture the OU1 plume;
- Determination of treatment requirements for water from the new extraction well(s) and the relocation or replacement of the existing groundwater treatment system, as necessary;
- Location and installation of additional monitoring wells to assess the extraction network, containment, compliance with groundwater performance standards, and treatment effectiveness;
- Assessment of the Phase V underdrain treatment system; and,
- Completion of the study to determine the extent of OU1 contribution to metals in the USR sediment.

SECTION 11.0 NEXT REVIEW

The next Five-Year Review for the Central Landfill Superfund Site will be performed in 2018, five years from the date of signature of this review.

ATTACHMENT A

FIGURES

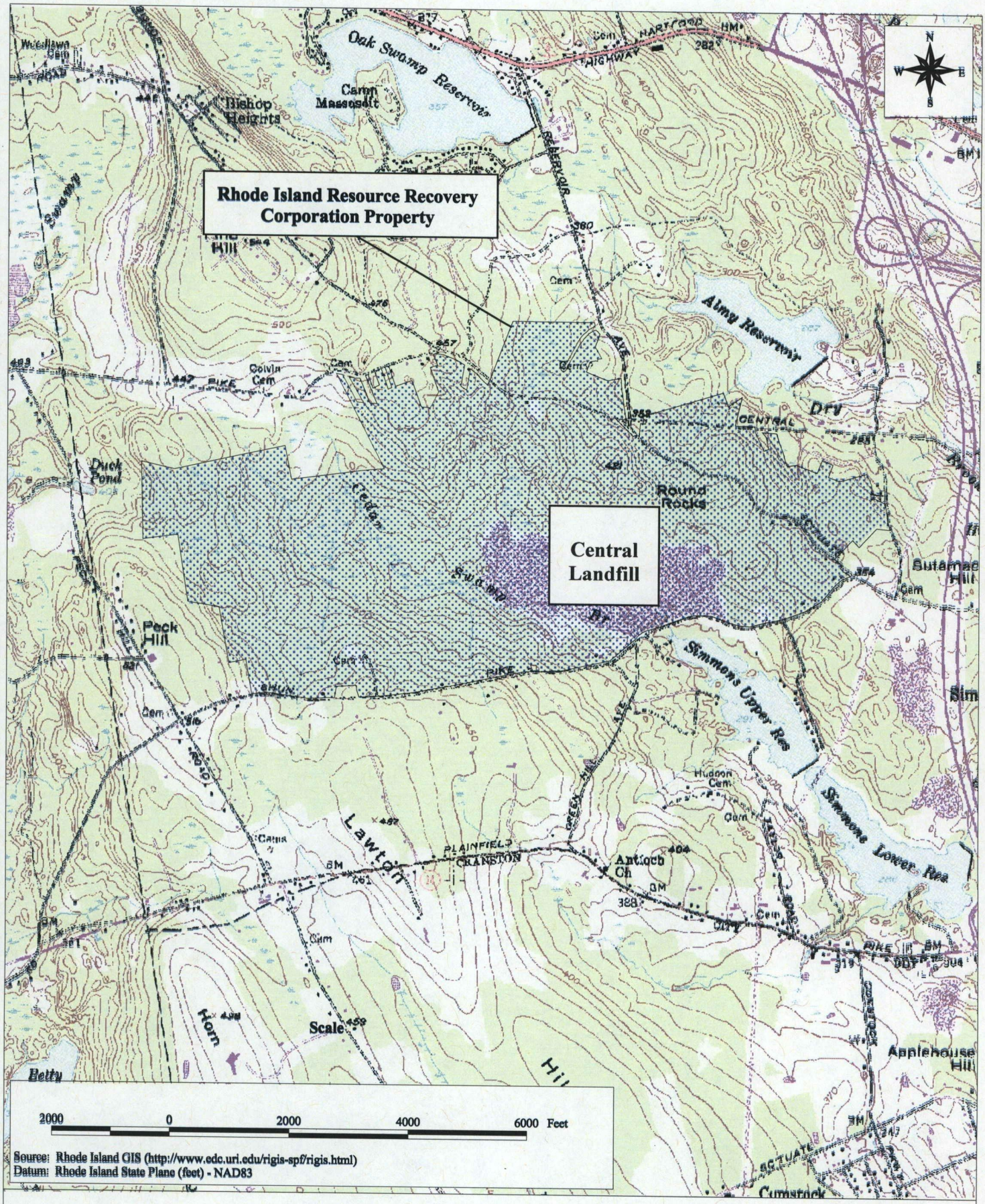
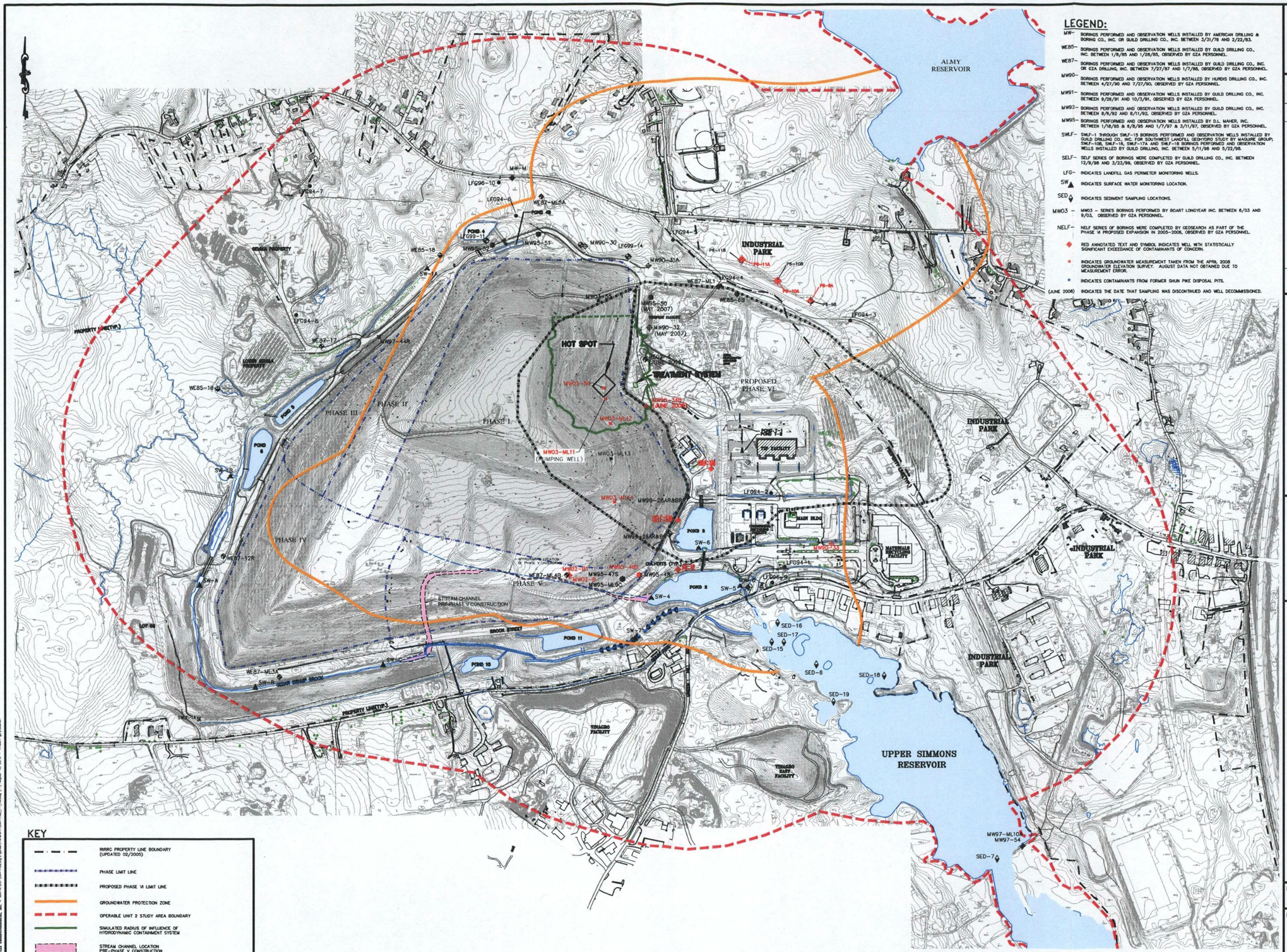


Figure 1
Site Locus Map
Central Landfill
Johnston, Rhode Island



LEGEND:

- MW- BORINGS PERFORMED AND OBSERVATION WELLS INSTALLED BY AMERICAN DRILLING & BORING CO., INC. OR GUILD DRILLING CO., INC. BETWEEN 3/31/76 AND 2/22/83.
- WE85- BORINGS PERFORMED AND OBSERVATION WELLS INSTALLED BY GUILD DRILLING CO., INC. BETWEEN 1/8/85 AND 1/28/85, OBSERVED BY GZA PERSONNEL.
- WE87- BORINGS PERFORMED AND OBSERVATION WELLS INSTALLED BY GUILD DRILLING CO., INC. OR GZA DRILLING, INC. BETWEEN 7/27/87 AND 1/7/88, OBSERVED BY GZA PERSONNEL.
- MW90- BORINGS PERFORMED AND OBSERVATION WELLS INSTALLED BY HURDIS DRILLING CO., INC. BETWEEN 4/27/90 AND 7/27/90, OBSERVED BY GZA PERSONNEL.
- MW91- BORINGS PERFORMED AND OBSERVATION WELLS INSTALLED BY GUILD DRILLING CO., INC. BETWEEN 9/28/91 AND 10/3/91, OBSERVED BY GZA PERSONNEL.
- MW92- BORINGS PERFORMED AND OBSERVATION WELLS INSTALLED BY GUILD DRILLING CO., INC. BETWEEN 8/8/92 AND 8/11/92, OBSERVED BY GZA PERSONNEL.
- MW95- BORINGS PERFORMED AND OBSERVATION WELLS INSTALLED BY D.L. MAHER, INC. BETWEEN 1/18/95 & 8/8/95 AND 1/7/97 & 3/11/97, OBSERVED BY GZA PERSONNEL.
- SWLF- SWLF-1 THROUGH SWLF-15 BORINGS PERFORMED AND OBSERVATION WELLS INSTALLED BY GUILD DRILLING CO., INC. FOR SOUTHWEST LANDFILL GEOHYDRO STUDY BY MAGUIRE GROUP; SWLF-10B, SWLF-16, SWLF-17A AND SWLF-18 BORINGS PERFORMED AND OBSERVATION WELLS INSTALLED BY GUILD DRILLING, INC. BETWEEN 5/11/98 AND 5/22/98.
- SELF- SELF SERIES OF BORINGS WERE COMPLETED BY GUILD DRILLING CO., INC. BETWEEN 12/8/98 AND 3/23/99, OBSERVED BY GZA PERSONNEL.
- LFG- INDICATES LANDFILL GAS PERIMETER MONITORING WELLS.
- SW ▲ INDICATES SURFACE WATER MONITORING LOCATION.
- SED INDICATES SEDIMENT SAMPLING LOCATIONS.
- MW03 – MW03 – SERIES BORINGS PERFORMED BY BOART LONGYEAR INC. BETWEEN 8/03 AND 9/03, OBSERVED BY GZA PERSONNEL.
- NELF- NELF SERIES OF BORINGS WERE COMPLETED BY GEOSEARCH AS PART OF THE PHASE VI PROPOSED EXPANSION IN 2005-2006, OBSERVED BY GZA PERSONNEL.
- ◆ RED ANNOTATED TEXT AND SYMBOL INDICATES WELL WITH STATISTICALLY SIGNIFICANT EXCEEDANCE OF CONTAMINANTS OF CONCERN.
- * INDICATES GROUNDWATER MEASUREMENT TAKEN FROM THE APRIL 2008 GROUNDWATER ELEVATION SURVEY. AUGUST DATA NOT OBTAINED DUE TO MEASUREMENT ERROR.
- * INDICATES CONTAMINANTS FROM FORMER SHUN PIKE DISPOSAL PITS.
- (JUNE 2008) INDICATES THE DATE THAT SAMPLING WAS DISCONTINUED AND WELL DECOMMISSIONED.

KEY

- RRRRC PROPERTY LINE BOUNDARY (UPDATED 02/2005)
- PHASE LIMIT LINE
- PROPOSED PHASE VI LIMIT LINE
- GROUNDWATER PROTECTION ZONE
- OPERABLE UNIT 2 STUDY AREA BOUNDARY
- SIMULATED RADIUS OF INFLUENCE OF HYDRODYNAMIC CONTAINMENT SYSTEM
- STREAM CHANNEL LOCATION PRE-PHASE V CONSTRUCTION

1 INCH = 300 FEET (APPROX)

0 150' 300' 600' 1200'

GZA GeoEnvironmental, Inc. Engineers and Scientists PROVIDENCE, RHODE ISLAND 02908

REV. NO.	DESCRIPTION	BY	DATE

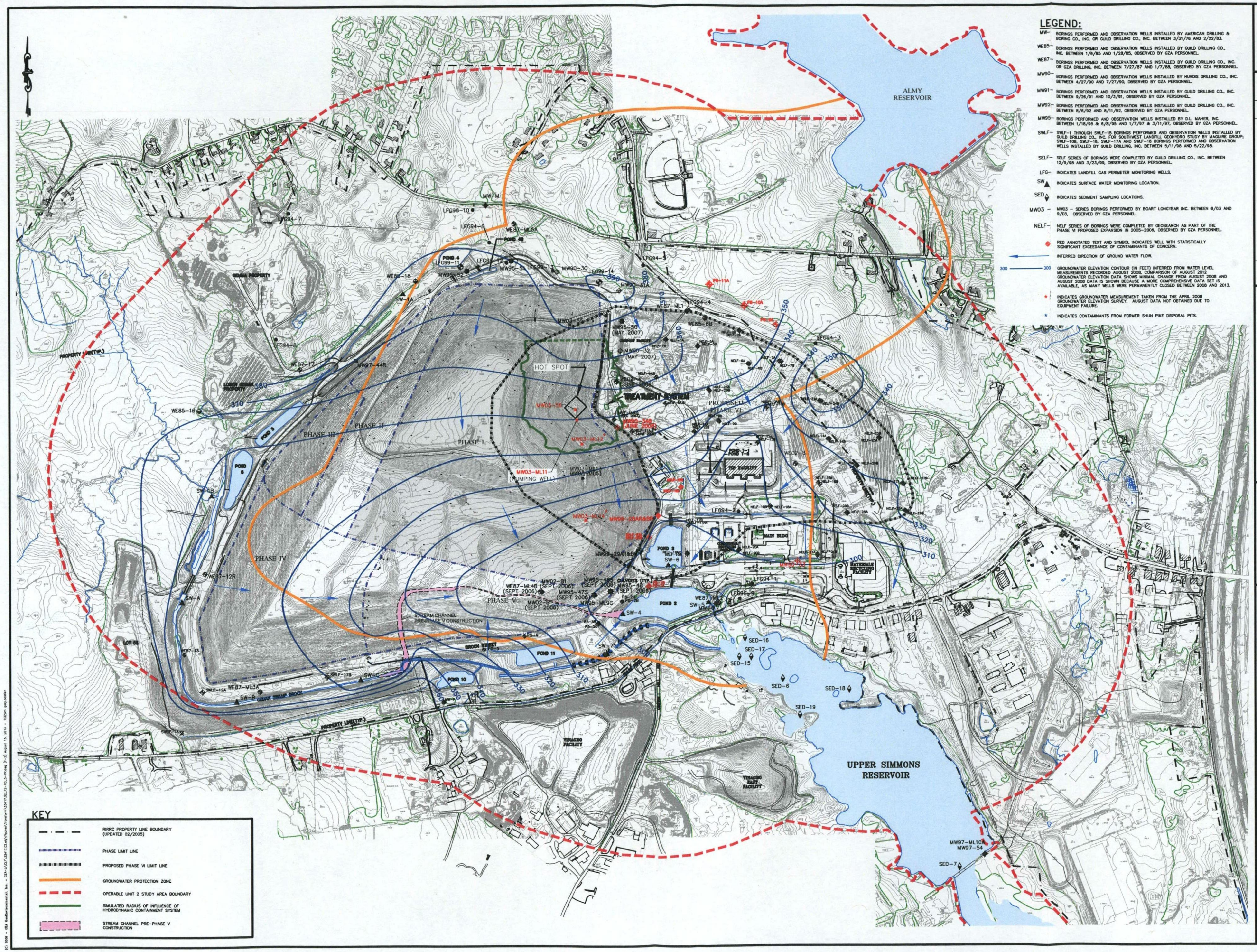
PROJ. MGR.: ALG
OPERATOR: SBB
REVIEWED BY: EAS
DATE: FEB 2013

RHODE ISLAND RESOURCE RECOVERY CORPORATION
CENTRAL LANDFILL
JOHNSTON, RHODE ISLAND

EPA FIVE-YEAR REVIEW REPORT
SAMPLING LOCATION PLAN

PROJECT NO. 33417.02

FIGURE NO. 2



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SW INDICATES SURFACE WATER MONITORING LOCATION.

SED INDICATES SEDIMENT SAMPLING LOCATIONS.

MW03 – MW03 – SERIES BORINGS PERFORMED BY BOART LONGYEAR INC. BETWEEN 6/03 AND 9/03, OBSERVED BY GZA PERSONNEL.

NELF– NELF SERIES OF BORINGS WERE COMPLETED BY GEOSEARCH AS PART OF THE PHASE VI PROPOSED EXPANSION IN 2005-2006, OBSERVED BY GZA PERSONNEL.

RED ANNOTATED TEXT AND SYMBOL INDICATES WELL WITH STATISTICALLY SIGNIFICANT EXCEEDANCE OF CONTAMINANTS OF CONCERN.

INFERRED DIRECTION OF GROUND WATER FLOW.

300 —— 300 GROUNDWATER ELEVATION CONTOUR (IN FEET) INFERRED FROM WATER LEVEL MEASUREMENTS RECORDED AUGUST 2008. COMPARISON OF AUGUST 2012 GROUNDWATER ELEVATION DATA SHOWS MINIMAL CHANGE FROM AUGUST 2008 AND AUGUST 2008 DATA IS SHOWN BECAUSE A MORE COMPREHENSIVE DATA SET IS AVAILABLE, AS MANY WELLS WERE PERMANENTLY CLOSED BETWEEN 2008 AND 2013.

* INDICATES GROUNDWATER MEASUREMENT TAKEN FROM THE APRIL 2008 GROUNDWATER ELEVATION SURVEY. AUGUST DATA NOT OBTAINED DUE TO EQUIPMENT FAILURE.

* INDICATES CONTAMINANTS FROM FORMER SHUN PIKE DISPOSAL PITS.

KEY

RIRRC PROPERTY LINE BOUNDARY (UPDATED 02/2005)

PHASE LIMIT LINE

PROPOSED PHASE VI LIMIT LINE

GROUNDWATER PROTECTION ZONE

OPERABLE UNIT 2 STUDY AREA BOUNDARY

SIMULATED RADIUS OF INFLUENCE OF HYDRODYNAMIC CONTAINMENT SYSTEM

STREAM CHANNEL PRE-PHASE V CONSTRUCTION

1 INCH = 300 FEET (APPROX)

0 150' 300' 600' 900' 1200'

REV. NO.	DESCRIPTION	BY	DATE

RHODE ISLAND RESOURCE RECOVERY CORPORATION

CENTRAL LANDFILL

JOHNSTON, RHODE ISLAND

EPA FIVE-YEAR REVIEW REPORT

GROUNDWATER CONTOUR PLAN

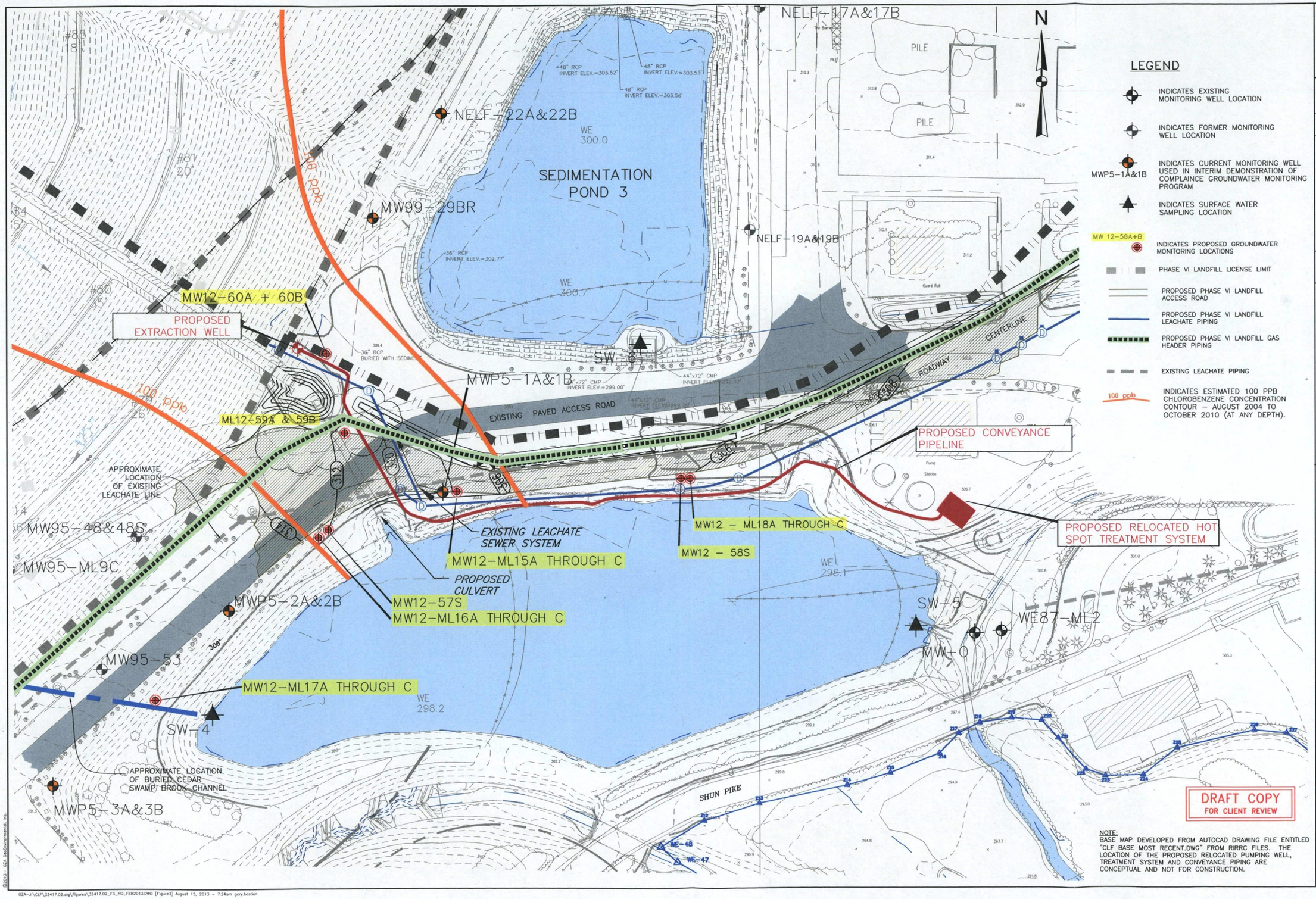
PROJ MGR:	ALG
OPERATOR:	SBB
REVIEWED BY:	EAS
DATE:	FEB 2013

GZA GeoEnvironmental, Inc. *Engineers and Scientists* 530 BROADWAY PROVIDENCE, RHODE ISLAND 02909

PROJECT NO. 33417.02

FIGURE NO. 3

(C) 2008 – GZA GeoEnvironmental, Inc. – GZA-J:\CLF\33417.02.olg\Figures\Transform\33417.02_F2-R0_5-YR.dwg



NOTE:
BASE MAP DEVELOPED FROM AUTOCAD DRAWING FILE ENTITLED "CLF BASE MOST RECENT.DWG" FROM RIRRC FILES. THE LOCATION OF THE PROPOSED RELOCATED PUMPING WELL, TREATMENT SYSTEM AND CONVEYANCE PIPING ARE CONCEPTUAL AND NOT FOR CONSTRUCTION.

REV. NO.	DESCRIPTION	BY	DATE

SCALE: 1" = 50'
0 25 50 100

GZA GeoEnvironmental, Inc.
Engineers and Scientists
530 BROADWAY
PROVIDENCE, RHODE ISLAND 02909
(401) 421-4140
(401) 751-8613

PROJ. MGR.: ABU
DESIGNED BY: RAK
REVIEWED BY: EAS
OPERATOR: SBB
DATE: FEB 2012

RHODE ISLAND RESOURCE RECOVERY CORP.
CENTRAL LANDFILL
EPA FIVE-YEAR REVIEW
JOHNSTON, RHODE ISLAND

PROPOSED MONITORING WELL EXTRACTION & LOCATIONS
RELOCATED HOT SPOT HYDRODYNAMIC CONTAINMENT

PROJECT NO.
33417.02

FIGURE NO.
4

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GZA-J:\CLF\33417.02.aig\Figures\32417.02_F3_R0_FEB2013.DWG [Figure3] August 15, 2013 - 7:24am gary.bestien

ATTACHMENT B

TABLES

TABLE 1

Comparison of August 2008 and August 2012 Groundwater Elevations
Five-Year Review Report

Central Landfill, Johnston, RI

WELL ID	August 25, 2008		August 22, 2012		GW ELEVATION CHANGE (FT)
	DTW(FT.)	ELEV.(FT.)	DTW (FT.)	ELEV. (FT.)	
MW03-55	68.95	384.91	69.54	384.32	0.59
MW03-56	69.5	352.11	71.66	349.95	2.16
MW03-ML12 A*	NA	347.8	NA	345.89	1.91
MW03-ML14 A*	NA	307.85	NA	306.44	1.41
MW90-30	19.99	385.06	21.05	384.00	1.06
MW90-31A	17.6	394.8	19.20	393.20	1.60
MW99-28AR	17.56	303.66	17.02	304.20	-0.54
MW99-28BR	18.75	302.46	18.38	302.83	-0.37
MW99-29AR	10.91	303.92	11.36	303.47	0.45
MW99-29BR	15.75	299.48	15.60	299.63	-0.15
NELF-6A	18.76	342.79	19.13	342.42	0.37
NELF-6B	18.72	342.76	19.07	342.41	0.35
NELF-9A	17.74	337.02	17.58	337.18	-0.16
NELF-9B	18.16	336.65	18.14	336.67	-0.02
NELF-10A	19.15	341.17	19.39	340.93	0.24
NELF-10B	22.4	338.42	22.41	338.41	0.01
NELF-13B	17.75	329.37	16.95	330.17	-0.80
NELF-15A	6.16	316.73	6.94	315.95	0.78
NELF-15B	5.97	317.02	6.60	316.39	0.63
NELF-18A	9.6	313.42	9.74	313.28	0.14
NELF-18B	9.08	314.54	9.05	314.57	-0.03
NELF-20A	8.79	304.53	8.71	304.61	-0.08
NELF-20B	12.09	301.53	11.80	301.82	-0.29
NELF-22A	17.96	298.71	17.79	298.88	-0.17
NELF-22B	17.74	298.74	17.55	298.93	-0.19
MWP5-1AR	10.55	298.85	11.68	297.72	1.13
MWP5-1B	10.47	297.66	10.27	297.86	-0.20
MWP5-2A	21.91	298.22	21.81	298.32	-0.10
MWP5-2B	22.09	298.23	22.03	298.29	-0.06
MWP5-3A	29.57	302.37	29.77	302.17	0.20
MWP5-3B	25.17	307.17	26.21	306.13	1.04

Notes:

1. NA indicates that a depth to water reading is not taken directly from the multi-level wells. Instead, a pressure transducer is used to record total piezometric pressure within the zones which is then converted to a theoretical water table elevation.
2. "*" Indicates that groundwater measurement was collected in April 2008.

TABLE 2

Statistical Exceedances of Groundwater Quality Standards
Five-Year Review Report

Central Landfill, Johnston, RI

Parameter	Downgradient Locations									
Metals	MW99-28BR	MW99-29BR	MWP5-1A	MWP5-1B	MWP5-2A	MWP5-2B	NELF-15A	NELF-15B	NELF-22A	NELF-22B
Antimony										
Arsenic (As)*				X			X			
Beryllium*	X							X		
Cadmium*										
Chromium*										
Lead*										
Mercury										
Selenium										
Thallium		X				X				X
Volatile Organic Compounds										
1,1,1-Trichloroethane										
1,1,2-Trichloroethane										
1,1-Dichloroethene										
1,2-Dibromo-3-chloropropane										
1,2-Dibromoethane										
1,2-Dichlorobenzene*										
1,2-Dichloroethane										
1,2-Dichloropropane										
1,4-Dichlorobenzene*										
Benzene*			X	X	X	X			X	X
Benzo(a)pyrene										
Carbon tetrachloride*										
Chlorobenzene*			X	X						
Cis-1,2-dichloroethene			X	X						
Ethyl benzene										
Heptachlor epoxide										
Methylene chloride*										
Pentachlorophenol										
Styrene										
Tetrachloroethene*			X							
Trichloroethene*			X							
Vinyl chloride*			X	X						
Water Quality Parameter										
Nitrate as N										

Notes: **Red X indicates a statistically significant exceedance of federal safe drinking water maximum contaminant level (MCL).**
Black X indicates an exceedance of federal safe drinking water MCL that is not statistcally significant.
The * identifies contaminants of concern (COC's).

TABLE 2

Statistical Exceedances of Groundwater Quality Standards
Five-Year Review Report

Central Landfill, Johnston, RI

Parameter	Sidegradient Locations										
Metals	**MWP6-9A**	**MWP6-10A**	**MWP6-11A**	**MW90-34B**	**WE02-4**	**WE87-8**	**MW90-33**	**MW-O**	**WE85-6B**	**WE85-ML1A**	**WE85-ML1E**
Antimony											
Arsenic (As)*	X	X	X			X					
Beryllium*	X	X	X	X	X		X		X	X	X
Cadmium*		X	X			X	X	X			
Chromium*											
Lead*	X										
Mercury											
Selenium											
Thallium				X						X	
Volatile Organic Compounds											
1,1,1-Trichloroethane											
1,1,2-Trichloroethane											
1,1-Dichloroethene											
1,2-Dibromo-3-chloropropane											
1,2-Dibromoethane											
1,2-Dichlorobenzene*											
1,2-Dichloroethane											
1,2-Dichloropropane											
1,4-Dichlorobenzene*				X							
Benzene*											
Benzo(a)pyrene											
Carbon tetrachloride*											
Chlorobenzene*				X							
Cis-1,2-dichloroethene				X							
Ethyl benzene											
Heptachlor epoxide											
Methylene chloride*											
Pentachlorophenol											
Styrene											
Tetrachloroethene*											
Trichloroethene*											
Vinyl chloride*											
Water Quality Parameter											
Nitrate as N			X								

Notes: **Red X indicates a statistically significant exceedance of federal safe drinking water maximum contaminant level (MCL).**
Black X indicates an exceedance of federal safe drinking water MCL that is not statistcally significant.
The * identifies contaminants of concern (COC's).

TABLE 2

Statistical Exceedances of Groundwater Quality Standards
Five-Year Review Report

Central Landfill, Johnston, RI

Parameter	Upgradient Locations						Plume Centerline Locations			
Metals	MW90-30	MW90-31A	MW95-51	WE85-16	MW03-55	WE87-ML5A	MW03-56	MW03-ML11	MW03-ML12A	MW03-ML12B
Antimony							X			
Arsenic (As)*				X			X			
Beryllium*			X	X	X	X		X	X	X
Cadmium*				X	X			X		
Chromium*										
Lead*					X		X			X
Mercury								X		
Selenium										
Thallium	X			X						
Volatile Organic Compounds										
1,1,1-Trichloroethane							X			
1,1,2-Trichloroethane										
1,1-Dichloroethene							X			
1,2-Dibromo-3-chloropropane										
1,2-Dibromoethane								X		
1,2-Dichlorobenzene*							X	X	X	X
1,2-Dichloroethane							X			
1,2-Dichloropropane										
1,4-Dichlorobenzene*							X	X	X	X
Benzene*					X		X	X	X	X
Benzo(a)pyrene										
Carbon tetrachloride*									X	
Chlorobenzene*							X	X		X
Cis-1,2-dichloroethene							X			
Ethyl benzene							X			
Heptachlor epoxide										
Methylene chloride*							X	X		
Pentachlorophenol										X
Styrene							X			
Tetrachloroethene*							X			
Trichloroethene*							X	X		
Vinyl chloride*							X	X		
Water Quality Parameter										
Nitrate as N		X						X		

Notes: **Red X indicates a statistically significant exceedance of federal safe drinking water maximum contaminant level (MCL).**
Black X indicates an exceedance of federal safe drinking water MCL that is not statistcally significant.
The * identifies contaminants of concern (COC's).

TABLE 2

Statistical Exceedances of Groundwater Quality Standards
Five-Year Review Report

Central Landfill, Johnston, RI

Parameter	Plume Centerline Locations Cont.							
Metals	MW03-ML12C	MW03-ML12D	MW03-ML12E	MW03-ML14A	MW03-ML14C	MW03-ML14D	MW03-ML14E	MW03-ML14F
Antimony				X				
Arsenic (As)*								
Beryllium*	X	X	X	X	X	X		X
Cadmium*								
Chromium*				X	X			X
Lead*				X	X			
Mercury								
Selenium								
Thallium								
Volatile Organic Compounds								
1,1,1-Trichloroethane								
1,1,2-Trichloroethane								
1,1-Dichloroethene					X			
1,2-Dibromo-3-chloropropane								
1,2-Dibromoethane								
1,2-Dichlorobenzene*								
1,2-Dichloroethane								
1,2-Dichloropropane								
1,4-Dichlorobenzene*								
Benzene*					X			
Benzo(a)pyrene								
Carbon tetrachloride*								
Chlorobenzene*	X	X	X		X	X		
Cis-1,2-dichloroethene					X	X	X	X
Ethyl benzene								
Heptachlor epoxide								
Methylene chloride*								
Pentachlorophenol								
Styrene								
Tetrachloroethene*								
Trichloroethene*		X			X	X	X	X
Vinyl chloride*					X	X	X	X
Water Quality Parameter								
Nitrate as N								

Notes: **Red X indicates a statistically significant exceedance of federal safe drinking water maximum contaminant level (MCL).**
Black X indicates an exceedance of federal safe drinking water MCL that is not statistcally significant.
The * identifies contaminants of concern (COC's).

TABLE 3

Groundwater Trend Tests for Statistically Significant Exceedances
Five-Year Review Report
Central Landfill, Johnston, RI

	Statistically Significant Decreasing Trend							
	Plume Centerline							
Parameter	MW03-56	MW03-ML11	MW03-ML12A	MW03-ML12B	MW03-ML12D	MW03-ML12E	MW03-ML14D	MW03-ML14E
1,2-Dichlorobenzene	x		x					
1,4-Dichlorobenzene	x	x						
Benzene								
Ethyl Benzene	x							
Chlorobenzene	x	x			x			
Total Xylene	x							
Vinyl Chloride								
Barium								
Beryllium						x		
Cadmium								
Chromium						x		
Cobalt		x						
Copper								
Iron		x		x	x	x		
Lead								
Manganese		x	x		x	x		x
Nickel	x	x		x	x	x	x	
Thallium								
Zinc							x	
Ammonia								
Chemical Oxygen Demand (COD)								
Chloride								
Nitrate								
Sulfate								
Total Dissolved Solids (TDS)								
Total Organic Carbon (TOC)				x				

Notes:
1. Parameters selected for evaluation are the OU1 Contaminants of Concern
2. A total of 1,661 Time Series Plots were evaluated.
3. Trend evaluation was performed using Compliance, Assessment and Remedaiton Statistics (CARStat) developed by Discerning Systems, Inc. of Burnaby, BC, Canada.

TABLE 3

Groundwater Trend Tests for Statistically Significant Exceedances
Five-Year Review Report
Central Landfill, Johnston, RI

	Statistically Significant Decreasing Trend									
	Downgradient				Downgradient Cont.					
Parameter	MW99-28BR	MW99-29BR	MWP5-1A	MWP5-1B	MWP5-2A	MWP5-3A	MWP5-3B	NELF-15B	NELF-22A	NELF-22B
1,2-Dichlorobenzene										
1,4-Dichlorobenzene										
Benzene										
Ethyl Benzene										
Chlorobenzene		x		x						
Total Xylene										
Vinyl Chloride										
Barium			x		x			x		
Beryllium	x						x			
Cadmium										
Chromium			x	x		x				
Cobalt	x		x							
Copper										
Iron										
Lead										
Manganese	x							x	x	x
Nickel		x	x		x					
Thallium										
Zinc	x									
Ammonia				x	x					
Chemical Oxygen Demand (COD)			x		x					
Chloride		x								
Nitrate								x		
Sulfate										
Total Dissolved Solids (TDS)			x		x					
Total Organic Carbon (TOC)			x		x					

Notes:
1. Parameters selected for evaluation are the OU1 Contaminants of Concern
2. A total of 1,661 Time Series Plots were evaluated.
3. Trend evaluation was performed using Compliance, Assessment and Remedaiton Statistics (CARStat) developed by Discerning Systems, Inc. of Burnaby, BC, Canada.

TABLE 3

Groundwater Trend Tests for Statistically Significant Exceedances
Five-Year Review Report
Central Landfill, Johnston, RI

	Statistically Significant Decreasing Trend								
	Sidegradient					Upgradient			
Parameter	MW90-33	MW-O	MWP6-9A	MWP6-11A	MWP6-11B	MW03-55	MW90-30	MW95-51	MW95-52
1,2-Dichlorobenzene									
1,4-Dichlorobenzene									
Benzene									
Ethyl Benzene									
Chlorobenzene									
Total Xylene									
Vinyl Chloride									
Barium		x		x	x				
Beryllium				x	x	x		x	
Cadmium		x		x					
Chromium									
Cobalt		x	x		x				
Copper					x				
Iron		x					x		
Lead				x					
Manganese						x			
Nickel	x			x	x				
Thallium				x					
Zinc		x		x	x				
Ammonia		x							x
Chemical Oxygen Demand (COD)			x	x					
Chloride		x	x	x	x				
Nitrate				x				x	
Sulfate									
Total Dissolved Solids (TDS)		x							
Total Organic Carbon (TOC)			x						

Notes:
1. Parameters selected for evaluation are the OU1 Contaminants of Concern
2. A total of 1,661 Time Series Plots were evaluated.
3. Trend evaluation was performed using Compliance, Assessment and Remedaiton Statistics (CARSta developed by Discerning Systems, Inc. of Burnaby, BC, Canada.

TABLE 3

Groundwater Trend Tests for Statistically Significant Exceedances
Five-Year Review Report
Central Landfill, Johnston, RI

	Statistically Significant Increasing Trend									
	Plume Centerline	Downgradient			Sidegradient				Upgradient	
Parameter	MW03-ML14F	MWP5-3A	MWP5-3B	NELF-22A	MWP6-10A	WE87-8	WE87-ML3D	WE87-ML3E	MW03-55	MW90-31
1,2-Dichlorobenzene										
1,4-Dichlorobenzene										
Benzene				x						
Ethyl Benzene										
Chlorobenzene										
Total Xylene										
Vinyl Chloride	x									
Barium										
Beryllium										
Cadmium										
Chromium										
Cobalt										
Copper										
Iron										
Lead									x	
Manganese										
Nickel										
Thallium										
Zinc									x	
Ammonia										
Chemical Oxygen Demand (COD)										
Chloride							x	x		
Nitrate										x
Sulfate										
Total Dissolved Solids (TDS)		x	x		x	x				
Total Organic Carbon (TOC)										

Notes:

1. Parameters selected for evaluation are the OU1 Contaminants of Concern
2. A total of 1,661 Time Series Plots were evaluated.
3. Trend evaluation was performed using Compliance, Assessment and Remedaiton Statistics (CARStat) developed by Discerning Systems, Inc. of Burnaby, BC, Canada.

TABLE 4

Surface Water Exceedances of FAWQC and RIAWQC
Five-Year Review Report
Central Landfill, Johnston, RI

Location	Surfacewater - Exceedances of FAWQC/RIAWQC							
	Inorganic Parameters							
	Arsenic		Beryllium		Cadmium*		Copper*	
Regulatory Standard	RIAWQC	FAWQC	RIAWQC	FAWQC	RIAWQC	FAWQC	RIAWQC	FAWQC
	1.4 µg/l	0.14 µg/l	0.17 µg/l	4 µg/l	0.24 µg/l	0.24 µg/l	8.6 µg/l	8.6 µg/l
SW-1A		x			x	x	x	x
SW-1B		x	x		x	x		
SW-5	x	x	x		x	x	x	x
SW-6	x	x	x		x	x	x	x
SW-7		x	x		x	x		
SW-A		x	x		x	x		
SW-B		x	x		x	x		
SW-C	x	x	x		x	x		

1. **Red X indicates a Statically Significant exceedance of Regulatory Criteria as identified by CARStat.**
2. Black X indicates an exceedance of the Regulatory Criteria that is not statistcally significant.
3. RIAWQC is the Rhode Island Ambient Water Quality Criteria
4. FAWQC is the Federal Ambient Water Quality Criteria
5. "*" indicates that the RIAWQC AND FAWQC are hardness dependent and the criteria was calculated using the average hardness of the receiving water body (the Upper Simmons Reservoir) equal to 96 mg/L CaCo3.
6. Ambient Water Quality Criteria (FAWQC/RIAWQC) presented in this table represents the lowest value between the Aquatic Life Criteria Freshwater Chronic (c) or the Human Health Criteria for Consumption of Aquatic Organisms Only (hhca). The Federal Maxiumum Contaminant Level (MCL) is used as the FAWQC for beryllium.

TABLE 4

Surface Water Exceedances of FAWQC and RIAWQC
Five-Year Review Report
Central Landfill, Johnston, RI

Location	Surfacewater - Exceedances of FAWQC/RIAWQC									
	Inorganic Parameters									
	Iron		Lead*		Selenium		Silver		Thallium	
Regulatory Standard	RIAWQC	FAWQC	RIAWQC	FAWQC	RIAWQC	FAWQC	RIAWQC	FAWQC	RIAWQC	FAWQC
	0.3 µg/l	0.3 µg/l	2.4 µg/l	2.4 µg/l	5 µg/l	5 µg/l	3.2 µg/l	3.0 µg/l	0.47 µg/l	0.47 µg/l
SW-1A	x	x	x	x						
SW-1B	x	x	x	x						
SW-5	x	x	x	x	x	x	x	x	x	x
SW-6	x	x	x	x	x	x	x	x	x	x
SW-7	x	x	x	x	x	x	x	x		
SW-A	x	x								
SW-B	x	x	x		x	x				
SW-C	x	x								

1. Red X indicates a Statically Significant exceedance of Regulatory Criteria as identified by CARStat.

2. Black X indicates an exceedance of the Regulatory Criteria that is not statistcally significant.
3. RIAWQC is the Rhode Island Ambient Water Quality Criteria
4. FAWQC is the Federal Ambient Water Quality Criteria
5. "*" indicates that the RIAWQC AND FAWQC are hardness dependent and the criteria was calculated using the average hardness of the receiving water body (the Upper Simmons Reservoir) equal to 96 mg/L CaCo3.

6. Ambient Water Quality Criteria (FAWQC/RIAWQC) presented in this table represents the lowest value between the Aquatic Life Criteria Freshwater Chronic (c) or the Human Health Criteria for Consumption of Aquatic Organisms Only (hhca). The Federal Maxiumum Contaminant Level (MCL) is used as the FAWQC for beryllium.

TABLE 5

PHASE V STONE TRENCH DISCHARGE (SW-4)
WATER QUALITY DATA STATISTICS

Central Landfill Johnston, RI

		Federal Safe Drinking Water Standard		State and Federal Water Quality Criteria (Aquatic Life)			
Class	Parameter	MCL (ug/L)	Exceedance	RIAWQC (ug/L)	Exceedance	FAWQC (ug/L)	Exceedance
VOC	Benzene*	5	x	5.9	x	51	
	Chlorobenzene*	100	x	18	x	130	
Inorganics	Arsenic*	10	x	150		150	
	Beryllium*	4		0.17	x	4	
	Cyanide*	200		5.2	x	5.2	x
	Iron	-		300	x	300	x
	Lead*	15		2.4	x	2.5	x
	Manganese*	-		-		100	x
	Selenium	50		5	x	5.0	x
	Silver	-		3.2	x	3.2	x
	Thallium	2	x	0.47	x	0.47	x

Notes:
1. Of the 220 sampled constituents, these 11 parameters exceeded one or more of the indicated criteria.
2. * indicates OU1 constituent of concern.
3. X indicates a statistically significant exceedances.
4. X indicates an exceedance that is not statistically significant.
5. MCL indicates Maximum Contaminant Level.
6. RIAWQC refers to the Rhode Island Ambient Water Quality Criteria-Chronic Effect Level.
7. FAWQC refers to the Federal Ambient Water Quality Criteria-Chronic Effect Level.
8. Human Health for Consumption of Aquatic Organisms.
9. No Chronic Health affect published. Criteria references Acute affect.

TABLE 6
UPPER SIMMONS RESEVOIR SEDIMENT RESULTS FOR INORGANICS AND SEDIMENT QUALITY PARAMETERS
Central Landfill - Johnston, Rhode Island

Chemical Name	Unit	Sediment Screening Benchmarks for the Protection of Benthic Organisms		SED-15															SED-16														
		TEC	PEC	5/22/2008			5/21/2009			5/25/2010			5/26/2011			5/25/2012			5/22/2008			5/21/2009			5/25/2010			5/26/2011			5/25/2012	
Inorganics																																	
Antimony	mg/kg	NA	NA	<	2	U	<	2	U		**3.1**	U	<	1.4	U	<	1.7	U	<	1.8	U	<	1.9	U		**1.92**		<	1.3	U	<	1.2	
Arsenic	mg/kg	9.79	33		**11**			**22**			**10.7**			**19**			**16**			**11**			**5.8**			**4.2**			**3**			**4.2**	
Barium	mg/kg	NA	NA		**180**			**180**			**169**			**190**			**160**			**160**			**210**			**135**			**38**			**41**	
Beryllium	mg/kg	NA	NA		**3.5**			**3.4**			**2.28**			**2.5**		<	0.44	U		**8.9**			**1.2**			**2.12**			**1.9**			**2.9**	
Cadmium	mg/kg	0.99	4.98		**2**			**0.54**			**0.62**			**1**			**0.43**			**1.5**			**0.82**			**1.31**			**0.28**			**0.31**	
Chromium	mg/kg	43.4	111		**26**			**81**			**65.1**			**68**			**59**			**17**			**17**			**13.2**			**5.2**			**5.7**	
Cobalt	mg/kg	50	NA		**12**			**22**			**21.8**			**24**			**22**			**8.8**			**5.6**			**8.58**			**3.2**			**2.4**	
Copper	mg/kg	31.6	149		**87**			**53**			**58.3**			**55**			**60**			**43**			**70**			**68.5**			**13**			**13**	
Iron	mg/kg	NA	NA		**41000**			**68000**			**47700**			**57000**			**43000**			**33000**			**15000**			**22100**			**10000**			**12000**	
Lead	mg/kg	35.8	128		**160**			**31**			**34.3**			**44**			**52**			**110**			**150**			**106**			**22**			**26**	
Nickel	mg/kg	22.7	48.6		**17**			**53**			**43.2**			**46**			**41**			**16**			**9.8**			**14.4**			**4.5**			**6**	
Selenium	mg/kg	NA	NA	<	3	U	<	3	U	<	3	U	<	2.1	U	<	2.6	U	<	2.7	U	<	2.8	U	<	3	U	<	2	U	<	1.7	
Silver	mg/kg	0.5	NA	<	3	U	<	3	U	<	0.3	U	<	2.1	U	<	2.6	U	<	2.7	U		**0.22**		<	0.29	U	<	2	U	<	1.7	
Thallium	mg/kg	NA	NA	<	2	U	<	2	U		**2.63**			**8.8**			**6.2**		<	1.8	U	<	1.9	U		**4.4**			**1.1**			**1.6**	
Vanadium (Fume OR Dust)	mg/kg	NA	NA		**35**			**96**			**81.5**			**87**			**77**			**27**			**19**			**26.3**			**11**			**10**	
Zinc	mg/kg	121	459		**120**			**150**			**168**			**170**			**200**			**400**			**220**			**236**			**74**			**120**	
Sediment Quality Parameters																																	
Ammonia as N	mg/kg				**490**			**110**			**130**			**222**		<	24	U		**190**			**35**			**170**			**141**		<	13	
Nitrate as N	mg/kg										**1.5**						**13**									**1.4**						**4.6**	
Nitrate as N	mg/l													**0.032**															**0.12**				
Phosphate (As P)	mg/kg			<	9.9	U		5			**3120**			**310**			**860**		<	10	U		**32**			**1220**			**33**			**210**	
Chloride	mg/kg			<	380	U	<	300	U	<	260	U					**120**		<	340	U	<	270	U	<	250						**85**	
Chloride	mg/l													**6.4**															**1.8**				
Total Coliform	mpn/100ml				**1400**			**300**						**500**			**80**		<	20	U		**500**						**16000**			**130**	
Total Kjeldahl Nitrogen	mg/kg				**2100**			**1300**			**1100**			**1900**			**1300**			**2300**			**290**			**2200**			**855**			**370**	
Total Organic Carbon	mg/kg				**60000**			**4000**			**9260**			**14000**			**21000**			**28000**			**18000**			**31400**			**14000**			**8400**	
Total Phosphate	mg/kg			<	30	U					**1020**			**920**			**2600**		<	30	U					**400**			**99**			**620**	

Notes
1. TEC = Threshold Effects Concentration. Concentrations above these values are considered to present a potential risk of harm to exposed benthic organisms (i.e., those that live in close contact with sediment). TECs presented are from the compilation of ecological screening by US EPA Region 5, which is available at: http://epa.gov/region05/waste/cars/pdfs/ecological-screening-levels-200308.pdf
TECs for organic contaminants were developed based on equlibrium partitioning (water-to-sediment organic carbon), assuming a total organic carbon content of 1%.
2. PEC = Probable Effects Concentration. Concentrations above these values are considered to have a relatively high probability of causing harm to exposed benthic organisms.
PECs presented are from MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39: 20-31.
3. µg/kg indicates result reported as micrograms per kilogram.
4. < indicates that parameter is not detected above the reporting limit.
5. J is a data qualifier indicating that the parameter is estimated below the reporting limit.
6. U is a data qualifier indicating that the parameter is not detected.
7. Green highlight indicates an exceedance of the TEC.
8. Orange highlight indicates an exceedance of the PEC.
9. Bold indicates the parameter was detected.
10. MPN/100ml indicates result reported in most probable number per 100 milliliters.
11. Mg/L indicates result reported in milligrams per liter.

TABLE 6
UPPER SIMMONS RESEVOIR SEDIMENT RESULTS FOR INORGANICS AND SEDIMENT QUALITY PARAMETERS
Central Landfill - Johnston, Rhode Island

Chemical Name	Unit	Sediment Screening Benchmarks for the Protection of Benthic Organisms		SED-17														SED-18														
		TEC	PEC	5/22/2008		5/21/2009		5/25/2010		5/26/2011		5/25/2012		5/22/2008		5/21/2009		5/25/2010		5/26/2011		5/25/2012	
Inorganics																																
Antimony	mg/kg	NA	NA	< 1.6	U	< 2.2	U	1.7		< 1.5	U	< 1.9	U	< 2.6	U	< 3.4	U	3.2		< 3.2	U	< 3.3	U
Arsenic	mg/kg	9.79	33	8.4		13		6.3		16		11		16		17		8.7		20		17	
Barium	mg/kg	NA	NA	170		170		206		180		150		230		220		213		230		170	
Beryllium	mg/kg	NA	NA	3.3		3.4		3.49		3.2		2.8		6		8.4		7.27		7.7		5.6	
Cadmium	mg/kg	0.99	4.98	1.5		1.1		1.19		1.5		0.99		2.1		2.5		2.42		2.7		2.1	
Chromium	mg/kg	43.4	111	25		42		26.4		54		32		33		34		23.5		48		31	
Cobalt	mg/kg	50	NA	9.6		14		13.5		20		9.8		15		15		17		24		15	
Copper	mg/kg	31.6	149	81		72		84		73		73		91		87		96.2		91		62	
Iron	mg/kg	NA	NA	36000		45000		37200		51000		33000		58000		49000		53100		59000		47000	
Lead	mg/kg	35.8	128	140		120		130		88		120		140		160		137		130		110	
Nickel	mg/kg	22.7	48.6	17		28		19.6		36		19		25		25		26.2		35		22	
Selenium	mg/kg	NA	NA	< 2.4	U	< 3.3	U	< 3	U	< 2.2	U	1.4		< 3.9	U	< 5.1	U	< 2.1	U	< 4.8	U	6.2	
Silver	mg/kg	0.5	NA	< 2.4	U	< 3.3	U	0.233		< 2.2		< 2.9	U	< 3.9	U	< 5.1	U	< 0.41	U	< 4.8	U	< 4.9	U
Thallium	mg/kg	NA	NA	< 1.6	U	< 2.2	U	8.9		6.9		< 1.9	U	< 2.6	U	< 3.4	U	4.3		6.9		< 3.3	U
Vanadium (Fume OR Dust)	mg/kg	NA	NA	35		52		38.5		70		42		50		48		51.4		73		53	
Zinc	mg/kg	121	459	310		240		291		260		290		430		470		455		430		370	
Sediment Quality Parameters																																
Ammonia as N	mg/kg			370		74		60		233		130		680				180		448		180	
Nitrate as N	mg/kg							1.9				0.24						3.5				0.39	
Nitrate as N	mg/l									0.029										< 0.13	U		
Phosphate (As P)	mg/kg			< 9	U	6.5		1700		110		850		< 13	U	7.2		1970		120		710	
Chloride	mg/kg			< 320	U	< 280	U	410				140		< 480	U	< 420	U	< 430	U			250	
Chloride	mg/l									6.8										2.5			
Total Coliform	mpn/100ml			9000		170				3000		2400		110		330				230		230	
Total Kjeldahl Nitrogen	mg/kg			2100		520		1600		2150		1400		2500		2000		2600		4670		2400	
Total Organic Carbon	mg/kg			48000		15000		34600		24000		40000		61000		18000		31200		56000		56000	
Total Phosphate	mg/kg			< 27	U			554		320		2600		< 38	U			644		360		2100	

Notes

1. TEC = Threshold Effects Concentration. Concentrations above these values are considered to present a potential risk of harm to exposed benthic organisms (i.e., those that live in close contact with sediment). TECs presented are from the compilation of ecological screening by US EPA Region 5, which is available at: http://epa.gov/region05/waste/cars/pdfs/ecological-screening-levels-200308.pdf
   TECs for organic contaminants were developed based on equilibrium partitioning (water-to-sediment organic carbon), assuming a total organic carbon content of 1%.
2. PEC = Probable Effects Concentration. Concentrations above these values are considered to have a relatively high probability of causing harm to exposed benthic organisms.
   PECs presented are from MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39: 20-31.
3. µg/kg indicates result reported as micrograms per kilogram.
4. < indicates that parameter is not detected above the reporting limit.
5. J is a data qualifier indicating that the parameter is estimated below the reporting limit.
6. U is a data qualifier indicating that the parameter is not detected.
7. Green highlight indicates an exceedance of the TEC.
8. Orange highlight indicates an exceedance of the PEC.
9. Bold indicates the parameter was detected.
10. MPN/100ml indicates result reported in most probable number per 100 milliliters.
11. Mg/L indicates result reported in milligrams per liter.

TABLE 6
UPPER SIMMONS RESEVDIR SEDIMENT RESULTS FOR INORGANICS AND SEDIMENT QUALITY PARAMETERS
Central Landfill - Johnston, Rhode Island

Chemical Name	Unit	Sediment Screening Benchmarks for the Protection of Benthic Organisms		SED-19														SED-6														
		TEC	PEC	5/22/2008			5/21/2009			5/25/2010			5/26/2011			5/25/2012		5/22/2008			5/21/2009			5/25/2010			5/26/2011			5/25/2012	
Inorganics																																
Antimony	mg/kg	NA	NA	<	3	U	<	5.3	U	<	2	U	<	3.7	U	<	4.7	U	<	1.9		<	1.8	U		**2.53**		<	1.7	U	<	2.4	U
Arsenic	mg/kg	9.79	33		**47**			**62**			**24**			**33**			**37**			**14**			**14**			**6.3**			**15**			**16**	
Barium	mg/kg	NA	NA		**220**			**210**			**181**			**140**			**150**			**210**			**200**			**140**			**180**			**170**	
Beryllium	mg/kg	NA	NA		**6.3**			**7.9**			**5.19**			**4.7**			**4.9**			**5.2**			**5.9**			**2.82**			**4.1**			**4.5**	
Cadmium	mg/kg	0.99	4.98		**2.6**			**3.3**			**1.27**			**2.1**			**1.9**			**2.3**			**2.6**			**0.92**			**1.6**			**3**	
Chromium	mg/kg	43.4	111		**24**			**25**			**2.13**			**21**			**26**			**34**			**35**			**26.2**			**43**			**38**	
Cobalt	mg/kg	50	NA		**13**			**14**			**17.6**			**15**			**14**			**13**			**13**			**13.8**			**17**			**13**	
Copper	mg/kg	31.6	149		**63**			**61**			**45.3**			**47**			**52**			**67**			**85**			**53.9**			**73**			**69**	
Iron	mg/kg	NA	NA		**110000**			**120000**			**78300**			**62000**			**73000**			**51000**			**54000**			**39000**			**48000**			**46000**	
Lead	mg/kg	35.8	128		**100**			**110**			**73.8**			**79**			**86**			**130**			**130**			**63.8**			**100**			**100**	
Nickel	mg/kg	22.7	48.6		**17**			**18**			**17.9**			**16**			**18**			**23**			**24**			**23.9**			**29**			**26**	
Selenium	mg/kg	NA	NA	<	4.5	U	<	7.9	U	<	3	U		**4.5**			**6**		<	2.8		<	2.7	U	<	1.9	U		**2**			**1.8**	
Silver	mg/kg	0.5	NA	<	4.5	U	<	7.9	U	<	0.91	U	<	5.5	U	<	7	U	<	2.8		<	2.7	U	<	0.38	U	<	2.6	U	<	3.6	U
Thallium	mg/kg	NA	NA	<	3	U	<	5.3	U		**20.8**			**1.9**		<	4.7	U	<	1.9		<	1.8	U		**4.8**			**6.6**			**6.4**	
Vanadium (Fume OR Dust)	mg/kg	NA	NA		**48**			**48**			**39.6**			**42**			**46**			**49**			**48**			**44.8**			**59**			**58**	
Zinc	mg/kg	121	459		**260**			**270**			**194**			**210**			**250**			**350**			**340**			**193**			**270**			**320**	
Sediment Quality Parameters																																
Ammonia as N	mg/kg				**400**			**440**			**95**			**475**			**180**			**220**			**310**			**110**			**304**			**220**	
Nitrate as N	mg/kg										**4.7**						**0.39**									**2**						**0.28**	
Nitrate as N	mg/l												<	0.13	U													<	0.13	U			
Phosphate (As P)	mg/kg			<	14	U		**32**			**2690**			**450**			**840**		<	11	U		**3.6**			**2400**			**170**			**1300**	
Chloride	mg/kg				**630**		<	590	U		**940**						**310**		<	370	U	<	330	U	<	320	U					**150**	
Chloride	mg/l													**4.6**															**2.2**				
Total Coliform	mpn/100ml				**500**			**1400**						**800**			**230**			**3500**			**1300**						**5000**			**140**	
Total Kjeldahl Nitrogen	mg/kg				**3800**			**3000**			**2000**			**7100**			**1600**			**2100**			**2100**			**1500**			**2510**			**810**	
Total Organic Carbon	mg/kg				**56000**			**25000**			**43000**			**61000**			**59000**			**48000**			**16000**			**22000**			**35000**			**41000**	
Total Phosphate	mg/kg			<	43	U					**878**			**1400**			**2500**		<	33	U					**802**			**510**			**3900**	

Notes
1. TEC = Threshold Effects Concentration. Concentrations above these values are considered to present a potential risk of harm to exposed benthic organisms (i.e., those that live in close contact with sediment). TECs presented are from the compilation of ecological screening by US EPA Region 5, which is available at: http://epa.gov/region05/waste/cars/pdfs/ecological-screening-levels-200308.pdf
TECs for organic contaminants were developed based on equlibrium partitioning (water-to-sediment organic carbon), assuming a total organic carbon content of 1%.
2. PEC = Probable Effects Concentration. Concentrations above these values are considered to have a relatively high probability of causing harm to exposed benthic organisms.
PECs presented are from MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39: 20-31.
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TABLE 6

UPPER SIMMONS RESEVOIR SEDIMENT RESULTS FOR INORGANICS AND SEDIMENT QUALITY PARAMETERS

Central Landfill - Johnston, Rhode Island

Chemical Name	Unit	Sediment Screening Benchmarks for the Protection of Benthic Organisms		SED-7														
		TEC	PEC	5/22/2008			5/21/2009			5/25/2010			5/26/2011			5/25/2012		
Inorganics																		
Antimony	mg/kg	NA	NA	<	1.7	U	<	2.9	U		**2.33**		<	2.3	U	<	3.4	U
Arsenic	mg/kg	9.79	33		**9.3**			**15**			**7.8**			**10**			**17**	
Barium	mg/kg	NA	NA		**130**			**180**			**192**			**240**			**220**	
Beryllium	mg/kg	NA	NA		**6.7**			**10**			**6.23**			**9**			**7**	
Cadmium	mg/kg	0.99	4.98		**1**			**1.9**			**1.43**			**2.3**			**1.4**	
Chromium	mg/kg	43.4	111		**13**			**25**			**25.4**			**35**			**33**	
Cobalt	mg/kg	50	NA		**5.9**			**12**			**15.1**			**21**			**14**	
Copper	mg/kg	31.6	149		**24**			**61**			**59.1**			**71**			**66**	
Iron	mg/kg	NA	NA		**24000**			**39000**			**41900**			**51000**			**48000**	
Lead	mg/kg	35.8	128		**59**			**110**			**93.5**			**140**			**120**	
Nickel	mg/kg	22.7	48.6		**14**			**22**			**23**			**32**			**27**	
Selenium	mg/kg	NA	NA	<	2.5	U	<	4.3	U	<	2.7	U		**2.3**		<	5.1	U
Silver	mg/kg	0.5	NA	<	2.5	U	<	4.3	U	<	0.54	U	<	3.5	U	<	5.1	U
Thallium	mg/kg	NA	NA	<	1.7	U	<	2.9	U		**5**			**6.7**			**7.3**	
Vanadium (Fume OR Dust)	mg/kg	NA	NA		**44**			**50**			**50.4**			**90**			**75**	
Zinc	mg/kg	121	459		**200**			**340**			**312**			**440**			**400**	
Sediment Quality Parameters																		
Ammonia as N	mg/kg				**330**			**1000**			**160**			**410**			**280**	
Nitrate as N	mg/kg										**3.2**						**5.4**	
Nitrate as N	mg/l													**0.02**				
Phosphate (As P)	mg/kg			<	8.2	U		**61**			**3430**			**360**			**1200**	
Chloride	mg/kg			<	320	U	<	430	U	<	460	U					**190**	
Chloride	mg/l													**2.8**				
Total Coliform	mpn/100ml				**1700**			**300**						**140**			**2400**	
Total Kjeldahl Nitrogen	mg/kg				**2600**			**2400**			**2300**			**4480**			**1600**	
Total Organic Carbon	mg/kg				**67000**			**22000**			**43500**			**49000**			**55000**	
Total Phosphate	mg/kg			<	25	U					**1120**			**1100**			**3500**	

Notes

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2. PEC = Probable Effects Concentration. Concentrations above these values are considered to have a relatively high probability of causing harm to exposed benthic organisms. PECs presented are from MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39: 20-31.
3. µg/kg indicates result reported as micrograms per kilogram.
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TABLE 6
UPPER SIMMONS RESEVOIR SEDIMENT RESULTS FOR ORGANIC COMPOUNDS
Central Landfill - Johnston Rhode Island

		Sediment Screening Benchmarks for the protection of Benthic Organisms		SED-15					SED-16				
Chemical Name	Unit	TEC	PEC	5/22/2008	5/21/2009	5/25/2010	5/26/2011	5/25/2012	5/22/2008	5/21/2009	5/25/2010	5/26/2011	5/25/2012
1,1,1-Trichloroethane	µg/kg	213	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
1,1,2,2-Tetrachloroethane	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
1,1,2-Trichloroethane	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
1,1-Dichloroethane	µg/kg	0.575	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
1,1-Dichloroethylene	µg/kg	19.4	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
1,2,3-Trichlorobenzene	µg/kg					< 10					< 10		
1,2-Dibromo-3-Chloropropane (DBCP)	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
1,2-Dibromoethane	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
1,2-Dichlorobenzene	µg/kg	294	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	4.2	< 8.8	< 6.6
1,2-Dichloroethane	µg/kg	260	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
1,2-Dichloropropane	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
1,3-Dichorobenzene	µg/kg	1,315	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	2.8	< 8.8	< 6.6
1,4-Dichlorobenzene	µg/kg	318	NA	< 17	< 14	< 10	< 12	< 11	< 16	15	15	< 8.8	< 6.6
2-Butanone	µg/kg	NA	NA	87	< 14	< 10	38	15	18	210	< 10	< 8.8	7.8
4-Methyl-2-Pentanone	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Acetone	µg/kg	9.90	NA	570	180	14	160	67	200	550	25	32	34
Benzene	µg/kg	142	NA	< 17	< 14	< 10	< 12	< 11	< 16	7.4	< 10	< 8.8	< 6.6
Bromodichloromethane	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Bromomethane	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Carbon Disulfide	µg/kg	24	NA	< 17	< 14	< 10	< 12	2.5	< 16	6	< 10	< 8.8	1.7
Carbon Tetrachloride	µg/kg	1,450	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
CFC-12	µg/kg					< 10					< 10		
Chlorobenzene	µg/kg	291	NA	< 17	< 14	< 10	< 12	< 11	< 16	37	11	< 8.8	< 6.6
Chlorobromomethane	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Chlorodibromomethane	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Chloroethane	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Chloroform	µg/kg	121	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Chloromethane	µg/kg	NA	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
cis-1,2-Dichloroethene	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
cis-1,3-Dichloropropene	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Dichloromethane	µg/kg			< 17	< 14	< 10	< 12	3.1	< 16	< 11	< 10	< 8.8	1.6
Ethylbenzene	µg/kg	175	NA	< 17	< 14	< 10	< 12	< 11	< 16	6.7	4.7	< 8.8	< 6.6
Hexachloro-1,3-Butadiene	µg/kg					< 10					< 10		
Iodomethane	µg/kg			< 17	< 14		< 12	< 11	< 16	< 11		< 8.8	< 6.6
Isopropylbenzene	µg/kg					< 10					73		
Methyl N-Butyl Ketone	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Methyl tert-butyl ether	µg/kg					< 10					< 10		
Naphthalene	µg/kg	176	561			< 10					15		
Styrene (Monomer)	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	3.8	< 8.8	< 6.6
Tetrachloroethene	µg/kg	990	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Toluene	µg/kg	1220	NA	< 17	13	< 10	< 12	< 11	< 16	47	< 10	< 8.8	< 6.6
trans-1,2-Dichloroethene	µg/kg	654	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
trans-1,3-Dichloropropene	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Tribomomethane	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Trichloroethylene	µg/kg			< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Vinyl chloride	µg/kg	202	NA	< 17	< 14	< 10	< 12	< 11	< 16	< 11	< 10	< 8.8	< 6.6
Xylenes (Total)	µg/kg	433	NA	< 17	< 14		< 12	< 11	< 16	11		< 8.8	< 6.6

Notes
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TABLE 6
UPPER SIMMONS RESEVOIR SEDIMENT RESULTS FOR ORGANIC COMPOUNDS
Central Landfill - Johnston Rhode Island

		Sediment Screening Benchmarks for the protection of Benthic Organisms		SED-17					SED-18				
Chemical Name	Unit	TEC	PEC	5/22/2008	5/21/2009	5/25/2010	5/26/2011	5/25/2012	5/22/2008	5/21/2009	5/25/2010	5/26/2011	5/25/2012
1,1,1-Trichloroethane	µg/kg	213	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
1,1,2,2-Tetrachloroethane	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
1,1,2-Trichloroethane	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
1,1-Dichloroethane	µg/kg	0.575	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
1,1-Dichloroethylene	µg/kg	19.4	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
1,2,3-Trichlorobenzene	µg/kg					< 10					< 10		
1,2-Dibromo-3-Chloropropane (DBCP)	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
1,2-Dibromoethane	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
1,2-Dichlorobenzene	µg/kg	294	NA	< 9.5	< 12	2	< 11	< 11	< 22	< 19	< 10	< 23	< 18
1,2-Dichloroethane	µg/kg	260	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
1,2-Dichloropropane	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
1,3-Dichorobenzene	µg/kg	1,315	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
1,4-Dichlorobenzene	µg/kg	318	NA	< 9.5	3.8	5.6	< 11	< 11	< 22	< 19	4	< 23	< 18
2-Butanone	µg/kg	NA	NA	< 9.5	86	< 10	48	47	95	27	< 10	89	> 190
4-Methyl-2-Pentanone	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Acetone	µg/kg	9.00	NA	< 9.5	420	29	140	150	460	270	30	290	540
Benzene	µg/kg	142	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Bromodichloromethane	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Bromomethane	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Carbon Disulfide	µg/kg	24	NA	< 9.5	< 12	< 10	< 11	3.8	< 22	< 19	< 10	< 23	< 12
Carbon Tetrachloride	µg/kg	1,450	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
CFC-12	µg/kg					< 10					< 10		
Chlorobenzene	µg/kg	291	NA	< 9.5	6.3	22	< 11	5.1	< 22	< 19	3.9	< 23	< 18
Chlorobromomethane	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Chlorodibromomethane	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Chloroethane	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Chloroform	µg/kg	121	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Chloromethane	µg/kg	NA	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
cis-1,2-Dichloroethene	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
cis-1,3-Dichloropropene	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Dichloromethane	µg/kg			< 9.5	< 12	< 10	< 11	2.2	< 22	< 19	< 10	< 23	5.5
Ethylbenzene	µg/kg	175	NA	< 9.5	4.1	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Hexachloro-1,3-Butadiene	µg/kg					< 10					< 10		
Iodomethane	µg/kg			< 9.5	< 12		< 11	< 11	< 22	< 19		< 23	< 18
Isopropylbenzene	µg/kg					4.6					< 10		
Methyl N-Butyl Ketone	µg/kg			< 9.5	< 12	< 10	< 11	16	< 22	< 19	< 10	< 23	12
Methyl tert-butyl ether	µg/kg					< 10					< 10		
Naphthalene	µg/kg	176	561			6.3					7.4		
Styrene (Monomer)	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Tetrachloroethene	µg/kg	990	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Toluene	µg/kg	1220	NA	< 9.5	13	< 10	< 11	2.5	< 22	< 19	< 10	< 23	< 18
trans-1,2-Dichloroethene	µg/kg	654	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
trans-1,3-Dichloropropene	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Tribomomethane	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Trichloroethylene	µg/kg			< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Vinyl chloride	µg/kg	202	NA	< 9.5	< 12	< 10	< 11	< 11	< 22	< 19	< 10	< 23	< 18
Xylenes (Total)	µg/kg	433	NA	< 9.5	14		< 11	< 11	< 22	< 19		< 23	< 18

Notes
1. TEC = Threshold Effects Concentration. Concentrations above these values are considered to present a potential risk of harm to exposed benthic organisms (i.e., those that live in close contact with sediment). TECs presented are from the compilation of ecological screening by US EPA Region 5, which is avalable at: http://epa.gov/region05/waste/cars/pdfs/ecological-screening-levels-200308.pdf
TECs for organic contaminants were developed based on equilibrium partitioning (water-to-sediment organic carbon), assuming a total organic carbon content of 1%.
2. PEC = Probable Effects Concentration. Concentrations above these values are considered to have a relatively high probability of causing harm to exposed benthic organisms.
PECs presented are from MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39: 20-31.
3. µg/kg indicates result reported as micrograms per kilogram.
4. < indicates that parameter is not detected above the reporting limit.
5. J is a data qualifier indicating that the parameter is estimated below the reporting limit.
6. Green highlight indicates an exceedance of the TEC.
7. Yellow highlight indicates the parameter was detected.
8. Orange highlight indicates an exceedance of the PEC.

TABLE 6

UPPER SIMMONS RESEVOIR SEDIMENT RESULTS FOR ORGANIC COMPOUNDS

Central Landfill - Johnston Rhode Island

		Sediment Screening Benchmarks for the protection of Benthic Organisms		SED-19					SED-6				
Chemical Name	Unit	TEC	PEC	5/22/2008	5/21/2009	5/25/2010	5/26/2011	5/25/2012	5/22/2008	5/21/2009	5/25/2010	5/26/2011	5/25/2012
1,1,1-Trichloroethane	µg/kg	213	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
1,1,2,2-Tetrachloroethane	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
1,1,2-Trichloroethane	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
1,1-Dichloroethane	µg/kg	0.575	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
1,1-Dichloroethylene	µg/kg	19.4	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
1,2,3-Trichlorobenzene	µg/kg					< 10					< 10		
1,2-Dibromo-3-Chloropropane (DBCP)	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
1,2-Dibromoethane	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
1,2-Dichlorobenzene	µg/kg	294	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
1,2-Dichloroethane	µg/kg	260	NA	< 25	< 27	< 10	< 22	8.9	< 15	< 15	< 10	< 13	< 15
1,2-Dichloropropane	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
1,3-Dichorobenzene	µg/kg	1,315	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
1,4-Dichlorobenzene	µg/kg	318	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
2-Butanone	µg/kg	NA	NA	350	310	< 10	110	91	120	140	< 10	76	130
4-Methyl-2-Pentanone	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Acetone	µg/kg	9.90	NA	2600	1300	54	320	300	550	650	19	230	380
Benzene	µg/kg	142	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Bromodichloromethane	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Bromomethane	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Carbon Disulfide	µg/kg	24	NA	< 25	< 27	9.2	< 22	24	< 15	< 15	< 10	< 13	5.7
Carbon Tetrachloride	µg/kg	1,450	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
CFC-12	µg/kg					< 10					< 10		
Chlorobenzene	µg/kg	291	NA	< 25	< 27	< 10	< 22	< 20	< 15	6.1	< 10	< 13	< 15
Chlorobromomethane	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Chlorodibromomethane	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Chloroethane	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Chloroform	µg/kg	121	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Chloromethane	µg/kg	NA	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
cis-1,2-Dichloroethene	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
cis-1,3-Dichloropropene	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Dichloromethane	µg/kg			< 25	< 27	< 10	< 22	4.3	< 15	< 15	< 10	< 13	3.2
Ethylbenzene	µg/kg	175	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Hexachloro-1,3-Butadiene	µg/kg					< 10					< 10		
Iodomethane	µg/kg			< 25	< 27		< 22	< 20	< 15	< 15		< 13	< 15
Isopropylbenzene	µg/kg					< 10					< 10		
Methyl N-Butyl Ketone	µg/kg			< 25	< 27	< 10	< 22	21	< 15	< 15	< 10	< 13	23
Methyl tert-butyl ether	µg/kg					< 10					< 10		
Naphthalene	µg/kg	176	561			< 10					< 10		
Styrene (Monomer)	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Tetrachloroethene	µg/kg	990	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Toluene	µg/kg	1220	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
trans-1,2-Dichloroethene	µg/kg	654	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
trans-1,3-Dichloropropene	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Tribromomethane	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Trichloroethylene	µg/kg			< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Vinyl chloride	µg/kg	202	NA	< 25	< 27	< 10	< 22	< 20	< 15	< 15	< 10	< 13	< 15
Xylenes (Total)	µg/kg	433	NA	< 25	< 27		< 22	< 20	< 15	5.8		< 13	< 15

Notes

1. TEC = Threshold Effects Concentration. Concentrations above these values are considered to present a potential risk of harm to exposed benthic organisms (i.e., those that live in close contact with sediment). TECs presented are from the compilation of ecological screening by US EPA Region 5, which is available at: http://epa.gov/region05/waste/cars/pdfs/ecological-screening-levels-200308.pdf
   TECs for organic contaminants were developed based on equilibrium partitioning (water-to-sediment organic carbon), assuming a total organic carbon content of 1%.
2. PEC = Probable Effects Concentration. Concentrations above these values are considered to have a relatively high probability of causing harm to exposed benthic organisms.
   PECs presented are from MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39: 20-31.
3. µg/kg indicates result reported as micrograms per kilogram.
4. < indicates that parameter is not detected above the reporting limit.
5. J is a data qualifier indicating that the parameter is estimated below the reporting limit.
6. Green highlight indicates an exceedance of the TEC.
7. Yellow highlight indicates the parameter was detected.
8. Orange highlight indicates an exceedance of the PEC.

TABLE 6

UPPER SIMMONS RESEVOIR SEDIMENT RESULTS FOR ORGANIC COMPOUNDS

Central Landfill - Johnston Rhode Island

		Sediment Screening Benchmarks for the protection of Benthic Organisms		SED-7																			
Chemical Name	Unit	TEC	PEC	5/22/2008			5/21/2009			5/25/2010			5/26/2011			5/25/2012							
1,1,1-Trichloroethane	µg/kg	213	NA	<	11		<	21		<	10		<	19		<	17						
1,1,2,2-Tetrachloroethane	µg/kg			<	11		<	21		<	10		<	19		<	17						
1,1,2-Trichloroethane	µg/kg			<	11		<	21		<	10		<	19		<	17						
1,1-Dichloroethane	µg/kg	0.575	NA	<	11		<	21		<	10		<	19		<	17						
1,1-Dichloroethylene	µg/kg	19.4	NA	<	11		<	21		<	10		<	19		<	17						
1,2,3-Trichlorobenzene	µg/kg									<	10												
1,2-Dibromo-3-Chloropropane (DBCP)	µg/kg			<	11		<	21		<	10		<	19		<	17						
1,2-Dibromoethane	µg/kg			<	11		<	21		<	10		<	19		<	17						
1,2-Dichlorobenzene	µg/kg	294	NA	<	11		<	21		<	10		<	19		<	17						
1,2-Dichloroethane	µg/kg	260	NA	<	11		<	21		<	10		<	19		<	17						
1,2-Dichloropropane	µg/kg			<	11		<	21		<	10		<	19		<	17						
1,3-Dichorobenzene	µg/kg	1,315	NA	<	11		<	21		<	10		<	19		<	17						
1,4-Dichlorobenzene	µg/kg	318	NA	<	11		<	21		<	10		<	19		<	17						
2-Butanone	µg/kg	NA	NA	<	11		<	21		<	10			**160**			**130**						
4-Methyl-2-Pentanone	µg/kg			<	11		<	21		<	10		<	19			**4.4**						
Acetone	µg/kg	**9.90**	NA	<	11		<	21		<	10			**510**			**390**						
Benzene	µg/kg	142	NA	<	11		<	21		<	10		<	19		<	17						
Bromodichloromethane	µg/kg			<	11		<	21		<	10		<	19		<	17						
Bromomethane	µg/kg			<	11		<	21		<	10		<	19		<	17						
Carbon Disulfide	µg/kg	24	NA	<	11		<	21		<	10		<	19			**8.2**						
Carbon Tetrachloride	µg/kg	1,450	NA	<	11		<	21		<	10		<	19		<	17						
CFC-12	µg/kg									<	10												
Chlorobenzene	µg/kg	291	NA	<	11		<	21		<	10		<	19		<	17						
Chlorobromomethane	µg/kg			<	11		<	21		<	10		<	19		<	17						
Chlorodibromomethane	µg/kg			<	11		<	21		<	10		<	19		<	17						
Chloroethane	µg/kg			<	11		<	21		<	10		<	19		<	17						
Chloroform	µg/kg	121	NA	<	11		<	21		<	10		<	19		<	17						
Chloromethane	µg/kg	NA	NA	<	11		<	21		<	10		<	19		<	17						
cis-1,2-Dichloroethene	µg/kg			<	11		<	21		<	10		<	19		<	17						
cis-1,3-Dichloropropene	µg/kg			<	11		<	21		<	10		<	19		<	17						
Dichloromethane	µg/kg			<	11		<	21		<	10		<	19			**3.9**						
Ethylbenzene	µg/kg	175	NA	<	11		<	21		<	10		<	19		<	17						
Hexachloro-1,3-Butadiene	µg/kg									<	10												
Iodomethane	µg/kg			<	11		<	21					<	19		<	17						
Isopropylbenzene	µg/kg									<	10												
Methyl N-Butyl Ketone	µg/kg			<	11		<	21		<	10		<	19			**11**						
Methyl tert-butyl ether	µg/kg									<	10												
Naphthalene	µg/kg	176	561							<	10												
Styrene (Monomer)	µg/kg			<	11		<	21		<	10		<	19		<	17						
Tetrachloroethene	µg/kg	990	NA	<	11		<	21		<	10			**4.9**		<	17						
Toluene	µg/kg	1220	NA	<	11		<	21		<	10		<	19		<	17						
trans-1,2-Dichloroethene	µg/kg	654	NA	<	11		<	21		<	10		<	19		<	17						
trans-1,3-Dichloropropene	µg/kg			<	11		<	21		<	10		<	19		<	17						
Tribomomethane	µg/kg			<	11		<	21		<	10		<	19		<	17						
Trichloroethylene	µg/kg			<	11		<	21		<	10		<	19		<	17						
Vinyl chloride	µg/kg	202	NA	<	11		<	21		<	10		<	19		<	17						
Xylenes (Total)	µg/kg	433	NA	<	11		<	21					<	19		<	17						

Notes

1. TEC = Threshold Effects Concentration. Concentrations above these values are considered to present a potential risk of harm to exposed benthic organisms (i.e., those that live in close contact with sediment). TECs presented are from the compilation of ecological screening by US EPA Region 5, which is available at: http://epa.gov/region05/waste/cars/pdfs/ecological-screening-levels-200308.pdf TECs for organic contaminants were developed based on equilibrium partitioning (water-to-sediment organic carbon), assuming a total organic carbon content of 1%.
2. PEC = Probable Effects Concentration. Concentrations above these values are considered to have a relatively high probability of causing harm to exposed benthic organisms. PECs presented are from MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39: 20-31.
3. µg/kg indicates result reported as micrograms per kilogram.
4. < indicates that parameter is not detected above the reporting limit.
5. J is a data qualifier indicating that the parameter is estimated below the reporting limit.
6. Green highlight indicates an exceedance of the TEC.
7. Yellow highlight indicates the parameter was detected.
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TABLE 7
Volatile Organic Compound Ambient Air Monitoring Results
2008 through 2012
Five-Year Review Report
Central Landfill Johnston, RI

Compound	Units	Average AAL 24-Hour	Average AAL Annual	OSHA PEL	D-1 2/1/2008 24-Hour		D-1 2/1/2008 Annual		D-1 3/7/2008 24-Hour		D-1 3/7/2008 Annual		D-4 4/23/2008 24-Hour		D-4 4/23/2008 Annual	
1,1,1,2-Tetrachloroethane	ug/m^3	100	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane	ug/m^3	6,000	3,000	1,900,000		0.39		0.07		0.16		0.03		0.11		0.02
1,1,2,2-Tetrachloroethane	ug/m^3	2,000	NE	7,000	<	0.61	<	0.10	<	0.67	<	0.11	<	0.73	<	0.12
1,1,2-Trichloroethane	ug/m^3	10	NE	45,000	<	0.49	<	0.08	<	0.53	<	0.09	<	0.56	<	0.09
1,1-Dichloroethane	ug/m^3	NE	0.6	400,000	<	0.36	<	0.06	<	0.39	<	0.07		0.09		0.01
1,1-Dichloroethylene	ug/m^3	200	70	400,000	<	0.35	<	0.06	<	0.39	<	0.06	<	0.41	<	0.07
1,2,4-Trichlorobenzene	ug/m^3	30	NE	NE	<	3.33	<	0.56	<	3.60	<	0.60	<	3.87	<	0.64
1,2,4-Trimethylbenzene	ug/m^3	NE	NE	NE	<	0.44	<	0.07		0.10		0.02	<	0.51	<	0.08
1,2-Dibromoethane	ug/m^3	9	0.02	156,200	<	0.67	<	0.11	<	0.73	<	0.12	<	0.80	<	0.13
1,2-Dichlorobenzene	ug/m^3	NE	300	300,000	<	0.53	<	0.09	<	0.59	<	0.10	<	0.62	<	0.10
1,2-Dichloroethane	ug/m^3	NE	0.04	205,500	<	0.36	<	0.06		0.07		0.01	<	0.42	<	0.07
1,2-Dichloropropane	ug/m^3	4	0.4	350,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,3,5-Trimethylbenzene	ug/m^3	NE	NE	NE	<	0.44	<	0.07		0.04		0.01		0.03		0.01
1,3-Butadiene	ug/m^3	NE	0.03	2,250,000	<	0.20	<	0.03	<	0.21	<	0.04	<	0.23	<	0.04
1,3-Dichlorobenzene	ug/m^3	NE	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,4-Dichlorobenzene	ug/m^3	800	0.09	450,000	<	0.53	<	0.09	<	0.59	<	0.10	<	0.62	<	0.10
1,4-Dioxane	ug/m^3	NE	0.2	360,000	<	0.32	<	0.05	<	0.35	<	0.06	<	0.37	<	0.06
2,2,4-Trimethylpentane	ug/m^3	NE	3,000	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	ug/m^3	5,000	NE	590,000		0.39		0.07	<	0.29	<	0.05		0.93		0.16
2-Chloro-1,3-Butadiene	ug/m^3	NE	1	3,600	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52
2-Phenylbutane	ug/m^3	NE	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4-Ethyltoluene	ug/m^3	NE	NE	NE		0.11		0.02		0.11		0.02	<	0.51	<	0.08
4-Methyl-2-Pentanone	ug/m^3	3,000	NE	410,000	<	1.80	<	0.30	<	2.00	<	0.33	<	2.13	<	0.36
Acetone	ug/m^3	3,000	NE	2,400,000		3.47		0.58	<	1.13	<	0.19		12.00		2.00
Benzene	ug/m^3	20	0.1	32,500		0.61		0.10		0.57		0.09		0.36		0.06
Bromodichloromethane	ug/m^3	70	0.02	NE	<	0.60	<	0.10	<	0.65	<	0.11	<	0.67	<	0.11
Bromomethane	ug/m^3	NE	5	80,000	<	0.35	<	0.06	<	0.38	<	0.06	<	0.40	<	0.07
Carbon Disulfide	ug/m^3	NE	700	62,200		0.10		0.02	<	1.53	<	0.26		0.13		0.02
Carbon Tetrachloride	ug/m^3	200	0.07	62,900		0.37		0.06		0.39		0.07		0.27		0.04
Chlordane	ug/m^3	0.7	0.002	0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	ug/m^3	NE	1,000	350,000	<	0.41	<	0.07	<	0.45	<	0.07		0.07		0.01
Chlorodibromomethane	ug/m^3	70	NE	NE	<	0.73	<	0.12	<	0.80	<	0.13	<	0.87	<	0.14
Chloroethane	ug/m^3	10,000	NE	2,600,000	<	0.23	<	0.04	<	0.25	<	0.04	<	0.27	<	0.05
Chloroform	ug/m^3	NE	0.05	240,000	<	0.43	<	0.07	<	0.47	<	0.08	<	0.51	<	0.08
Chloromethane	ug/m^3	400	90	210,000		1.00		0.17		0.67		0.11		0.87		0.14
cis-1,2-Dichloroethene	ug/m^3	1,000	NE	NE	<	0.35	<	0.06	<	0.39	<	0.06		0.12		0.02
cis-1,3-Dichloropropene	ug/m^3	20	0.2	NE	<	0.41	<	0.07	<	0.44	<	0.07	<	0.47	<	0.08
Cyclohexane	ug/m^3	6,000	NE	1,050,000		0.15		0.02		0.32		0.05		0.42		0.07
Dichloromethane	ug/m^3	1,000	2	88,250		1.00		0.17		2.67		0.44		3.20		0.53
Ethanol	ug/m^3	NE	NE	1,900,000		6.67		1.11		2.80		0.47	<	1.00	<	0.17
Ethylbenzene	ug/m^3	3000	NE	435,000		0.15		0.02		0.19		0.03		0.11		0.02
Freon-11	ug/m^3	1,000	NE	5,600,000		5.80		0.97		2.40		0.40		3.53		0.59
Freon 113	ug/m^3	NE	NE	7,600,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Freon 114	ug/m^3	NE	NE	1,900,000	<	0.63	<	0.10	<	0.67	<	0.11		0.14		0.02
Freon 12	ug/m^3	NE	NE	5,600,000		3.27		0.54		2.20		0.37		2.73		0.46
Hexachloro-1,3-Butadiene	ug/m^3	0.7	NE	240	<	4.73	<	0.79	<	5.20	<	0.87	<	5.53	<	0.92
Hexane	ug/m^3	NE	700	1,800,000		0.35		0.06		0.48		0.08		0.51		0.08
Isopropylbenzene	ug/m^3	400	NE	245,000	<	0.44	<	0.07	<	0.48	<	0.08	<	0.51	<	0.08
Methyl N-Butyl Ketone	ug/m^3	NE	NE	NE	<	1.80	<	0.30	<	2.00	<	0.33	<	2.13	<	0.36
Methyl Tert-Butyl Ether	ug/m^3	3,000	NE	NE	<	0.32	<	0.05	<	0.35	<	0.06		0.08		0.01
Methylbenzene	ug/m^3	NE	300	766,000		1.87		0.31		1.53		0.26		1.07		0.18
Naphthalene	ug/m^3	3	0.03	50,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)	ug/m^3	1,000	100	433,000	<	0.38	<	0.06		0.12		0.02	<	0.44	<	0.07
Tetrachloroethene	ug/m^3	NE	0.2	489,000		0.35		0.06		0.25		0.04		0.25		0.04
trans-1,2-Dichloroethene	ug/m^3	70	NE	660,000	<	0.35	<	0.06	<	0.39	<	0.06	<	0.41	<	0.07
trans-1,3-Dichloropropene	ug/m^3	20	0.2	NE	<	0.41	<	0.07	<	0.44	<	0.07	<	0.47	<	0.08
Tribromomethane	ug/m^3	70	0.9	5,000	<	0.93	<	0.16	<	1.00	<	0.17	<	1.07	<	0.18
Trichloroethylene	ug/m^3	500	0.5	546,000	<	0.48	<	0.08		0.11		0.02	<	0.55	<	0.09
Vinyl chloride	ug/m^3	100	0.2	2,500	<	0.23	<	0.04		0.07		0.01		0.17		0.03
Xylenes (Total)	ug/m^3	3,000	100	435,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Compound	D-4 7/16/2008 24-Hour		D-4 7/16/2008 Annual		D-1 10/14/2008 24-Hour		D-1 10/14/2008 Annual		D-1 1/23/2009 24-Hour		D-1 1/23/2009 Annual	
1,1,1,2-Tetrachloroethane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane		0.51		0.09		0.67		0.11		0.51		0.09
1,1,2,2-Tetrachloroethane	<	0.80	<	0.13	<	0.65	<	0.11	<	0.59	<	0.10
1,1,2-Trichloroethane	<	0.67	<	0.11	<	0.51	<	0.09	<	0.47	<	0.08
1,1-Dichloroethane	<	0.49	<	0.08		0.23		0.04	<	0.35	<	0.06
1,1-Dichloroethylene	<	0.48	<	0.08	<	0.37	<	0.06	<	0.35	<	0.06
1,2,4-Trichlorobenzene	<	4.53	<	0.76	<	3.47	<	0.58	<	3.20	<	0.53
1,2,4-Trimethylbenzene		0.17		0.03	<	0.46	<	0.08		0.49		0.08
1,2-Dibromoethane	<	0.93	<	0.16	<	0.73	<	0.12	<	0.67	<	0.11
1,2-Dichlorobenzene	<	0.73	<	0.12	<	0.57	<	0.09	<	0.52	<	0.09
1,2-Dichloroethane	<	0.49	<	0.08	<	0.38	<	0.06	<	0.35	<	0.06
1,2-Dichloropropane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,3,5-Trimethylbenzene	<	0.60	<	0.10	<	0.46	<	0.08		0.23		0.04
1,3-Butadiene	<	0.27	<	0.04	<	0.21	<	0.03	<	0.19	<	0.03
1,3-Dichlorobenzene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,4-Dichlorobenzene		0.13		0.02		0.20		0.03		0.29		0.05
1,4-Dioxane	<	0.44	<	0.07	<	0.34	<	0.06	<	0.31	<	0.05
2,2,4-Trimethylpentane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone		2.07		0.34	<	0.28	<	0.05	<	0.25	<	0.04
2-Chloro-1,3-Butadiene	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52
2-Phenylbutane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4-Ethyltoluene		0.17		0.03	<	0.46	<	0.08		0.46		0.08
4-Methyl-2-Pentanone	<	2.47	<	0.41	<	1.93	<	0.32	<	1.80	<	0.30
Acetone		12.00		2.00	<	1.13	<	0.19	<	1.00	<	0.17
Benzene		0.36		0.06		0.87		0.14		1.07		0.18
Bromodichloromethane	<	0.80	<	0.13	<	0.63	<	0.10	<	0.58	<	0.10
Bromomethane	<	0.43	<	0.07	<	0.37	<	0.06	<	0.33	<	0.06
Carbon Disulfide		0.21		0.04	<	1.47	<	0.24		0.19		0.03
Carbon Tetrachloride		0.33		0.06		0.47		0.08		0.35		0.06
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.56	<	0.09	<	0.43	<	0.07		0.07		0.01
Chlorodibromomethane	<	1.07	<	0.18	<	0.80	<	0.13	<	0.73	<	0.12
Chloroethane	<	0.32	<	0.05	<	0.25	<	0.04		0.26		0.04
Chloroform	<	0.59	<	0.10	<	0.46	<	0.08	<	0.42	<	0.07
Chloromethane		1.00		0.17		1.13		0.19		1.00		0.17
cis-1,2-Dichloroethene	<	0.48	<	0.08		0.48		0.08		0.25		0.04
cis-1,3-Dichloropropene	<	0.55	<	0.09	<	0.43	<	0.07	<	0.39	<	0.07
Cyclohexane		0.30		0.05	<	0.32	<	0.05	<	0.30	<	0.05
Dichloromethane		2.07		0.34	<	0.65	<	0.11	<	0.60	<	0.10
Ethanol		24.67		4.11		20.00		3.33		22.67		3.78
Ethylbenzene		0.27		0.04	<	0.41	<	0.07		1.07		0.18
Freon-11		14.67		2.44		7.33		1.22		2.60		0.43
Freon 113	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Freon 114	<	0.87	<	0.14	<	0.65	<	0.11		0.37		0.06
Freon 12		3.13		0.52		6.27		1.04		4.67		0.78
Hexachloro-1,3-Butadiene	<	6.53	<	1.09	<	5.00	<	0.83	<	4.60	<	0.77
Hexane		0.66		0.11	<	0.33	<	0.06	<	0.31	<	0.05
Isopropylbenzene	<	0.60	<	0.10	<	0.46	<	0.08		0.43		0.07
Methyl N-Butyl Ketone	<	2.47	<	0.41	<	1.93	<	0.32	<	1.80	<	0.30
Methyl Tert-Butyl Ether	<	0.44	<	0.07		0.31		0.05		0.15		0.02
Methylbenzene		2.07		0.35	<	0.35	<	0.06	<	0.33	<	0.05
Naphthalene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)		0.11		0.02	<	0.40	<	0.07	<	0.37	<	0.06
Tetrachloroethene		0.39		0.07		0.80		0.13		0.64		0.11
trans-1,2-Dichloroethene	<	0.48	<	0.08	<	0.37	<	0.06	<	0.35	<	0.06
trans-1,3-Dichloropropene	<	0.55	<	0.09	<	0.43	<	0.07	<	0.39	<	0.07
Tribromomethane	<	1.27	<	0.21	<	0.93	<	0.16	<	0.87	<	0.14
Trichloroethylene		0.13		0.02	<	0.51	<	0.09	<	0.47	<	0.08
Vinyl chloride	<	0.31	<	0.05		1.93		0.32		1.27		0.21
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Compound	D-1 4/16/2009 24-Hour		D-1 4/16/2009 Annual		D-1 7/21/2009 24-Hour		D-1 7/21/2009 Annual		D-1 10/23/2009 24-Hour		D-1 10/23/2009 Annual	
1,1,1,2-Tetrachloroethane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane		0.06		0.01		0.25		0.04	<	0.73	<	0.12
1,1,2,2-Tetrachloroethane	<	0.73	<	0.12	<	1.07	<	0.18	<	1.17	<	0.19
1,1,2-Trichloroethane	<	0.59	<	0.10	<	0.80	<	0.13	<	0.73	<	0.12
1,1-Dichloroethane	<	0.43	<	0.07	<	0.62	<	0.10	<	0.55	<	0.09
1,1-Dichloroethylene	<	0.43	<	0.07	<	0.61	<	0.10	<	0.81	<	0.13
1,2,4-Trichlorobenzene	<	4.00	<	0.67	<	5.67	<	0.94	<	2.74	<	0.46
1,2,4-Trimethylbenzene		0.12		0.02		0.19		0.03		2.03		0.34
1,2-Dibromoethane	<	0.80	<	0.13	<	1.20	<	0.20	<	0.95	<	0.16
1,2-Dichlorobenzene	<	0.65	<	0.11	<	0.93	<	0.16	<	1.60	<	0.27
1,2-Dichloroethane		0.15		0.03	<	0.62	<	0.10	<	0.60	<	0.10
1,2-Dichloropropane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,3,5-Trimethylbenzene	<	0.53	<	0.09	<	0.73	<	0.12	<	1.05	<	0.17
1,3-Butadiene	<	0.24	<	0.04	<	0.34	<	0.06	<	0.19	<	0.03
1,3-Dichlorobenzene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,4-Dichlorobenzene	<	0.65	<	0.11	<	0.93	<	0.16	<	1.62	<	0.27
1,4-Dioxane	<	0.39	<	0.06	<	0.55	<	0.09	<	0.67	<	0.11
2,2,4-Trimethylpentane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone		1.47		0.24		3.07		0.51	<	2.45	<	0.41
2-Chloro-1,3-Butadiene	<	3.13	<	0.52	<	2.80	<	0.47	NT	NT	NT	NT
2-Phenylbutane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4-Ethyltoluene		0.15		0.03		0.20		0.03	<	4.07	<	0.68
4-Methyl-2-Pentanone		0.13		0.02		0.29		0.05	<	3.73	<	0.62
Acetone		3.87		0.64		12.00		2.00		276.67		46.11
Benzene		0.59		0.10		0.34		0.06	<	0.41	<	0.07
Bromodichloromethane	<	0.73	<	0.12	<	1.00	<	0.17	<	0.20	<	0.03
Bromomethane	<	0.41	<	0.07		0.41		0.07	<	0.85	<	0.14
Carbon Disulfide	<	1.67	<	0.28	<	2.40	<	0.40	<	2.53	<	0.42
Carbon Tetrachloride		0.24		0.04	<	0.93	<	0.16	<	0.47	<	0.08
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.49	<	0.08	<	0.67	<	0.11	<	0.68	<	0.11
Chlorodibromomethane	<	0.93	<	0.16	<	1.33	<	0.22	<	33.33	<	5.56
Chloroethane		0.17		0.03	<	0.41	<	0.07	<	0.99	<	0.17
Chloroform		0.07		0.01	<	0.73	<	0.12	<	0.79	<	0.13
Chloromethane		0.61		0.10		0.73		0.12	<	0.55	<	0.09
cis-1,2-Dichloroethene		0.27		0.05	<	0.61	<	0.10	<	0.53	<	0.09
cis-1,3-Dichloropropene	<	0.49	<	0.08	<	0.67	<	0.11	<	0.44	<	0.07
Cyclohexane		0.67		0.11		0.80		0.13	<	2.80	<	0.47
Dichloromethane	<	0.73	<	0.12		0.93		0.16	<	33.33	<	5.56
Ethanol		0.93		0.16		9.33		1.56	<	0.20	<	0.03
Ethylbenzene		0.57		0.09		0.51		0.09	<	0.78	<	0.13
Freon-11		0.93		0.16		3.53		0.59		12.27		2.04
Freon 113	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Freon 114	<	0.73	<	0.12	<	1.07	<	0.18	<	1.91	<	0.32
Freon 12		2.60		0.43		3.80		0.63		3.87		0.65
Hexachloro-1,3-Butadiene	<	5.73	<	0.96	<	8.00	<	1.33		3.77		0.63
Hexane		0.73		0.12		1.40		0.23	<	2.94	<	0.49
Isopropylbenzene		0.28		0.05		0.07		0.01	<	1.33	<	0.22
Methyl N-Butyl Ketone	<	2.20	<	0.37		0.52		0.09	<	3.40	<	0.57
Methyl Tert-Butyl Ether	<	0.39	<	0.06	<	0.55	<	0.09	<	3.01	<	0.50
Methylbenzene		5.13		0.86		3.20		0.53		7.07		1.18
Naphthalene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)		0.11		0.02		0.13		0.02	<	0.68	<	0.11
Tetrachloroethene		0.20		0.03		0.37		0.06	<	0.67	<	0.11
trans-1,2-Dichloroethene	<	0.43	<	0.07	<	0.61	<	0.10	<	3.31	<	0.55
trans-1,3-Dichloropropene	<	0.49	<	0.08	<	0.67	<	0.11	<	0.53	<	0.09
Tribromomethane	<	1.13	<	0.19	<	1.60	<	0.27	<	0.54	<	0.09
Trichloroethylene		0.25		0.04	<	0.80	<	0.13	<	0.61	<	0.10
Vinyl chloride		0.67		0.11		0.73		0.12	<	1.33	<	0.22
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Compound	D-1 1/21/2010 24-Hour		D-1 1/21/2010 Annual		D-1 4/21/2010 24-Hour		D-1 4/21/2010 Annual		D-1 7/28/2010 24-Hour		D-1 7/28/2010 Annual	
1,1,1,2-Tetrachloroethane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12
1,1,2,2-Tetrachloroethane	<	1.17	<	0.19	<	1.17	<	0.19	<	1.17	<	0.19
1,1,2-Trichloroethane	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12
1,1-Dichloroethane	<	0.55	<	0.09	<	0.55	<	0.09	<	0.55	<	0.09
1,1-Dichloroethylene	<	0.81	<	0.13	<	0.81	<	0.13	<	0.81	<	0.13
1,2,4-Trichlorobenzene	<	2.74	<	0.46	<	2.74	<	0.46	<	2.74	<	0.46
1,2,4-Trimethylbenzene	<	1.39	<	0.23	<	1.39	<	0.23	<	1.39	<	0.23
1,2-Dibromoethane	<	0.95	<	0.16	<	0.95	<	0.16	<	0.95	<	0.16
1,2-Dichlorobenzene	<	1.60	<	0.27	<	1.60	<	0.27	<	1.60	<	0.27
1,2-Dichloroethane	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10
1,2-Dichloropropane	<	0.59	<	0.10	<	0.58	<	0.10	<	0.58	<	0.10
1,3,5-Trimethylbenzene	<	1.05	<	0.17	<	1.05	<	0.17	<	1.05	<	0.17
1,3-Butadiene	<	0.18	<	0.03	<	0.18	<	0.03	<	0.18	<	0.03
1,3-Dichlorobenzene	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10
1,4-Dichlorobenzene	<	1.62	<	0.27	<	0.53	<	0.09		0.54		0.09
1,4-Dioxane	<	0.67	<	0.11	<	0.67	<	0.11	<	0.67	<	0.11
2,2,4-Trimethylpentane	<	3.87	<	0.64	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	<	2.45	<	0.41	<	2.45	<	0.41	<	2.45	<	0.41
2-Chloro-1,3-Butadiene	NT	NT	NT	NT	<	0.48	<	0.08	<	0.48	<	0.08
2-Phenylbutane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4-Ethyltoluene	<	4.07	<	0.68	<	4.06	<	0.68	<	4.06	<	0.68
4-Methyl-2-Pentanone	<	3.73	<	0.62	<	3.74	<	0.62	<	3.74	<	0.62
Acetone	<	1.98	<	0.33	<	1.98	<	0.33		32.27		5.38
Benzene	<	0.41	<	0.07	<	0.41	<	0.07	<	0.41	<	0.07
Bromodichloromethane	<	0.20	<	0.03	<	0.20	<	0.03	<	0.20	<	0.03
Bromomethane	<	0.85	<	0.14	<	0.85	<	0.14	<	0.85	<	0.14
Carbon Disulfide	<	2.53	<	0.42	<	2.53	<	0.42	<	2.53	<	0.42
Carbon Tetrachloride	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11
Chlorodibromomethane	<	33.33	<	5.56	<	33.33	<	5.56	<	33.33	<	5.56
Chloroethane	<	0.99	<	0.17	<	0.99	<	0.17	<	0.99	<	0.17
Chloroform	<	0.79	<	0.13	<	0.79	<	0.13	<	0.79	<	0.13
Chloromethane	<	0.55	<	0.09		0.77		0.13		0.85		0.14
cis-1,2-Dichloroethene	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09
cis-1,3-Dichloropropene	<	0.44	<	0.07	<	0.44	<	0.07	<	0.44	<	0.07
Cyclohexane	<	2.80	<	0.47	<	2.80	<	0.47	<	2.80	<	0.47
Dichloromethane	<	33.33	<	5.56	<	1.33	<	0.22	<	1.33	<	0.22
Ethanol	<	0.20	<	0.03		4.39		0.73		9.47		1.58
Ethylbenzene	<	0.78	<	0.13	<	0.78	<	0.13	<	0.78	<	0.13
Freon-11		7.47		1.24		6.87		1.14		12.53		2.09
Freon 113	<	1.55	<	0.26	<	1.55	<	0.26	<	1.55	<	0.26
Freon 114	<	1.91	<	0.32	<	1.91	<	0.32	<	1.91	<	0.32
Freon 12		4.72		0.79		4.21		0.70		5.01		0.83
Hexachloro-1,3-Butadiene	<	2.03	<	0.34	<	2.03	<	0.34	<	2.03	<	0.34
Hexane	<	2.94	<	0.49	<	2.93	<	0.49	<	2.93	<	0.49
Isopropylbenzene	<	1.33	<	0.22	<	1.33	<	0.22	<	1.33	<	0.22
Methyl N-Butyl Ketone	<	3.40	<	0.57	<	3.39	<	0.56	<	3.39	<	0.56
Methyl Tert-Butyl Ether	<	3.01	<	0.50	<	3.00	<	0.50	<	3.00	<	0.50
Methylbenzene	<	1.19	<	0.20		3.24		0.54		1.40		0.23
Naphthalene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11
Tetrachloroethene	<	0.67	<	0.11		0.63		0.11		1.09		0.18
trans-1,2-Dichloroethene	<	3.31	<	0.55	<	3.30	<	0.55	<	3.30	<	0.55
trans-1,3-Dichloropropene	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09
Tribromomethane	<	0.54	<	0.09	<	0.54	<	0.09	<	0.54	<	0.09
Trichloroethylene	<	0.61	<	0.10	<	0.61	<	0.10	<	0.61	<	0.10
Vinyl chloride	<	1.33	<	0.22	<	0.13	<	0.02	<	0.13	<	0.02
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Notes
1. "<" indicates that the parameter is not detected. "NT" indicates that the parameter was not tested. U-1 samples were collected upwind of the active landfill face and samples D-1 through D-4 were collected downwind of the active landfill face.
2. Orange highlight indicates an exceedance of the Rhode Island Department of Environmental Management's (RIDEM) 24-hour Acceptable Ambient Levels (AAL) set forth in RIDEM Air Pollution Regulation No. 22. An orange highlight of the 24-hour AAL indicates that the typical method reporting limit exceeds the 24-hour AAL.
3. Green highlight indicates an exceedance of the RIDEM Annual AAL taken from RIDEM Air Pollution Regulation No. 22. An orange highlight of the annual AAL indicates that the typical method reporting limit exceeds the annual AAL.
4. Concentrations adjusted using RIDEM's time scale factor from the Air Toxics Modeling Guidelines (RIDEM June 2005).
5. OSHA PEL is the Permissible Exposure Limits as described in the Occupational Safety and Health Standards Part Number 1910 subpart Z Tables Z-1 and Z2.

TABLE 7
Volatile Organic Compound Ambient Air Monitoring Results
2008 through 2012
Five-Year Review Report
Central Landfill, Johnston, RI

Compound	Units	Average AAL 24-hour	Average AAL Annual	OSHA PEL	D-2 10/27/2010 24-Hour		D-2 10/27/2010 Annual		D-3 1/25/2011 24-Hour		D-3 1/25/2011 Annual		D-1 6/22/2011 24-Hour		D-1 6/22/2011 Annual	
1,1,1,2-Tetrachloroethane	ug/m^3	100	NE	NE	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08
1,1,1-Trichloroethane	ug/m^3	6,000	5,000	1,900,000	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1,2,2-Tetrachloroethane	ug/m^3	2,000	NE	7,000	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08
1,1,2-Trichloroethane	ug/m^3	10	NE	45,000	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1-Dichloroethane	ug/m^3	NE	0.6	400,000	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,1-Dichloroethylene	ug/m^3	200	70	400,000	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2,4-Trichlorobenzene	ug/m^3	30	NE	NE	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08
1,2,4-Trimethylbenzene	ug/m^3	NE	NE	NE		0.46		0.08	<	0.33	<	0.05	<	0.33	<	0.05
1,2-Dibromoethane	ug/m^3	9	0.02	156,200	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09
1,2-Dichlorobenzene	ug/m^3	NE	300	300,000	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,2-Dichloroethane	ug/m^3	NE	0.04	205,500	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2-Dichloropropane	ug/m^3	4	0.1	350,000	<	0.31	<	0.05		0.86		0.14	<	0.31	<	0.05
1,3,5-Trimethylbenzene	ug/m^3	NE	NE	NE	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
1,3-Butadiene	ug/m^3	NE	0.03	2,250,000	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02
1,3-Dichlorobenzene	ug/m^3	NE	NE	NE	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dichlorobenzene	ug/m^3	800	0.09	450,000	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dioxane	ug/m^3	NE	0.2	360,000	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20
2,2,4-Trimethylpentane	ug/m^3	NE	3,000	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	ug/m^3	5,000	NE	590,000		1.12		0.19		14.35		2.39		0.71		0.12
2-Chlor-1,3-Butadiene	ug/m^3	NE	1	3,600	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Phenylbutane	ug/m^3	NE	NE	NE	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
4-Ethyltoluene	ug/m^3	NE	NE	NE	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
4-Methyl-2-Pentanone	ug/m^3	3,000	NE	410,000	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05
Acetone	ug/m^3	3,000	NE	2,400,000		6.11		1.02		13.75		2.29		4.87		0.81
Benzene	ug/m^3	30	0.1	32,500	<	0.21	<	0.04		1.15		0.19		0.25		0.04
Bromodichloromethane	ug/m^3	70	0.02	NE	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07
Bromomethane	ug/m^3	NE	5	80,000	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04
Carbon Disulfide	ug/m^3	NE	700	62,200	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17
Carbon Tetrachloride	ug/m^3	200	0.07	62,900	<	0.42	<	0.07		0.92		0.15	<	0.42	<	0.07
Chlordane	ug/m^3	0.7	0.001	0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	ug/m^3	NE	1,000	350,000	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05
Chlorodibromomethane	ug/m^3	70	NE	NE	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09
Chloroethane	ug/m^3	10,000	NE	2,600,000	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03
Chloroform	ug/m^3	NE	0.1	240,000	<	0.33	<	0.05		1.57		0.26	<	0.33	<	0.05
Chloromethane	ug/m^3	400	90	210,000		0.63		0.11		1.69		0.42		0.71		0.12
cis-1,2-Dichloroethene	ug/m^3	1,000	NE	NE	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
cis-1,3-Dichloropropene	ug/m^3	20	0.2	NE	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05
Cyclohexane	ug/m^3	6,000	NE	1,050,000	<	0.23	<	0.04	<	0.23	<	0.04	<	0.23	<	0.04
Dichloromethane	ug/m^3	1,000	3	88,250		1.43		0.24		3.96		0.66	<	1.32	<	0.22
Ethanol	ug/m^3	NE	NE	1,900,000		11.01		1.84		2.66		0.43		3.28		0.55
Ethylbenzene	ug/m^3	3000	NE	435,000	<	0.29	<	0.05		0.43		0.07	<	0.29	<	0.05
Freon-11	ug/m^3	1,000	NE	5,600,000		3.89		0.65		1.50		0.25		1.87		0.31
Freon 113	ug/m^3	NE	NE	7,600,000	<	0.51	<	0.09	<	0.51	<	0.09		1.02		0.17
Freon 114	ug/m^3	NE	NE	1,900,000	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08
Freon 12	ug/m^3	NE	NE	5,600,000		1.55		0.26		1.85		0.31		2.14		0.36
Hexachloro-1,3-Butadiene	ug/m^3	0.7	NE	240	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12
Hexane	ug/m^3	NE	700	1,800,000	<	1.17	<	0.20	<	1.17	<	0.20	<	1.17	<	0.20
Isopropylbenzene	ug/m^3	400	NE	245,000	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
Methyl N-Butyl Ketone	ug/m^3	NE	NE	NE	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05
Methyl Tert-Butyl Ether	ug/m^3	3,000	NE	NE	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04
Methylbenzene	ug/m^3	NE	300	766,000		1.05		0.18		0.93		0.15		0.60		0.10
Naphthalene	ug/m^3	3	0.03	50,000	NT	NT	NT	NT	<	1.75	<	0.29	<	1.75	<	0.29
Styrene (Monomer)	ug/m^3	1,000	100	433,000	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05
Tetrachloroethene	ug/m^3	NE	0.3	689,000	<	0.45	<	0.08	<	0.45	<	0.08	<	0.45	<	0.08
trans-1,2-Dichloroethene	ug/m^3	70	NE	660,000	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
trans-1,3-Dichloropropene	ug/m^3	20	0.2	NE	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05
Tribromomethane	ug/m^3	70	0.3	5,000	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11
Trichloroethylene	ug/m^3	500	0.5	546,000	<	0.36	<	0.06	<	0.36	<	0.06	<	0.36	<	0.06
Vinyl chloride	ug/m^3	100	0.2	2,500	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03
Xylenes (Total)	ug/m^3	3,000	100	435,000	<	0.58	<	0.10	NT	NT	NT	NT	NT	NT	NT	NT

Compound	D-2 [illegible]/2011 24-Hour		D-2 Annual		D-3 10/18/2011 24-Hour		D-3 Annual		D-1 1/19/2012 24-Hour		D-1 Annual		D-2 4/19/2012 24-Hour		D-2 Annual	
1,1,1,2-Tetrachloroethane	<	0.46	<	0.08	<	0.44	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08
1,1,1-Trichloroethane		1.57		0.26	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1,2,2-Tetrachloroethane	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08
1,1,2-Trichloroethane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1-Dichloroethane		0.46		0.08	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,1-Dichloroethylene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2,4-Trichlorobenzene	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08
1,2,4-Trimethylbenzene		1.41		0.23		0.36		0.06		0.33		0.05	<	0.33	<	0.05
1,2-Dibromoethane	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09
1,2-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,2-Dichloroethane	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2-Dichloropropane		0.31		0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05
1,3,5-Trimethylbenzene		0.69		0.11	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
1,3-Butadiene	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02
1,3-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dichlorobenzene		0.80		0.13	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dioxane	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20
2,2,4-Trimethylpentane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone		16.61		2.77		4.67		0.11		0.27		0.05	<	0.19	<	0.03
2-Chlor-1,3-Butadiene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Phenylbutane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
4-Ethyltoluene		0.69		0.11	<	0.33	<	0.05		0.33		0.05	<	0.33	<	0.05
4-Methyl-2-Pentanone	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05
Acetone		33.29		5.55		5.95		0.99	<	3.68	<	0.63		3.77		0.63
Benzene		0.79		0.13		0.25		0.04		0.30		0.05	<	0.21	<	0.04
Bromodichloromethane	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07
Bromomethane	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04
Carbon Disulfide		3.45		0.57	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17
Carbon Tetrachloride		1.43		0.24	<	0.42	<	0.07	<	0.42	<	0.07	<	0.42	<	0.07
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.31	<	0.05	<	0.31	<	0.05		0.52		0.09	<	0.31	<	0.05
Chlorodibromomethane	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09
Chloroethane		0.39		0.06	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03
Chloroform		0.36		0.06	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
Chloromethane	<	0.14	<	0.02		0.67		0.11		0.71		0.12	<	0.14	<	0.02
cis-1,2-Dichloroethene		0.58		0.09	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
cis-1,3-Dichloropropene	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05
Cyclohexane		3.56		0.59	<	0.23	<	0.04	<	0.23	<	0.04	<	0.23	<	0.04
Dichloromethane		5.21		0.87		0.79		0.13	<	10.35	<	1.72		0.77		0.13
Ethanol		37.21		6.20		2.95		0.49		2.61		0.44	<	1.37	<	0.23
Ethylbenzene		2.55		0.42	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05
Freon-11		91.79		15.30		1.39		0.23		0.86		0.14		0.97		0.16
Freon 113		1.43		0.24	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09
Freon 114	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08
Freon 12		8.70		1.45		1.61		0.27		1.58		0.26		2.24		0.37
Hexachloro-1,3-Butadiene	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12
Hexane		8.93		1.49	<	1.17	<	0.20	<	1.17	<	0.20	<	1.17	<	0.20
Isopropylbenzene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
Methyl N-Butyl Ketone	<	0.27	<	0.05		0.30		0.05	<	0.27	<	0.05	<	0.27	<	0.05
Methyl Tert-Butyl Ether	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04
Methylbenzene		24.33		4.06		0.93		0.15		0.90		0.15	<	0.25	<	0.04
Naphthalene		1.92		0.32	<	1.75	<	0.29	<	1.75	<	0.29	<	1.75	<	0.29
Styrene (Monomer)		0.93		0.16	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05
Tetrachloroethene		4.88		0.81		0.50		0.08	<	0.45	<	0.08		0.81		0.14
trans-1,2-Dichloroethene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
trans-1,3-Dichloropropene	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05
Tribromomethane	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11
Trichloroethylene		1.18		0.20	<	0.36	<	0.06	<	0.36	<	0.06	<	0.36	<	0.06
Vinyl chloride		0.94		0.16	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Compound	D-3 7/31/2012 24-Hour		D-3 Annual		D-2 1/1/2009 24-Hour		D-2 Annual		D-1 2/2/2009 24-Hour		D-1 Annual		D-3 4/25/2009 24-Hour		D-3 Annual		D-2 2/27/2008 24-Hour		D-2 Annual	
1,1,1,2-Tetrachloroethane	<	0.46	<	0.08	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane	<	0.37	<	0.06		0.17		0.03		0.05		0.01		0.09		0.02		1.07		0.18
1,1,2,2-Tetrachloroethane	<	0.46	<	0.08	<	0.62	<	0.10	<	0.61	<	0.10	<	0.73	<	0.12	<	0.80	<	0.13
1,1,2-Trichloroethane	<	0.37	<	0.06	<	0.49	<	0.08	<	0.49	<	0.08	<	0.56	<	0.09	<	0.67	<	0.11
1,1-Dichloroethane	<	0.27	<	0.04	<	0.37	<	0.06	<	0.36	<	0.06	<	0.42	<	0.07		0.47		0.08
1,1-Dichloroethylene	<	0.27	<	0.04	<	0.36	<	0.06	<	0.35	<	0.06	<	0.41	<	0.07	<	0.48	<	0.08
1,2,4-Trichlorobenzene	<	0.49	<	0.08	<	3.33	<	0.56	<	3.33	<	0.56	<	3.87	<	0.64	<	4.53	<	0.76
1,2,4-Trimethylbenzene		0.59		0.10	<	0.45	<	0.07		0.04		0.01		0.05		0.01		0.17		0.03
1,2-Dibromoethane	<	0.51	<	0.09	<	0.67	<	0.11	<	0.67	<	0.11	<	0.80	<	0.13	<	0.93	<	0.16
1,2-Dichlorobenzene	<	0.40	<	0.07	<	0.55	<	0.09	<	0.53	<	0.09	<	0.62	<	0.10	<	0.73	<	0.12
1,2-Dichloroethane	<	0.27	<	0.04	<	0.37	<	0.06		0.05		0.01	<	0.42	<	0.07		0.45		0.08
1,2-Dichloropropane	<	0.31	<	0.05	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,3,5-Trimethylbenzene	<	0.33	<	0.05	<	0.43	<	0.07		0.02		0.004		0.02		0.004		0.09		0.02
1,3-Butadiene	<	0.15	<	0.02	<	0.20	<	0.03	<	0.20	<	0.03	<	0.23	<	0.04	<	0.27	<	0.04
1,3-Dichlorobenzene	<	0.40	<	0.07	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,4-Dichlorobenzene	<	0.40	<	0.07	<	0.55	<	0.09	<	0.53	<	0.09	<	0.62	<	0.10	<	0.73	<	0.12
1,4-Dioxane	<	1.20	<	0.20	<	0.33	<	0.05	<	0.32	<	0.05	<	0.37	<	0.06	<	0.44	<	0.07
2,2,4-Trimethylpentane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone		1.97		0.33		0.60		0.10		1.80		0.30		3.27		0.54		2.47		0.41
2-Chlor-1,3-Butadiene	NT	NT	NT	NT	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52
2-Phenylbutane	<	0.37	<	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4-Ethyltoluene	<	0.33	<	0.05		0.13		0.02		0.07		0.01		0.09		0.01		0.20		0.03
4-Methyl-2-Pentanone	<	0.27	<	0.05		0.13		0.02		0.18		0.03		0.10		0.03	<	2.47	<	0.41
Acetone		16.16		2.69		3.07		0.51	<	1.07	<	0.18		43.33		7.22		28.00		4.67
Benzene	<	0.21	<	0.04		0.73		0.12	<	0.29	<	0.05	<	0.33	<	0.06		0.44		0.08
Bromodichloromethane	<	0.45	<	0.07	<	0.61	<	0.10	<	0.60	<	0.10	<	0.67	<	0.11	<	0.80	<	0.13
Bromomethane	<	0.26	<	0.04		0.32		0.05	<	0.35	<	0.06	<	0.40	<	0.07	<	0.47	<	0.08
Carbon Disulfide	<	1.04	<	0.17	<	1.40	<	0.23	<	1.40	<	0.23		0.07		0.01		1.07		0.18
Carbon Tetrachloride		0.46		0.08		0.47		0.08		0.31		0.05		0.31		0.05		0.27		0.05
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.31	<	0.05	<	0.42	<	0.07	<	0.41	<	0.07	<	0.47	<	0.08	<	0.56	<	0.09
Chlorodibromomethane	<	0.57	<	0.09	<	0.80	<	0.13	<	0.73	<	0.12	<	0.87	<	0.14	<	1.07	<	0.18
Chloroethane	<	0.17	<	0.03	<	0.24	<	0.04	<	0.23	<	0.04	<	0.27	<	0.05		1.27		0.21
Chloroform	<	0.33	<	0.05	<	0.44	<	0.07	<	0.43	<	0.07	<	0.51	<	0.08	<	0.59	<	0.10
Chloromethane		1.01		0.17		1.00		0.17		0.55		0.09		0.80		0.13	<	0.25	<	0.04
cis-1,2-Dichloroethene		0.27		0.04	<	0.36	<	0.06	<	0.35	<	0.06	<	0.41	<	0.07	<	0.48	<	0.08
cis-1,3-Dichloropropene	<	0.30	<	0.05	<	0.41	<	0.07	<	0.41	<	0.07	<	0.47	<	0.08	<	0.55	<	0.09
Cyclohexane	<	0.23	<	0.04		0.16		0.03	<	0.31	<	0.05		0.19		0.03		2.00		0.33
Dichloromethane		4.51		0.75	<	0.61	<	0.10		1.53		0.26	<	0.73	<	0.12		10.67		1.78
Ethanol		25.77		4.29		6.00		1.00	<	0.87	<	0.14	<	1.00	<	0.17		8.67		1.44
Ethylbenzene		0.32		0.05		0.31		0.05	<	0.39	<	0.06		0.19		0.03		0.41		0.07
Freon-11		2.32		0.39		2.67		0.44		0.93		0.16		1.47		0.24		28.67		4.78
Freon 113	<	0.51	<	0.09	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Freon 114	<	0.47	<	0.08		0.29		0.05	<	0.63	<	0.10	<	0.73	<	0.12	<	0.87	<	0.14
Freon 12		3.13		0.52		2.93		0.49		1.60		0.27		2.13		0.36		8.67		1.44
Hexachloro-1,3-Butadiene	<	0.71	<	0.12	<	4.80	<	0.80	<	4.73	<	0.79	<	5.53	<	0.92	<	6.53	<	1.09
Hexane		1.91		0.32		0.28		0.05		0.19		0.03		0.21		0.04		4.47		0.74
Isopropylbenzene	<	0.33	<	0.05	<	0.45	<	0.07	<	0.44	<	0.07	<	0.51	<	0.08	<	0.60	<	0.10
Methyl N-Butyl Ketone	<	0.27	<	0.05	<	1.87	<	0.31		0.21		0.03		0.29		0.05	<	2.47	<	0.41
Methyl Tert-Butyl Ether	<	0.24	<	0.04	<	0.33	<	0.05	<	0.32	<	0.05	<	0.37	<	0.06		0.15		0.03
Methylbenzene		1.81		0.30		1.60		0.27		0.60		0.10		0.93		0.16		3.40		0.57
Naphthalene	<	1.75	<	0.29	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)	<	0.29	<	0.05	<	0.39	<	0.06	<	0.38	<	0.06	<	0.44	<	0.07	<	0.52	<	0.09
Tetrachloroethene		2.89		0.48		0.36		0.06	<	0.61	<	0.10	<	0.67	<	0.11		0.93		0.16
trans-1,2-Dichloroethene	<	0.27	<	0.04	<	0.36	<	0.06	<	0.35	<	0.06	<	0.41	<	0.07	<	0.48	<	0.08
trans-1,3-Dichloropropene	<	0.30	<	0.05	<	0.41	<	0.07	<	0.41	<	0.07	<	0.47	<	0.08	<	0.55	<	0.09
Tribromomethane	<	0.69	<	0.11	<	0.93	<	0.16	<	0.93	<	0.16	<	1.07	<	0.18	<	1.27	<	0.21
Trichloroethylene	<	0.36	<	0.06	<	0.49	<	0.08		0.06		0.01	<	0.55	<	0.09		0.73		0.12
Vinyl chloride	<	0.17	<	0.03	<	0.23	<	0.04	<	0.23	<	0.04	<	0.27	<	0.04		0.46		0.08
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Notes:
1. "<" indicates that the parameter is not detected. "NT" indicates that the parameter was not tested. D-1 samples were collected upwind of the active landfill face and samples D-1 through D-4 were collected downwind of the active landfill face.
2. Orange highlight indicates an exceedance of the Rhode Island Department of Environmental Management's (RIDEM) 24-hour Acceptable Ambient Levels (AAL) taken from RIDEM Air Pollution Regulation No. 22. An orange highlight of the 24-hour AAL indicates that the typical method reporting limit exceeds the 24-hour AAL.
3. Green highlight indicates an exceedance of the RIDEM Annual AAL, taken from RIDEM Air Pollution Regulation No. 22. An orange highlight of the Annual AAL indicates that the typical method reporting limit exceeds the Annual AAL.
4. Concentrations adjusted using RIDEM's time scale factor from the Air Toxics Modeling Guidelines (RIDEM June 2005)
5. OSHA PEL is the Permissible Exposure Limits as described in the Occupational Safety and Health Standards Part Number 1910 subpart Z Tables Z-1 and Z2

TABLE 7
Volatile Organic Compound Ambient Air Monitoring Results
2008 through 2012
Five-Year Review Report
Central Landfill, Johnston, RI

Compound	Units	Average AAL		OSHA	D-1 10/24/2008				D-1 3/23/2009				D-2 6/13/2009				D-3 9/1/2009			
		24-hour	Annual	PEL	24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual	
1,1,1,2-Tetrachloroethane	ug/m^3	100	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane	ug/m^3	6,000	5,000	1,900,000	<	0.59	<	0.10		0.12		0.02		0.06		0.01	<	0.80	<	0.13
1,1,2,2-Tetrachloroethane	ug/m^3	2,000	NE	7,000	<	0.73	<	0.12	<	0.61	<	0.10	<	0.67	<	0.11	<	1.00	<	0.17
1,1,2-Trichloroethane	ug/m^3	10	NE	45,000	<	0.59	<	0.10	<	0.49	<	0.08	<	0.53	<	0.09	<	0.80	<	0.13
1,1-Dichloroethane	ug/m^3	NE	0.6	400,000	<	0.43	<	0.07		0.15		0.02	<	0.39	<	0.07	<	0.60	<	0.10
1,1-Dichloroethylene	ug/m^3	200	70	400,000	<	0.43	<	0.07	<	0.35	<	0.06	<	0.39	<	0.06	<	0.59	<	0.10
1,2,4-Trichlorobenzene	ug/m^3	30	NE	NE	<	4.00	<	0.67	<	3.33	<	0.56	<	3.60	<	0.60	<	5.53	<	0.92
1,2,4-Trimethylbenzene	ug/m^3	NE	NE	NE	<	0.53	<	0.09	<	0.44	<	0.07		0.13		0.02		0.15		0.02
1,2-Dibromoethane	ug/m^3	9	0.02	156,200	<	0.80	<	0.13	<	0.67	<	0.11	<	0.73	<	0.12	<	1.13	<	0.19
1,2-Dichlorobenzene	ug/m^3	NE	300	300,000	<	0.65	<	0.11	<	0.53	<	0.09	<	0.59	<	0.10	<	0.87	<	0.14
1,2-Dichloroethane	ug/m^3	NE	0.04	205,500	<	0.43	<	0.07	<	0.36	<	0.06	<	0.39	<	0.07	<	0.60	<	0.10
1,2-Dichloropropane	ug/m^3	4	0.1	350,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,3,5-Trimethylbenzene	ug/m^3	NE	NE	NE	<	0.53	<	0.09	<	0.44	<	0.07	<	0.48	<	0.08	<	0.73	<	0.12
1,3-Butadiene	ug/m^3	NE	0.03	2,250,000	<	0.24	<	0.04	<	0.20	<	0.03	<	0.21	<	0.04	<	0.33	<	0.05
1,3-Dichlorobenzene	ug/m^3	NE	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,4-Dichlorobenzene	ug/m^3	800	0.09	450,000		0.11		0.02	<	0.53	<	0.09	<	0.59	<	0.10	<	0.87	<	0.14
1,4-Dioxane	ug/m^3	NE	0.1	360,000	<	0.39	<	0.06	<	0.32	<	0.05	<	0.35	<	0.06	<	0.53	<	0.09
2,2,4-Trimethylpentane	ug/m^3	NE	3,000	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	ug/m^3	5,000	NE	590,000	<	0.31	<	0.05	<	0.27	<	0.04		1.20		0.20		1.33		0.22
2-Chloro-1,3-Butadiene	ug/m^3	NE	1	3,600	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52	<	2.67	<	0.44
2-Phenylbutane	ug/m^3	NE	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4-Ethyltoluene	ug/m^3	NE	NE	NE	<	0.53	<	0.09	<	0.44	<	0.07		0.11		0.02		0.15		0.02
4-Methyl-2-Pentanone	ug/m^3	3,000	NE	410,000	<	2.20	<	0.37	<	1.80	<	0.30	<	2.00	<	0.33		0.11		0.02
Acetone	ug/m^3	3,000	NE	2,400,000	<	1.27	<	0.21	<	1.07	<	0.18		4.40		0.73		4.33		0.72
Benzene	ug/m^3	20	0.13	32,500	<	0.34	<	0.06		0.93		0.16		0.31		0.05		0.31		0.05
Bromodichloromethane	ug/m^3	70	0.02	NE	<	0.73	<	0.12	<	0.60	<	0.10	<	0.65	<	0.11	<	1.00	<	0.17
Bromomethane	ug/m^3	NE	5	80,000	<	0.41	<	0.07	<	0.35	<	0.06	<	0.35	<	0.06		0.31		0.05
Carbon Disulfide	ug/m^3	NE	700	63,200	<	1.67	<	0.28		0.31		0.05	<	1.53	<	0.26	<	2.33	<	0.39
Carbon Tetrachloride	ug/m^3	200	0.07	63,900		0.60		0.10		0.39		0.06		0.21		0.03		0.31		0.05
Chlordane	ug/m^3	0.7	0.001	0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	ug/m^3	NE	1,000	350,000	<	0.49	<	0.08	<	0.41	<	0.07	<	0.45	<	0.07	<	0.67	<	0.11
Chlorodibromomethane	ug/m^3	70	NE	NE	<	0.93	<	0.16	<	0.73	<	0.13	<	0.80	<	0.13	<	1.27	<	0.21
Chloroethane	ug/m^3	10,000	NE	2,600,000	<	0.29	<	0.05	<	0.23	<	0.04	<	0.25	<	0.04	<	0.39	<	0.07
Chloroform	ug/m^3	NE	0.3	240,000	<	0.53	<	0.09	<	0.43	<	0.07		0.06		0.01	<	0.73	<	0.12
Chloromethane	ug/m^3	400	90	210,000		0.80		0.13		0.87		0.14		0.59		0.10		0.80		0.13
cis-1,2-Dichloroethene	ug/m^3	1,000	NE	NE	<	0.43	<	0.07		0.32		0.05	<	0.39	<	0.06	<	0.59	<	0.10
cis-1,3-Dichloropropene	ug/m^3	20	0.2	NE	<	0.49	<	0.08	<	0.41	<	0.07	<	0.44	<	0.07	<	0.67	<	0.11
Cyclohexane	ug/m^3	6,000	NE	1,050,000	<	0.37	<	0.06	<	0.31	<	0.05		0.49		0.08		0.34		0.06
Dichloromethane	ug/m^3	1,000	2	88,250	<	0.73	<	0.12	<	0.62	<	0.10		1.20		0.20		1.13		0.19
Ethanol	ug/m^3	NE	NE	1,900,000	<	1.00	<	0.17		3.67		0.61		0.80		0.13		2.20		0.37
Ethylbenzene	ug/m^3	3000	NE	435,000	<	0.47	<	0.08		0.65		0.11		0.42		0.07		0.43		0.07
Freon-11	ug/m^3	1,000	NE	5,600,000		1.60		0.27		2.00		0.33		0.93		0.16		2.27		0.38
Freon 113	ug/m^3	NE	NE	7,600,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Freon 114	ug/m^3	NE	NE	1,900,000	<	0.73	<	0.12		0.21		0.04	<	0.67	<	0.11	<	1.07	<	0.18
Freon 12	ug/m^3	NE	NE	5,600,000		2.33		0.39		2.67		0.41		1.80		0.30		1.73		0.29
Hexachloro-1,3-Butadiene	ug/m^3	4.7	NE	240	<	5.73	<	0.96	<	4.73	<	0.79	<	5.20	<	0.87	<	8.00	<	1.33
Hexane	ug/m^3	NE	700	1,800,000	<	0.38	<	0.06	<	0.31	<	0.05		0.47		0.08		0.73		0.12
Isopropylbenzene	ug/m^3	400	NE	245,000	<	0.53	<	0.09		0.19		0.03		0.09		0.02	<	0.73	<	0.12
Methyl N-Butyl Ketone	ug/m^3	NE	NE	NE	<	2.20	<	0.37	<	1.80	<	0.30		0.13		0.02	<	3.07	<	0.51
Methyl Tert-Butyl Ether	ug/m^3	3,000	NE	NE	<	0.39	<	0.06		0.13		0.02	<	0.35	<	0.06	<	0.53	<	0.09
Methylbenzene	ug/m^3	NE	300	766,000	<	0.41	<	0.07	<	0.33	<	0.06		1.93		0.32		2.00		0.33
Naphthalene	ug/m^3	3	0.03	50,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)	ug/m^3	1,000	100	433,000	<	0.43	<	0.08	<	0.38	<	0.06	<	0.41	<	0.07	<	0.63	<	0.11
Tetrachloroethene	ug/m^3	NE	[illegible]	689,000	<	0.73	<	0.12		0.29		0.05	<	0.66	<	0.11	<	1.00	<	0.17
trans-1,2-Dichloroethene	ug/m^3	70	NE	660,000	<	0.43	<	0.07	<	0.35	<	0.06	<	0.39	<	0.06	<	0.59	<	0.10
trans-1,3-Dichloropropene	ug/m^3	20	0.2	NE	<	0.49	<	0.08	<	0.41	<	0.07	<	0.44	<	0.07	<	0.67	<	0.11
Tribromomethane	ug/m^3	70	0.5	5,600	<	1.13	<	0.19	<	0.93	<	0.16	<	1.00	<	0.17	<	1.53	<	0.26
Trichloroethylene	ug/m^3	500	0.5	546,000	<	0.57	<	0.10	<	0.48	<	0.08	<	0.52	<	0.09	<	0.80	<	0.13
Vinyl chloride	ug/m^3	100	0.2	2,500	<	0.27	<	0.05		0.57		0.09		0.13		0.02	<	0.38	<	0.06
Xylenes (Total)	ug/m^3	3,000	100	435,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Compound	D-4 10/29/2009				D-2 1/21/2010				D-3 4/15/2010				D-4 7/29/2010			
	24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual	
1,1,1,2-Tetrachloroethane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12
1,1,2,2-Tetrachloroethane	<	1.17	<	0.19	<	1.17	<	0.19	<	1.17	<	0.19	<	1.17	<	0.19
1,1,2-Trichloroethane	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12
1,1-Dichloroethane	<	0.55	<	0.09	<	0.55	<	0.09	<	0.55	<	0.09	<	0.55	<	0.09
1,1-Dichloroethylene	<	0.81	<	0.13	<	0.81	<	0.13	<	0.81	<	0.13	<	0.81	<	0.13
1,2,4-Trichlorobenzene	<	2.74	<	0.46	<	2.74	<	0.46	<	2.74	<	0.46	<	2.74		0.46
1,2,4-Trimethylbenzene	<	1.39	<	0.23	<	1.39	<	0.23	<	1.39	<	0.23	<	1.39	<	0.23
1,2-Dibromoethane	<	0.95	<	0.16	<	0.95	<	0.16	<	0.95	<	0.16	<	0.95	<	0.16
1,2-Dichlorobenzene	<	1.60	<	0.27	<	1.60	<	0.27	<	1.60	<	0.27	<	1.60	<	0.27
1,2-Dichloroethane	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10
1,2-Dichloropropane	NT	NT	NT	NT	<	0.59	<	0.10	<	0.58	<	0.10	<	0.58	<	0.10
1,3,5-Trimethylbenzene	<	1.05	<	0.17	<	1.05	<	0.17	<	1.05	<	0.17	<	1.05	<	0.17
1,3-Butadiene	<	0.19	<	0.03	<	0.18	<	0.03	<	0.18	<	0.03	<	0.18	<	0.03
1,3-Dichlorobenzene	NT	NT	NT	NT	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10
1,4-Dichlorobenzene	<	1.62	<	0.27	<	1.62	<	0.27		0.80		0.13		0.40		0.07
1,4-Dioxane	<	0.67	<	0.11	<	0.67	<	0.11	<	0.67	<	0.11	<	0.67	<	0.11
2,2,4-Trimethylpentane	NT	NT	NT	NT	<	3.87	<	0.64	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	<	2.45	<	0.41	<	2.45	<	0.41		7.33		1.22	<	2.45	<	0.41
2-Chloro-1,3-Butadiene	NT	NT	NT	NT	NT	NT	NT	NT	<	0.48	<	0.08	<	0.48	<	0.08
2-Phenylbutane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4-Ethyltoluene	<	4.07	<	0.68		4.07		0.68	<	4.06	<	0.68	<	4.06	<	0.68
4-Methyl-2-Pentanone	<	3.73	<	0.62	<	3.73	<	0.62	<	3.74	<	0.62	<	3.74	<	0.61
Acetone		20.80		3.47	<	1.98	<	0.33		19.13		3.19		5.84		0.97
Benzene	<	0.41	<	0.07	<	0.41	<	0.07		4.69		[illegible]	<	0.41	<	0.07
Bromodichloromethane	<	0.20	<	0.03	<	0.20	<	0.03	<	0.20	<	0.03	<	0.20	<	0.03
Bromomethane	<	0.85	<	0.14	<	0.85	<	0.14	<	0.85	<	0.14	<	0.85	<	0.14
Carbon Disulfide	<	2.53	<	0.42	<	2.53	<	0.42	<	2.53	<	0.42	<	2.53	<	0.42
Carbon Tetrachloride	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.68	<	0.11	<	0.68	<	0.11	<	0.64	<	0.11	<	0.64	<	0.11
Chlorodibromomethane	<	33.33	<	5.56	<	33.33	<	5.56	<	33.33	<	5.56	<	33.33	<	5.56
Chloroethane	<	0.99	<	0.17	<	0.99	<	0.17	<	0.99	<	0.17	<	0.99	<	0.17
Chloroform	<	0.79	<	0.13	<	0.79	<	0.13	<	0.79	<	0.13	<	0.79	<	0.13
Chloromethane	<	0.55	<	0.09		1.09		0.18		0.73		0.12		0.65		0.11
cis-1,2-Dichloroethene	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09
cis-1,3-Dichloropropene	<	0.44	<	0.07	<	0.44	<	0.07	<	0.44	<	0.07	<	0.44	<	0.07
Cyclohexane	<	2.80	<	0.47	<	2.80	<	0.47	<	2.80	<	0.47	<	2.80	<	0.47
Dichloromethane	<	33.33	<	5.56	<	33.33	<	5.56	<	1.33	<	0.22	<	1.33	<	0.22
Ethanol	<	0.20	<	0.03	<	0.20	<	0.03		25.60		4.27		4.01		0.67
Ethylbenzene	<	0.78	<	0.13	<	0.78	<	0.13		3.13		0.52	<	0.78	<	0.13
Freon-11		1.67		0.28		3.45		0.57		4.79		0.80	<	1.05	<	0.17
Freon 113	NT	NT	NT	NT	<	1.55	<	0.26	<	1.55	<	0.26	<	1.55	<	0.26
Freon 114	<	1.91	<	0.32	<	1.91	<	0.32	<	1.91	<	0.32	<	1.91	<	0.32
Freon 12		2.11		0.35		3.73		0.62		3.99		0.66		1.33		0.22
Hexachloro-1,3-Butadiene	<	2.03	<	0.34	<	2.03	<	0.34	<	2.03	<	0.34	<	2.03	<	0.34
Hexane	<	2.94	<	0.49	<	2.94	<	0.49	<	2.93	<	0.49	<	2.93	<	0.49
Isopropylbenzene	<	1.33	<	0.22	<	1.33	<	0.22	<	1.33	<	0.22	<	1.33	<	0.22
Methyl N-Butyl Ketone	<	3.40	<	0.57	<	3.40	<	0.57	<	3.39	<	0.56	<	3.39	<	0.56
Methyl Tert-Butyl Ether	<	3.01	<	0.50	<	3.01	<	0.50	<	3.00	<	0.50	<	3.00	<	0.50
Methylbenzene	<	1.19	<	0.20	<	1.19	<	0.20		11.80		1.97	<	1.19	<	0.20
Naphthalene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11
Tetrachloroethene	<	0.67	<	0.11	<	0.67	<	0.11		1.17		0.20		0.18		0.03
trans-1,2-Dichloroethene	<	3.31	<	0.55	<	3.31	<	0.55	<	3.30	<	0.55	<	3.30	<	0.55
trans-1,3-Dichloropropene	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09
Tribromomethane	<	0.54	<	0.09	<	0.54	<	0.09	<	0.54	<	0.09	<	0.54	<	0.09
Trichloroethylene	<	0.61	<	0.10	<	0.61	<	0.10	<	0.61	<	0.10	<	0.61	<	0.10
Vinyl chloride	<	1.33	<	0.22	<	1.33	<	0.22		0.34		0.06	<	0.13	<	0.02
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Compound	D-2 10/27/2010				D-3 1/25/2011				D-4 4/22/2011				D-2 1/28/2012			
	24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual	
1,1,1,2-Tetrachloroethane	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08
1,1,1-Trichloroethane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1,2,2-Tetrachloroethane	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08
1,1,2-Trichloroethane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1-Dichloroethane	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,1-Dichloroethylene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2,4-Trichlorobenzene	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08		0.55		0.09
1,2,4-Trimethylbenzene		0.43		0.07	<	0.33	<	0.05	<	0.33	<	0.05		0.36		0.06
1,2-Dibromoethane	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09
1,2-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,2-Dichloroethane	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2-Dichloropropane	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05
1,3,5-Trimethylbenzene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
1,3-Butadiene	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02
1,3-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dioxane	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20
2,2,4-Trimethylpentane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone		0.93		0.15		14.59		2.43		0.77		0.13		2.28		0.38
2-Chloro-1,3-Butadiene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Phenylbutane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
4-Ethyltoluene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
4-Methyl-2-Pentanone	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05
Acetone		5.27		0.88		5.42		0.90		5.32		0.89		11.20		1.87
Benzene		0.32		0.05		1.30		0.22		0.21		0.04		0.51		0.09
Bromodichloromethane	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07
Bromomethane	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04
Carbon Disulfide	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17
Carbon Tetrachloride	<	0.42	<	0.07	<	0.42	<	0.07	<	0.43	<	0.07		0.42		0.07
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05
Chlorodibromomethane	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09
Chloroethane	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03
Chloroform	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
Chloromethane		0.83		0.14		0.63		0.11		0.51		0.08		0.80		0.13
cis-1,2-Dichloroethene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
cis-1,3-Dichloropropene	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05
Cyclohexane	<	0.23	<	0.04	<	0.35		0.06	<	0.23	<	0.04		0.37		0.06
Dichloromethane		1.41		0.24		5.03		0.84	<	2.13	<	0.35		0.35		0.06
Ethanol		6.56		1.09		4.03		0.67		10.70		1.78		4.27		0.71
Ethylbenzene	<	0.29	<	0.05		0.89		0.15	<	0.29	<	0.05		0.69		0.12
Freon-11		1.57		0.26		1.73		0.29		1.83		0.31		3.30		0.55
Freon 113	<	0.51	<	0.09	<	0.51	<	0.09		0.87		0.14		0.56		0.09
Freon 114	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08
Freon 12		1.61		0.27		2.01		0.34		1.49		0.25		2.31		0.38
Hexachloro-1,3-Butadiene	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12
Hexane	<	1.17	<	0.20	<	1.17	<	0.20	<	1.17	<	0.20		2.99		0.50
Isopropylbenzene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
Methyl N-Butyl Ketone	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05		0.27		0.05
Methyl Tert-Butyl Ether	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04
Methylbenzene		0.78		0.13		2.83		0.47		0.83		0.14		2.31		0.38
Naphthalene	NT	NT	NT	NT	<	1.75	<	0.29	<	1.75	<	0.29	<	1.75	<	0.29
Styrene (Monomer)	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05
Tetrachloroethene	<	0.45	<	0.08	<	0.45	<	0.08	<	0.45	<	0.08		0.59		0.10
trans-1,2-Dichloroethene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
trans-1,3-Dichloropropene	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05
Tribromomethane	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11
Trichloroethylene	<	0.36	<	0.06	<	0.36	<	0.06	<	0.36	<	0.06	<	0.36	<	0.06
Vinyl chloride	<	0.17	<	0.03		0.25		0.04	<	0.17	<	0.03	<	0.17	<	0.03
Xylenes (Total)	<	0.58	<	0.10	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Notes
1. "<" indicates that the parameter is not detected. "NT" indicates that the parameter was not tested. U-1 samples were collected upwind of the active landfill face and samples D-1 through D-4 were collected downwind of the active landfill face.
2. Orange highlight indicates an exceedance of the Rhode Island Department of Environmental Management's (RIDEM) 24-hour Acceptable Ambient Levels (AAL) taken from RIDEM's Air Pollution Regulation No. 22. An orange highlight of the 24-hour AAL indicates that the typical method reporting limit exceeds the 24-hour AAL.
3. Green highlight indicates an exceedance of the RIDEM Annual AAL taken from RIDEM Air Pollution Regulation No. 22. An orange highlight of the Annual AAL indicates that the typical method reporting limit exceeds the Annual AAL.
4. Concentrations adjusted using RIDEM's time scale factor from the Air Toxics Modeling Guidelines (RIDEM June 2005).
5. OSHA PEL is the Permissible Exposure Limits as described in the Occupational Safety and Health Standards Part Number 1910 subpart Z Tables Z-1 and Z-2.

TABLE 7
Volatile Organic Compound Ambient Air Monitoring Results
2004 through 2012
Five-Year Review Report
Central Landfill, Johnston, RI

Compound	Units	Average AAL 24-Hour	Average AAL Annual	OSHA PEL	D-1 10/18/2012 24-Hour		D-1 10/18/2012 Annual		D-1 1/19/2012 24-Hour		D-1 1/19/2012 Annual		D-2 6/18/2012 24-Hour		D-2 6/18/2012 Annual		D-4 5/14/2012 24-Hour		D-4 5/14/2012 Annual	
1,1,1,2-Tetrachloroethane	ug/m^3	100	NE	NE	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08
1,1,1-Trichloroethane	ug/m^3	6,000	5,000	1,900,000	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1,2,2-Tetrachloroethane	ug/m^3	2,000	NE	7,000	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08
1,1,2-Trichloroethane	ug/m^3	10	NE	45,000	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1-Dichloroethane	ug/m^3	NE	0.6	400,000	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,1-Dichloroethylene	ug/m^3	200	70	400,000	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2,4-Trichlorobenzene	ug/m^3	30	NE	NE	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08
1,2,4-Trimethylbenzene	ug/m^3	NE	NE	NE		0.39		0.07		0.33		0.05	<	0.33	<	0.05		1.35		0.23
1,2-Dibromoethane	ug/m^3	9	0.02	156,200	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09
1,2-Dichlorobenzene	ug/m^3	NE	300	300,000	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,2-Dichloroethane	ug/m^3	NE	0.04	203,500	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2-Dichloropropane	ug/m^3	4	0.2	350,000	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05
1,3,5-Trimethylbenzene	ug/m^3	NE	NE	NE	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
1,3-Butadiene	ug/m^3	NE	0.03	2,250,000	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02
1,3-Dichlorobenzene	ug/m^3	NE	NE	NE	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dichlorobenzene	ug/m^3	800	0.09	450,000	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dioxane	ug/m^3	NE	0.1	360,000	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20
2,2,4-Trimethylpentane	ug/m^3	NE	1,000	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	ug/m^3	5,000	NE	590,000		0.53		0.09		0.25		0.04	<	0.19	<	0.03		12.86		2.14
2-Chloro-1,3-Butadiene	ug/m^3	NE	1	3,600	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Phenylbutane	ug/m^3	NE	NE	NE	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
4-Ethyltoluene	ug/m^3	NE	NE	NE	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05		0.43		0.07
4-Methyl-2-Pentanone	ug/m^3	3,000	NE	410,000	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05		2.49		0.41
Acetone	ug/m^3	3,000	NE	2,400,000		5.48		0.91	<	2.71	<	0.45		28.45		4.74		71.92		11.99
Benzene	ug/m^3	30	0.1	32,500		0.27		0.05		0.30		0.05	<	0.21	<	0.04		0.27		0.05
Bromodichloromethane	ug/m^3	70	0.02	NE	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07
Bromomethane	ug/m^3	NE	5	80,000	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04
Carbon Disulfide	ug/m^3	NE	700	62,200	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17
Carbon Tetrachloride	ug/m^3	200	0.07	63,900	<	0.42	<	0.07	<	0.42	<	0.07	<	0.42	<	0.07		0.46		0.08
Chlordane	ug/m^3	0.7	0.001	0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	ug/m^3	NE	1,000	350,000	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.29	<	0.05
Chlorodibromomethane	ug/m^3	70	NE	NE	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09
Chloroethane	ug/m^3	10,000	NE	2,600,000	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03
Chloroform	ug/m^3	NE	0.3	240,000	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
Chloromethane	ug/m^3	400	90	210,000		0.65		0.11		0.70		0.12	<	0.14	<	0.02		1.06		0.18
cis-1,2-Dichloroethene	ug/m^3	1,000	NE	NE	<	0.27	<	0.04	<	0.27	<	0.04		0.45		0.07		0.63		0.11
cis-1,3-Dichloropropene	ug/m^3	20	0.2	NE	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05
Cyclohexane	ug/m^3	6,000	NE	1,050,000	<	0.23	<	0.04	<	0.23	<	0.04	<	0.23	<	0.04	<	0.23	<	0.04
Dichloromethane	ug/m^3	1,000	3	88,250		0.58		0.10	<	0.35	<	0.06		0.55		0.09		4.91		0.82
Ethanol	ug/m^3	NE	NE	1,900,000		4.90		0.82		1.15		0.19	<	1.89	<	0.31		28.15		4.69
Ethylbenzene	ug/m^3	3000	NE	435,000		0.35		0.06	<	0.29	<	0.05	<	0.29	<	0.05		0.32		0.05
Freon-11	ug/m^3	2,000	NE	5,600,000		1.35		0.22		1.01		0.17		0.97		0.16		4.12		0.69
Freon 113	ug/m^3	NE	NE	7,600,000	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09
Freon 114	ug/m^3	NE	NE	1,900,000	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08
Freon 12	ug/m^3	NE	NE	5,600,000		1.78		0.30		1.73		0.29		2.27		0.38		2.79		0.45
Hexachloro-1,3-Butadiene	ug/m^3	4.7	NE	240	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12
Hexane	ug/m^3	NE	700	1,800,000	<	1.17	<	0.20	<	1.17	<	0.20	<	1.17	<	0.20		1.27		0.21
Isopropylbenzene	ug/m^3	400	NE	245,000	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
Methyl N-Butyl Ketone	ug/m^3	NE	NE	NE	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05		6.64		1.11
Methyl Tert-Butyl Ether	ug/m^3	3,000	NE	NE	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04
Methylbenzene	ug/m^3	NE	300	766,000		0.83		0.14		0.37		0.06	<	0.25	<	0.04		1.01		0.17
Naphthalene	ug/m^3	3	0.03	50,000	<	1.75	<	0.29	<	1.75	<	0.29	<	1.75	<	0.29		13.31		2.22
Styrene (Monomer)	ug/m^3	1,000	100	433,000	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05
Tetrachloroethene	ug/m^3	NE	0.3	689,000	<	0.45	<	0.08	<	0.45	<	0.08	<	0.45	<	0.08		0.81		0.14
trans-1,2-Dichloroethene	ug/m^3	70	NE	660,000	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
trans-1,3-Dichloropropene	ug/m^3	20	0.2	NE	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05
Tribromomethane	ug/m^3	70	0.3	5,000	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11
Trichloroethylene	ug/m^3	500	0.5	546,000	<	0.36	<	0.06	<	0.36	<	0.06		6.63		1.10		2.43		0.41
Vinyl chloride	ug/m^3	100	0.2	2,500	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03
Xylenes (Total)	ug/m^3	3,000	100	435,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Compound	D-3 2/1/2009 24-Hour		D-3 2/1/2009 Annual		D-3 3/7/2009 24-Hour		D-3 3/7/2009 Annual		D-3 4/26/2009 24-Hour		D-3 4/26/2009 Annual		D-3 7/10/2008 24-Hour		D-3 7/10/2008 Annual	
1,1,1,2-Tetrachloroethane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane		0.43		0.07		0.07		0.01		0.10		0.02		0.14		0.02
1,1,2,2-Tetrachloroethane	<	0.55	<	0.09	<	0.65	<	0.11	<	0.73	<	0.12	<	0.80	<	0.13
1,1,2-Trichloroethane	<	0.43	<	0.07	<	0.51	<	0.09	<	0.59	<	0.10	<	0.63	<	0.11
1,1-Dichloroethane	<	0.32	<	0.05	<	0.38	<	0.06	<	0.43	<	0.07	<	0.47	<	0.08
1,1-Dichloroethylene	<	0.31	<	0.05	<	0.37	<	0.06	<	0.43	<	0.07	<	0.46	<	0.08
1,2,4-Trichlorobenzene	<	2.93	<	0.49	<	3.47	<	0.58	<	4.00	<	0.67	<	4.33	<	0.72
1,2,4-Trimethylbenzene	<	0.39	<	0.06		0.05		0.01		0.06		0.01		0.07		0.01
1,2-Dibromoethane	<	0.61	<	0.10	<	0.73	<	0.12	<	0.80	<	0.13	<	0.87	<	0.14
1,2-Dichlorobenzene	<	0.48	<	0.08	<	0.57	<	0.09	<	0.65	<	0.11	<	0.67	<	0.11
1,2-Dichloroethane	<	0.32	<	0.05		0.05		0.01	<	0.43	<	0.07	<	0.47	<	0.08
1,2-Dichloropropane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,3,5-Trimethylbenzene		0.06		0.01	<	0.46	<	0.08	<	0.53	<	0.09	<	0.57	<	0.10
1,3-Butadiene	<	0.17	<	0.03	<	0.21	<	0.03	<	0.24	<	0.04	<	0.26	<	0.04
1,3-Dichlorobenzene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,4-Dichlorobenzene	<	0.48	<	0.08	<	0.57	<	0.09	<	0.65	<	0.11	<	0.67	<	0.11
1,4-Dioxane	<	0.29	<	0.05	<	0.34	<	0.06	<	0.39	<	0.06	<	0.42	<	0.07
2,2,4-Trimethylpentane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone		1.40		0.23		2.00		0.33		1.00		0.17		1.80		0.30
2-Chloro-1,3-Butadiene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Phenylbutane	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52
4-Ethyltoluene		0.11		0.02		0.06		0.01	<	0.53	<	0.09		0.06		0.01
4-Methyl-2-Pentanone		2.47		0.41	<	1.93	<	0.32	<	2.20	<	0.37	<	2.40	<	0.40
Acetone		10.67		1.78		16.67		2.78		12.67		2.11		14.00		2.33
Benzene		0.80		0.13		0.45		0.08	<	0.34	<	0.06		0.27		0.05
Bromodichloromethane	<	0.53	<	0.09	<	0.63	<	0.10	<	0.73	<	0.12	<	0.80	<	0.13
Bromomethane		0.45		0.08	<	0.37	<	0.06	<	0.41	<	0.07	<	0.45	<	0.08
Carbon Disulfide		0.21		0.03	<	1.47	<	0.24	<	1.67	<	0.28	<	1.80	<	0.30
Carbon Tetrachloride		0.46		0.08		0.33		0.06	<	0.67	<	0.11		0.26		0.04
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.37	<	0.06	<	0.43	<	0.07	<	0.49	<	0.08	<	0.53	<	0.09
Chlorodibromomethane	<	0.67	<	0.11	<	0.80	<	0.13	<	0.93	<	0.16	<	1.00	<	0.17
Chloroethane	<	0.21	<	0.03	<	0.25	<	0.04	<	0.28	<	0.05	<	0.31	<	0.05
Chloroform	<	0.39	<	0.06	<	0.46	<	0.08	<	0.53	<	0.09	<	0.57	<	0.09
Chloromethane		1.20		0.20		0.53		0.09		0.73		0.12		0.80		0.13
cis-1,2-Dichloroethene	<	0.31	<	0.05	<	0.37	<	0.06	<	0.43	<	0.07	<	0.46	<	0.08
cis-1,3-Dichloropropene	<	0.36	<	0.06	<	0.43	<	0.07	<	0.49	<	0.08	<	0.53	<	0.09
Cyclohexane		0.14		0.02	<	0.32	<	0.05		0.06		0.01	<	0.40	<	0.07
Dichloromethane	<	0.55	<	0.09		1.13		0.19	<	0.73	<	0.12		0.80		0.13
Ethanol		3.87		0.64		1.40		0.23	<	1.00	<	0.17		8.00		1.33
Ethylbenzene		0.43		0.07		0.12		0.02		0.18		0.03		0.12		0.02
Freon-11		1.47		0.24		0.93		0.16		1.27		0.21		3.47		0.58
Freon 113	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Freon 114	<	0.55	<	0.09	<	0.65	<	0.11	<	0.73	<	0.12	<	0.80	<	0.13
Freon 12		2.33		0.39		1.40		0.23		1.93		0.32		2.00		0.33
Hexachloro-1,3-Butadiene	<	4.20	<	0.70	<	5.00	<	0.83	<	5.73	<	0.96	<	6.20	<	1.03
Hexane		0.25		0.04		0.12		0.02		0.14		0.02		0.29		0.05
Isopropylbenzene	<	0.39	<	0.06	<	0.46	<	0.08	<	0.53	<	0.09	<	0.57	<	0.10
Methyl N-Butyl Ketone	<	1.60	<	0.27		0.37		0.06	<	2.20	<	0.37		0.26		0.04
Methyl Tert-Butyl Ether	<	0.29	<	0.05	<	0.34	<	0.06	<	0.39	<	0.06	<	0.42	<	0.07
Methylbenzene		2.87		0.49		0.55		0.09		0.63		0.11		1.00		0.17
Naphthalene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)	<	0.34	<	0.06		0.05		0.01	<	0.45	<	0.08	<	0.49	<	0.08
Tetrachloroethene		1.20		0.20		3.53		0.59	<	0.73	<	0.12		0.17		0.03
trans-1,2-Dichloroethene	<	0.31	<	0.05	<	0.37	<	0.06	<	0.43	<	0.07	<	0.46	<	0.08
trans-1,3-Dichloropropene	<	0.36	<	0.06	<	0.43	<	0.07	<	0.49	<	0.08	<	0.53	<	0.09
Tribromomethane	<	0.80	<	0.13	<	0.93	<	0.16	<	1.13	<	0.19	<	1.20	<	0.20
Trichloroethylene		2.47		0.41	<	0.51	<	0.08	<	0.57	<	0.10	<	0.61	<	0.10
Vinyl chloride		0.10		0.02	<	0.24	<	0.04	<	0.27	<	0.05	<	0.30	<	0.05
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Compound	D-3 10/24/2008 24-Hour		D-3 10/24/2008 Annual		D-3 1/22/2009 24-Hour		D-3 1/22/2009 Annual		D-3 4/15/2009 24-Hour		D-3 4/15/2009 Annual		D-4 7/21/2009 24-Hour		D-4 7/21/2009 Annual	
1,1,1,2-Tetrachloroethane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane	<	0.55	<	0.09	<	0.56	<	0.09	<	0.59	<	0.10	<	0.93	<	0.16
1,1,2,2-Tetrachloroethane	<	0.67	<	0.11	<	0.73	<	0.12	<	0.73	<	0.12	<	1.20	<	0.20
1,1,2-Trichloroethane	<	0.55	<	0.09	<	0.56	<	0.09	<	0.59	<	0.10	<	0.93	<	0.16
1,1-Dichloroethane	<	0.41	<	0.07	<	0.42	<	0.07	<	0.43	<	0.07	<	0.67	<	0.11
1,1-Dichloroethylene	<	0.40	<	0.07	<	0.41	<	0.07	<	0.43	<	0.07	<	0.67	<	0.11
1,2,4-Trichlorobenzene	<	3.73	<	0.62	<	3.87	<	0.64	<	4.00	<	0.67	<	6.40	<	1.07
1,2,4-Trimethylbenzene		2.73		0.46		0.31		0.05	<	0.53	<	0.09		0.11		0.02
1,2-Dibromoethane	<	0.80	<	0.13	<	0.80	<	0.13	<	0.80	<	0.13	<	1.33	<	0.22
1,2-Dichlorobenzene	<	0.61	<	0.10	<	0.62	<	0.10	<	0.65	<	0.11	<	1.07	<	0.18
1,2-Dichloroethane	<	0.41	<	0.07	<	0.42	<	0.07	<	0.43	<	0.07	<	0.67	<	0.11
1,2-Dichloropropane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,3,5-Trimethylbenzene		0.80		0.13		0.13		0.02	<	0.53	<	0.09	<	0.87	<	0.14
1,3-Butadiene	<	0.23	<	0.04	<	0.23	<	0.04	<	0.24	<	0.04	<	0.38	<	0.06
1,3-Dichlorobenzene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,4-Dichlorobenzene	<	0.61	<	0.10	<	0.62	<	0.10	<	0.65	<	0.11	<	1.07	<	0.18
1,4-Dioxane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.39	<	0.06	<	0.62	<	0.10
2,2,4-Trimethylpentane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	<	0.30	<	0.05	<	0.31	<	0.05		1.40		0.23		5.00		0.83
2-Chloro-1,3-Butadiene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Phenylbutane	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52
4-Ethyltoluene		1.80		0.30		0.32		0.05	<	0.53	<	0.09	<	0.87	<	0.14
4-Methyl-2-Pentanone	<	2.07	<	0.34	<	2.13	<	0.36	<	2.20	<	0.37		0.24		0.04
Acetone	<	1.20	<	0.20	<	1.20	<	0.20		5.20		0.87		15.33		2.56
Benzene		1.40		0.23		1.00		0.17		0.29		0.05		0.29		0.05
Bromodichloromethane	<	0.67	<	0.11	<	0.67	<	0.11	<	0.73	<	0.12	<	1.13	<	0.19
Bromomethane	<	0.39	<	0.07	<	0.40	<	0.07	<	0.41	<	0.07		0.39		0.06
Carbon Disulfide	<	1.60	<	0.27	<	1.60	<	0.27	<	1.67	<	0.28	<	2.67	<	0.44
Carbon Tetrachloride		0.45		0.07		0.68		0.11		0.24		0.04		0.34		0.06
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.47	<	0.08	<	0.47	<	0.08	<	0.49	<	0.08	<	0.80	<	0.13
Chlorodibromomethane	<	0.87	<	0.14	<	0.87	<	0.14	<	0.93	<	0.16	<	1.47	<	0.24
Chloroethane	<	0.27	<	0.04	<	0.27	<	0.05	<	0.28	<	0.05	<	0.43	<	0.07
Chloroform	<	0.49	<	0.08	<	0.51	<	0.08		0.06		0.01	<	0.87	<	0.14
Chloromethane		1.00		0.17		0.80		0.13		0.56		0.09		0.73		0.12
cis-1,2-Dichloroethene	<	0.40	<	0.07	<	0.41	<	0.07	<	0.43	<	0.07	<	0.67	<	0.11
cis-1,3-Dichloropropene	<	0.46	<	0.08	<	0.47	<	0.08	<	0.49	<	0.08	<	0.80	<	0.13
Cyclohexane	<	0.35	<	0.06	<	0.35	<	0.06		0.04		0.01		0.29		0.05
Dichloromethane	<	0.67	<	0.11	<	0.73	<	0.12	<	0.73	<	0.12		3.47		0.58
Ethanol	<	0.93	<	0.16		3.07		0.51		0.73		0.12		3.53		0.59
Ethylbenzene	<	0.44	<	0.07	<	0.45	<	0.07		0.13		0.02		0.37		0.06
Freon-11		1.60		0.27		1.47		0.24		0.87		0.14		0.87		0.14
Freon 113	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Freon 114	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	1.20	<	0.20
Freon 12		2.40		0.40		2.27		0.38		1.60		0.27		1.27		0.21
Hexachloro-1,3-Butadiene	<	5.40	<	0.90	<	5.53	<	0.92	<	5.73	<	0.96	<	9.33	<	1.56
Hexane	<	0.36	<	0.06	<	0.37	<	0.06		0.18		0.03		0.67		0.11
Isopropylbenzene	<	0.50	<	0.08		0.09		0.02	<	0.53	<	0.09	<	0.87	<	0.14
Methyl N-Butyl Ketone	<	2.07	<	0.34	<	2.13	<	0.36		0.17		0.03		0.63		0.10
Methyl Tert-Butyl Ether		0.12		0.02	<	0.37	<	0.06	<	0.39	<	0.06	<	0.62	<	0.10
Methylbenzene	<	0.38	<	0.06	<	0.39	<	0.06		0.57		0.10		4.27		0.71
Naphthalene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)	<	0.43	<	0.07	<	0.44	<	0.07	<	0.45	<	0.08	<	0.73	<	0.12
Tetrachloroethene		0.30		0.05		0.23		0.04		0.13		0.02	<	1.20	<	0.20
trans-1,2-Dichloroethene	<	0.40	<	0.07	<	0.41	<	0.07	<	0.43	<	0.07	<	0.67	<	0.11
trans-1,3-Dichloropropene	<	0.46	<	0.08	<	0.47	<	0.08	<	0.49	<	0.08	<	0.80	<	0.13
Tribromomethane	<	1.07	<	0.18	<	1.07	<	0.18	<	1.13	<	0.19	<	1.80	<	0.30
Trichloroethylene	<	0.55	<	0.09	<	0.55	<	0.09	<	0.57	<	0.10	<	0.93	<	0.16
Vinyl chloride	<	0.26	<	0.04		0.15		0.02	<	0.27	<	0.05	<	0.44	<	0.07
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Notes
1. "<" indicates that the parameter is not detected. "NT" indicates that the parameter was not tested. U-1 samples were collected upwind of the active landfill face and samples D-1 through D-4 were collected downwind of the active landfill face.
2. Orange highlight indicates an exceedance of the Rhode Island Department of Environmental Management's (RIDEM) 24-hour Acceptable Ambient Levels (AAL) taken from RIDEM Air Pollution Regulation No. 22. An orange highlight of the 24-hour AAL indicates that the typical method reporting limit exceeds the 24-hour AAL.
3. Green highlight indicates an exceedance of the RIDEM's Annual AAL taken from RIDEM Air Pollution Regulation No. 22. An orange highlight of the Annual AAL indicates that the typical method reporting limit exceeds the Annual AAL.
4. Concentrations adjusted using RIDEM's time scale factor from the Air Toxics Modeling Guidelines (RIDEM June 2005).
5. OSHA PEL is the Permissible Exposure Limits as described in the Occupational Safety and Health Standards Part Number 1910 subpart Z Tables Z-1 and Z2.

TABLE 7
Volatile Organic Compound Ambient Air Monitoring Results
2009 through 2012
Five-Year Review Report
Central Landfill Johnston, RI

	Units	Average AAL		OSHA	D-3				D-3				D-3				D-3				D-3				D-4				D-3				D-4				D-4				D-3				D-3				D-4			
					10/28/2009				1/21/2010				4/19/2010				7/29/2010				10/29/2010				1/26/2011				4/27/2011				7/29/2011				10/19/2011				1/19/2012				4/19/2012				7/18/2012			
		24-hour	Annual	PEL	24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual	
1,1,1,2-Tetrachloroethane	ug/m^3	100	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.91	<	0.15	<	0.46	<	0.08	<	0.46	<	0.08
1,1,1-Trichloroethane	ug/m^3	6,000	5,000	1,900,000	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06		0.43		0.07	<	0.37	<	0.06	<	0.73	<	0.12	<	0.37	<	0.06	<	0.37	<	0.06
1,1,2,2-Tetrachloroethane	ug/m^3	2,000	NE	7,000	<	1.17	<	0.19	<	1.17	<	0.19	<	1.17	<	0.19	<	1.17	<	0.19	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.91	<	0.15	<	0.46	<	0.08	<	0.46	<	0.08
1,1,2-Trichloroethane	ug/m^3	10	NE	45,000	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.73	<	0.12	<	0.37	<	0.06	<	0.37	<	0.06
1,1-Dichloroethane	ug/m^3	NE	0.6	400,000	<	0.55	<	0.09	<	0.55	<	0.09	<	0.55	<	0.09	<	0.55	<	0.09	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.54	<	0.09	<	0.27	<	0.04	<	0.27	<	0.04
1,1-Dichloroethylene	ug/m^3	200	70	400,000	<	0.81	<	0.13	<	0.81	<	0.13	<	0.81	<	0.13	<	0.81	<	0.13	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.53	<	0.09	<	0.27	<	0.04	<	0.27	<	0.04
1,2,4-Trichlorobenzene	ug/m^3	30	NE	NE	<	2.74	<	0.46	<	2.74	<	0.46	<	2.74	<	0.46	<	2.74	<	0.46	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08	<	0.99	<	0.16	<	0.49	<	0.08	<	0.49	<	0.08
1,2,4-Trimethylbenzene	ug/m^3	NE	NE	NE	<	1.39	<	0.23		3.96		0.66		1.78		0.30	<	1.39	<	0.23	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05		0.53		0.09	<	0.33	<	0.05	<	0.65	<	0.11		0.69		0.11	<	0.33	<	0.05
1,2-Dibromoethane	ug/m^3	9	0.03	154,200	<	0.95	<	0.16	<	0.95	<	0.16	<	0.95	<	0.16	<	0.95	<	0.16	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09	<	1.03	<	0.17	<	0.51	<	0.09	<	0.51	<	0.09
1,2-Dichlorobenzene	ug/m^3	NE	300	300,000	<	1.60	<	0.27	<	1.60	<	0.27	<	1.60	<	0.27	<	1.60	<	0.27	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.80	<	0.13	<	0.40	<	0.07	<	0.40	<	0.07
1,2-Dichloroethane	ug/m^3	NE	0.04	205,500	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.54	<	0.09	<	0.27	<	0.04	<	0.27	<	0.04
1,2-Dichloropropane	ug/m^3	4	0.1	350,000	NT	NT	NT	NT	<	0.59	<	0.10	<	0.58	<	0.10	<	0.58	<	0.10	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05		0.44		0.07	<	0.61	<	0.10	<	0.31	<	0.05	<	0.31	<	0.05
1,3,5-Trimethylbenzene	ug/m^3	NE	NE	NE	<	1.05	<	0.17	<	1.05	<	0.17	<	1.05	<	0.17	<	1.05	<	0.17	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.65	<	0.11	<	0.33	<	0.05	<	0.33	<	0.05
1,3-Butadiene	ug/m^3	NE	0.03	2,250,000	<	0.19	<	0.03	<	0.18	<	0.03	<	0.18	<	0.03	<	0.18	<	0.03	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02	<	0.29	<	0.05	<	0.15	<	0.02	<	0.15	<	0.02
1,3-Dichlorobenzene	ug/m^3	NE	NE	NE	NT	NT	NT	NT	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.80	<	0.13	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dichlorobenzene	ug/m^3	800	0.09	450,000	<	1.62	<	0.27	<	1.62	<	0.27	<	0.53	<	0.09		0.36		0.06	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.80	<	0.13	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dioxane	ug/m^3	NE	0.2	360,000	<	0.67	<	0.11	<	0.67	<	0.11	<	0.67	<	0.11	<	0.67	<	0.11	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20	<	2.40	<	0.40	<	1.20	<	0.20	<	1.20	<	0.20
2,2,4-Trimethylpentane	ug/m^3	NE	1,000	NE	NT	NT	NT	NT	<	3.87	<	0.64	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	ug/m^3	5,000	NE	590,000	<	2.45	<	0.41	<	2.45	<	0.41	<	2.45	<	0.41	<	2.45	<	0.41	<	0.19	<	0.03		0.95		0.16		0.55		0.09		5.53		0.92		0.33		0.06	<	0.39	<	0.07		0.67		0.11		2.07		0.34
2-Chloro-1,3-Butadiene	ug/m^3	NE	1	3,600	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Phenylbutane	ug/m^3	NE	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.73	<	0.12	<	0.37	<	0.06	<	0.37	<	0.06
4-Ethyltoluene	ug/m^3	NE	NE	NE	<	4.07	<	0.68		14.53		2.42	<	4.06	<	0.68	<	4.06	<	0.68	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05		0.39		0.07	<	0.33	<	0.05	<	0.65	<	0.11	<	0.33	<	0.05	<	0.33	<	0.05
4-Methyl-2-Pentanone	ug/m^3	3,000	NE	410,000	<	3.73	<	0.62	<	3.73	<	0.62	<	3.74	<	0.62	<	3.74	<	0.62	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05		0.52		0.09	<	0.27	<	0.05	<	0.55	<	0.09	<	0.27	<	0.05	<	0.27	<	0.05
Acetone	ug/m^3	3,000	NE	2,400,000		8.2*		1.39	<	1.98	<	0.33		8.00		1.33		6.01		1.00		3.93		0.65		5.57		0.93		4.44		0.77		19.49		3.25		5.67		0.95	<	3.39	<	0.57		21.80		3.65		24.55		4.09
Benzene	ug/m^3	20	0.1	32,500	<	0.41	<	0.07	<	0.41	<	0.07	<	0.41	<	0.07	<	0.41	<	0.07	<	0.21	<	0.04		0.44		0.08	<	0.21	<	0.04		0.32		0.05	<	0.21	<	0.04	<	0.43	<	0.07	<	0.21	<	0.04		0.23		0.04
Bromodichloromethane	ug/m^3	70	0.03	NE	<	0.20	<	0.03	<	0.20	<	0.03	<	0.20	<	0.03	<	0.20	<	0.03	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07	<	0.89	<	0.15	<	0.45	<	0.07	<	0.45	<	0.07
Bromomethane	ug/m^3	NE	5	80,000	<	0.85	<	0.14	<	0.85	<	0.14	<	0.85	<	0.14	<	0.85	<	0.14	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04	<	0.52	<	0.09	<	0.26	<	0.04	<	0.26	<	0.04
Carbon Disulfide	ug/m^3	NE	700	63,200	<	2.53	<	0.42	<	2.53	<	0.42	<	2.53	<	0.42	<	2.53	<	0.42	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17	<	2.07	<	0.35	<	1.04	<	0.17	<	1.04	<	0.17
Carbon Tetrachloride	ug/m^3	200	0.07	63,900	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.42	<	0.07	<	0.42	<	0.07	<	0.42	<	0.07		0.42		0.07	<	0.42	<	0.07	<	0.84	<	0.14	<	0.42	<	0.07	<	0.42	<	0.07
Chlordane	ug/m^3	0.7	0.001	0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.31	<	0.05	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	ug/m^3	NE	1,000	350,000	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.61	<	0.10	<	0.31	<	0.05	<	0.31	<	0.05
Chlorodibromomethane	ug/m^3	70	NE	NE	<	33.33	<	5.56	<	33.33	<	5.56	<	33.33	<	5.56	<	33.33	<	5.56	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09	<	1.13	<	0.19	<	0.57	<	0.09	<	0.57	<	0.09
Chloroethane	ug/m^3	10,000	NE	2,600,000	<	0.99	<	0.17	<	0.99	<	0.17	<	0.99	<	0.17	<	0.99	<	0.17	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03	<	0.35	<	0.06	<	0.17	<	0.03	<	0.17	<	0.03
Chloroform	ug/m^3	NE	0.3	240,000	<	0.79	<	0.13	<	0.79	<	0.13	<	0.79	<	0.13	<	0.79	<	0.13	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.65	<	0.11	<	0.33	<	0.05	<	0.33	<	0.05
Chloromethane	ug/m^3	400	90	210,000	<	0.55	<	0.09	<	0.55	<	0.09		0.79		0.13		0.69		0.11		0.81		0.14		0.66		0.11		0.58		0.10		0.75		0.13		0.70		0.12		0.55		0.09	<	0.14	<	0.02		1.17		0.20
cis-1,2-Dichloroethene	ug/m^3	1,000	NE	NE	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.53	<	0.09	<	0.27	<	0.04	<	0.27	<	0.04
cis-1,3-Dichloropropene	ug/m^3	20	0.1	NE	<	0.44	<	0.07	<	0.44	<	0.07	<	0.44	<	0.07	<	0.44	<	0.07	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.61	<	0.10	<	0.30	<	0.05	<	0.30	<	0.05
Cyclohexane	ug/m^3	6,000	NE	1,050,000	<	2.80	<	0.47	<	2.80	<	0.47	<	2.80	<	0.47	<	2.80	<	0.47	<	0.23	<	0.04	<	0.23	<	0.04	<	0.23	<	0.04	<	0.23	<	0.04	<	0.23	<	0.04	<	0.46	<	0.08	<	0.23	<	0.04	<	0.23	<	0.04
Dichloromethane	ug/m^3	1,000	2	88,250	<	33.33	<	5.56	<	33.33	<	5.56	<	1.33	<	0.22	<	1.33	<	0.22		0.49		0.08		0.55		0.09	<	3.15	<	0.52		1.18		0.20		0.49		0.08	<	20.05	<	3.34		2.59		0.43		5.21		0.87
Ethanol	ug/m^3	NE	NE	1,900,000	<	0.20	<	0.03	<	0.20	<	0.03		8.87		1.48		4.57		0.76		6.06		1.01		4.53		0.75		36.0*		6.01		52.92		8.82		5.24		0.87		3.57		0.59	<	10.11	<	1.68		34.95		5.82
Ethylbenzene	ug/m^3	3000	NE	435,000	<	0.78	<	0.13	<	0.78	<	0.13	<	0.78	<	0.13	<	0.78	<	0.13	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05		0.52		0.09	<	0.29	<	0.05	<	0.58	<	0.10	<	0.29	<	0.05	<	0.29	<	0.05
Freon-11	ug/m^3	1,000	NE	5,600,000		1.43		0.24		2.96		0.49		2.17		0.36	<	1.65	<	0.27		0.97		0.16		1.09		0.18		0.56		0.09		1.16		0.19		1.73		0.29		0.83		0.14		0.97		0.16		2.62		0.44
Freon 113	ug/m^3	NE	NE	7,600,000	NT	NT	NT	NT	<	1.55	<	0.26	<	1.55	<	0.26	<	1.55	<	0.26	<	0.51	<	0.09	<	0.51	<	0.09		0.87		0.14		0.51		0.09	<	0.51	<	0.09	<	1.02	<	0.17	<	0.51	<	0.09	<	0.51	<	0.09
Freon 114	ug/m^3	NE	NE	1,900,000	<	1.91	<	0.32	<	1.91	<	0.32	<	1.91	<	0.32	<	1.91	<	0.32	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.93	<	0.16	<	0.47	<	0.08	<	0.47	<	0.08
Freon 12	ug/m^3	NE	NE	5,600,000		1.81		0.30		4.49		0.75		2.29		0.38		1.44		0.24		1.61		0.27		1.71		0.29		1.51		0.25		2.34		0.39		1.71		0.29		1.32		0.22		2.37		0.40		2.34		0.39
Hexachloro-1,3-Butadiene	ug/m^3	0.7	NE	240	<	2.03	<	0.34	<	2.03	<	0.34	<	2.03	<	0.34	<	2.03	<	0.34	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12	<	1.42	<	0.24	<	0.71	<	0.12	<	0.71	<	0.12
Hexane	ug/m^3	NE	700	1,800,000	<	2.94	<	0.49	<	2.94	<	0.49	<	2.93	<	0.49	<	2.93	<	0.49	<	1.17	<	0.20	<	1.17	<	0.20	<	1.17	<	0.20		1.97		0.33	<	1.17	<	0.20		3.01		0.50		1.53		0.25		1.60		0.27
Isopropylbenzene	ug/m^3	400	NE	245,000	<	1.33	<	0.22	<	1.33	<	0.22	<	1.33	<	0.22	<	1.33	<	0.22	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.65	<	0.11	<	0.33	<	0.05	<	0.33	<	0.05
Methyl N-Butyl Ketone	ug/m^3	NE	NE	NE	<	3.40	<	0.57	<	3.40	<	0.57	<	3.39	<	0.56	<	3.39	<	0.56	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05	<	0.55	<	0.09	<	0.27	<	0.05	<	0.27	<	0.05
Methyl Tert-Butyl Ether	ug/m^3	3,000	NE	NE	<	3.01	<	0.50	<	3.01	<	0.50	<	3.00	<	0.50	<	3.00	<	0.50	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04	<	0.48	<	0.08	<	0.24	<	0.04	<	0.24	<	0.04
Methylbenzene	ug/m^3	NE	300	766,000	<	1.19	<	0.20	<	1.19	<	0.20		1.89		0.32	<	1.19	<	0.20	<	0.25	<	0.04	<	0.25	<	0.04		1.33		0.22		7.43		1.24	<	0.25	<	0.04		0.50		0.08		0.70		0.12		1.01		0.17
Naphthalene	ug/m^3	3	0.03	50,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	1.75	<	0.29	<	1.75	<	0.29	<	1.75	<	0.29	<	1.75	<	0.29	<	3.49	<	0.58	<	1.75	<	0.29	<	1.75	<	0.29
Styrene (Monomer)	ug/m^3	1,000	100	433,000	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05	<	0.57	<	0.09	<	0.29	<	0.05	<	0.29	<	0.05
Tetrachloroethene	ug/m^3	NE	3	689,000	<	0.67	<	0.11	<	0.67	<	0.11	<	0.16	<	0.03	<	0.16	<	0.03	<	0.45	<	0.08	<	0.45	<	0.08		0.99		0.17		0.63		0.11	<	0.45	<	0.08	<	0.91	<	0.15	<	0.45	<	0.08	<	0.45	<	0.08
trans-1,2-Dichloroethene	ug/m^3	70	NE	660,000	<	3.31	<	0.55	<	3.31	<	0.55	<	3.30	<	0.55	<	3.30	<	0.55	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.53	<	0.09	<	0.27	<	0.04	<	0.27	<	0.04
trans-1,3-Dichloropropene	ug/m^3	20	0.2	NE	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.61	<	0.10	<	0.30	<	0.05	<	0.30	<	0.05
Tribromomethane	ug/m^3	70	0.9	5,000	<	0.54	<	0.09	<	0.54	<	0.09	<	0.54	<	0.09	<	0.54	<	0.09	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11	<	1.38	<	0.23	<	0.69	<	0.11	<	0.69	<	0.11
Trichloroethylene	ug/m^3	500	0.5	546,000	<	0.61	<	0.10	<	0.61	<	0.10	<	0.61	<	0.10	<	0.61	<	0.10	<	0.36	<	0.06	<	0.36	<	0.06	<	0.36	<	0.06	<	0.36	<	0.06	<	0.36	<	0.06	<	0.73	<	0.12		2.58		0.43		0.79		0.13
Vinyl chloride	ug/m^3	100	0.2	2,500	<	1.33	<	0.22	<	1.33	<	0.22	<	0.13	<	0.02	<	0.13	<	0.02	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03	<	0.34	<	0.06	<	0.17	<	0.03	<	0.17	<	0.03
Xylenes (Total)	ug/m^3	3,000	100	435,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.58	<	0.10	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Notes:
1. "<" indicates that the parameter is not detected. "NT" indicates that the parameter was not tested. D-1 samples were collected upwind of the active landfill face and samples D-2 through D-4 were collected downwind of the active landfill face.
2. Orange highlight indicates an exceedance of the Rhode Island Department of Environmental Management's (RIDEM's) 24-hour Acceptable Ambient Levels (AAL), taken from RIDEM Air Pollution Regulation No. 22. An orange highlight of the 24-hour AAL indicates that the typical method reporting limit exceeds the 24-hour AAL.
3. Green highlight indicates an exceedance of the RIDEM's annual AAL, taken from RIDEM Air Pollution Regulation No. 22. An orange highlight of the annual AAL indicates that the typical method reporting limit exceeds the Annual AAL.
4. Concentrations adjusted using RIDEM's time scale factor from the Air Toxics Modeling Guidelines (RIDEM June 2005).
5. OSHA PEL is the Permissible Exposure Limits as described in the Occupational Safety and Health Standards Part Number 1910 subpart Z Tables Z-1 and Z3.

TABLE 7
Volatile Organic Compound Ambient Air Monitoring Results
2008 through 2012
Five-Year Review Report
Central Landfill, Johnston, RI

	Units	Average AAL		OSHA	D-4				D-4				D-4				D-4				D-4				D-4				U-1				D-4				D-4				D-4				D-4				D-4			
					2/1/2008				3/7/2008				6/25/2008				10/6/2008				10/22/2008				1/23/2009				7/1/2009				10/28/2009				2/21/2010				6/18/2010				7/29/2010				10/22/2010			
		24-Hour	Annual	PEL	24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual		24-Hour		Annual	
1,1,1,2-Tetrachloroethane	ug/m^3	100	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.46	<	0.08
1,1,1-Trichloroethane	ug/m^3	6,000	5,000	1,900,000		0.33		0.05		0.19		0.03		0.10		0.02		0.52		0.09	<	0.53	<	0.09		0.09		0.02	<	0.93	<	0.16	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.37	<	0.06
1,1,2,2-Tetrachloroethane	ug/m^3	2,000	NE	7,000	<	0.61	<	0.10	<	0.65	<	0.11	<	0.73	<	0.12	<	0.73	<	0.12	<	0.67	<	0.11	<	0.65	<	0.11	<	1.13	<	0.19	<	1.17	<	0.19	<	1.17	<	0.19	<	1.17	<	0.19	<	1.17	<	0.19	<	0.46	<	0.08
1,1,2-Trichloroethane	ug/m^3	10	NE	45,000	<	0.49	<	0.08	<	0.51	<	0.09	<	0.59	<	0.10	<	0.56	<	0.09	<	0.53	<	0.09	<	0.52	<	0.09	<	0.93	<	0.16	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.37	<	0.06
1,1-Dichloroethane	ug/m^3	NE	0.6	400,000	<	0.36	<	0.06	<	0.38	<	0.06		0.07		0.01	<	0.42	<	0.07	<	0.39	<	0.07	<	0.39	<	0.06	<	0.67	<	0.11	<	0.55	<	0.09	<	0.55	<	0.09	<	0.55	<	0.09	<	0.55	<	0.09	<	0.27	<	0.04
1,1-Dichloroethylene	ug/m^3	200	70	400,000	<	0.35	<	0.06	<	0.37	<	0.06	<	0.43	<	0.07	<	0.41	<	0.07	<	0.39	<	0.06	<	0.38	<	0.06	<	0.67	<	0.11	<	0.81	<	0.13	<	0.81	<	0.13	<	0.81	<	0.13	<	0.81	<	0.13	<	0.27	<	0.04
1,2,4-Trichlorobenzene	ug/m^3	30	NE	NE	<	3.35	<	0.56	<	3.47	<	0.58	<	4.07	<	0.68	<	3.87	<	0.64	<	3.60	<	0.60	<	3.53	<	0.59	<	6.20	<	1.03	<	2.74	<	0.46	<	2.74	<	0.46	<	2.74	<	0.46	<	2.74	<	0.46	<	0.49	<	0.08
1,2,4-Trimethylbenzene	ug/m^3	NE	NE	NE	<	0.44	<	0.07		0.09		0.01	<	0.54	<	0.09		0.15		0.03	<	0.48	<	0.08		0.29		0.05		0.09		0.02	<	1.39	<	0.23	<	1.39	<	0.23	<	1.39	<	0.23	<	1.39	<	0.23	<	0.33	<	0.05
1,2-Dibromoethane	ug/m^3	9	0.02	156,200	<	0.67	<	0.11	<	0.73	<	0.12	<	0.87	<	0.14	<	0.80	<	0.13	<	0.73	<	0.12	<	0.73	<	0.12	<	1.27	<	0.21	<	0.95	<	0.16	<	0.95	<	0.16	<	0.95	<	0.16	<	0.95	<	0.16	<	0.51	<	0.09
1,2-Dichlorobenzene	ug/m^3	NE	300	300,000	<	0.53	<	0.09	<	0.57	<	0.09	<	0.66	<	0.11	<	0.62	<	0.10	<	0.59	<	0.10	<	0.57	<	0.10	<	1.00	<	0.17	<	1.60	<	0.27	<	1.60	<	0.27	<	1.60	<	0.27	<	1.60	<	0.27	<	0.40	<	0.07
1,2-Dichloroethane	ug/m^3	NE	0.04	205,500	<	0.36	<	0.06		0.11		0.02	<	0.44	<	0.07	<	0.42	<	0.07	<	0.39	<	0.07	<	0.39	<	0.06	<	0.67	<	0.11	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10	<	0.27	<	0.04
1,2-Dichloropropane	ug/m^3	4	0.2	350,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.59	<	0.10	<	0.58	<	0.10	<	0.58	<	0.10	<	0.31	<	0.05
1,3,5-Trimethylbenzene	ug/m^3	NE	NE	NE	<	0.44	<	0.07		0.04		0.01	<	0.54	<	0.09	<	0.51	<	0.08	<	0.48	<	0.08		0.13		0.02	<	0.80	<	0.13	<	1.05	<	0.17	<	1.05	<	0.17	<	1.05	<	0.17	<	1.05	<	0.17	<	0.33	<	0.05
1,3-Butadiene	ug/m^3	NE	0.03	2,250,000		0.19		0.03	<	0.21	<	0.03	<	0.24	<	0.04	<	0.23	<	0.04	<	0.21	<	0.04	<	0.21	<	0.04	<	0.37	<	0.06	<	0.19	<	0.03	<	0.18	<	0.03	<	0.18	<	0.03	<	0.18	<	0.03	<	0.15	<	0.02
1,3-Dichlorobenzene	ug/m^3	NE	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10	<	0.40	<	0.07
1,4-Dichlorobenzene	ug/m^3	400	0.09	450,000	<	0.53	<	0.09	<	0.57	<	0.09	<	0.66	<	0.11		0.12		0.02	<	0.59	<	0.10	<	0.57	<	0.10	<	1.00	<	0.17	<	1.62	<	0.27	<	1.62	<	0.27	<	0.53	<	0.09	<	0.14	<	0.02	<	0.40	<	0.07
1,4-Dioxane	ug/m^3	NE	0.2	360,000	<	0.32	<	0.05	<	0.34	<	0.06	<	0.39	<	0.07	<	0.37	<	0.06	<	0.35	<	0.06		0.15		0.02	<	0.60	<	0.10	<	0.67	<	0.11	<	0.67	<	0.11	<	0.67	<	0.11	<	0.67	<	0.11	<	1.20	<	0.20
2,2,4-Trimethylpentane	ug/m^3	NE	1,000	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	3.87	<	0.64	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	ug/m^3	5,000	NE	590,000		0.80		0.13	<	0.28	<	0.05		0.80		0.13		1.27		0.21	<	0.29	<	0.05	<	0.28	<	0.05		3.00		0.50	<	2.45	<	0.41	<	2.45	<	0.41	<	2.45	<	0.41	<	2.45	<	0.41		0.49		0.08
2-Chloro-1,3-Butadiene	ug/m^3	NE	1	3,600	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52	<	3.00	<	0.50	NT	NT	NT	NT	NT	NT	NT	NT	<	0.48	<	0.08	<	0.48	<	0.08	NT	NT	NT	NT
2-Phenylbutane	ug/m^3	NE	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.37	<	0.06
4-Ethyltoluene	ug/m^3	NE	NE	NE		0.1*		0.03		0.11		0.02	<	0.54	<	0.09		0.19		0.03	<	0.48	<	0.08	<	0.47	<	0.08	<	0.80	<	0.13	<	4.07	<	0.68	<	4.07	<	0.68	<	4.06	<	0.68	<	4.06	<	0.68	<	0.33	<	0.05
4-Methyl-2-Pentanone	ug/m^3	3,000	NE	410,000		0.19		0.03	<	1.93	<	0.32	<	2.27	<	0.38	<	2.13	<	0.36	<	2.00	<	0.33	<	1.93	<	0.32		0.21		0.03	<	3.73	<	0.62	<	3.73	<	0.62	<	3.74	<	0.62	<	3.74	<	0.62	<	0.27	<	0.05
Acetone	ug/m^3	3,000	NE	2,400,000		1.6*		0.61	<	1.13	<	0.19		10.6*		1.78		6.67		1.11	<	1.13	<	0.19	<	1.13	<	0.19		14.6*		2.44		5.94		0.99		12.60		2.10		4.16		0.69		7.00		1.17		3.20		0.53
Benzene	ug/m^3	20	0.1	12,500		0.73		0.12		0.53		0.09		0.39		0.05		0.35		0.06	<	0.31	<	0.05		0.93		0.16		0.24		0.04	<	0.41	<	0.07	<	0.41	<	0.07	<	0.41	<	0.07	<	0.41	<	0.07	<	0.21	<	0.04
Bromodichloromethane	ug/m^3	70	0.03	NE	<	0.68	<	0.10	<	0.63	<	0.10	<	0.73	<	0.12	<	0.67	<	0.11	<	0.65	<	0.11	<	0.64	<	0.11	<	1.13	<	0.19	<	0.20	<	0.03	<	0.20	<	0.03	<	0.20	<	0.03	<	0.20	<	0.03	<	0.45	<	0.07
Bromomethane	ug/m^3	NE	5	80,000	<	0.35	<	0.06	<	0.37	<	0.06	<	0.43	<	0.07		0.19		0.03	<	0.38	<	0.06		0.22		0.04		0.37		0.06	<	0.85	<	0.14	<	0.85	<	0.14	<	0.85	<	0.14	<	0.85	<	0.14	<	0.26	<	0.04
Carbon Disulfide	ug/m^3	NE	700	63,200		0.20		0.03	<	1.47	<	0.24		0.14		0.02		0.24		0.04	<	1.53	<	0.26		0.11		0.02	<	2.60	<	0.43	<	2.53	<	0.42	<	2.53	<	0.42	<	2.53	<	0.42	<	2.53	<	0.42	<	1.04	<	0.17
Carbon Tetrachloride	ug/m^3	200	0.07	63,900		0.51		0.08		0.32		0.05		0.33		0.06		0.39		0.06	<	0.61	<	0.10		0.35		0.06	<	1.07	<	0.18	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.42	<	0.07
Chlordane	ug/m^3	0.7	0.001	0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.31	<	0.05
Chlorobenzene	ug/m^3	NE	1,000	350,000	<	0.41	<	0.07	<	0.43	<	0.07	<	0.51	<	0.08	<	0.47	<	0.08	<	0.45	<	0.07	<	0.44	<	0.07	<	0.80	<	0.13	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11	<	0.31	<	0.05
Chlorodibromomethane	ug/m^3	70	NE	NE	<	0.73	<	0.12	<	0.80	<	0.13	<	0.93	<	0.16	<	0.87	<	0.14	<	0.80	<	0.13	<	0.80	<	0.13	<	1.40	<	0.23	<	33.33	<	5.56	<	33.33	<	5.56	<	33.33	<	5.56	<	33.33	<	5.56	<	0.57	<	0.09
Chloroethane	ug/m^3	10,000	NE	2,600,000	<	0.23	<	0.04		0.22		0.04	<	0.29	<	0.05	<	0.27	<	0.05	<	0.25	<	0.04	<	0.25	<	0.04	<	0.44	<	0.07	<	0.99	<	0.17	<	0.99	<	0.17	<	0.99	<	0.17	<	0.99	<	0.17	<	0.17	<	0.03
Chloroform	ug/m^3	NE	0.04	240,000	<	0.43	<	0.07		0.07		0.01	<	0.53	<	0.09	<	0.51	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.80	<	0.13	<	0.79	<	0.13	<	0.79	<	0.13	<	0.79	<	0.13	<	0.79	<	0.13	<	0.33	<	0.05
Chloromethane	ug/m^3	400	40	210,000		1.13		0.19		0.63		0.10		0.87		0.14		1.00		0.17		1.00		0.17		0.93		0.16		0.67		0.11		0.6*		0.11		1.28		0.21		0.66		0.11		0.58		0.10		0.78		0.13
cis-1,2-Dichloroethene	ug/m^3	1,000	NE	NE	<	0.35	<	0.06	<	0.37	<	0.06		0.13		0.02	<	0.41	<	0.07	<	0.39	<	0.06	<	0.38	<	0.06	<	0.67	<	0.11	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.27	<	0.04
cis-1,3-Dichloropropene	ug/m^3	20	0.2	NE	<	0.41	<	0.07	<	0.43	<	0.07	<	0.49	<	0.08	<	0.47	<	0.08	<	0.44	<	0.07	<	0.43	<	0.07	<	0.73	<	0.12	<	0.44	<	0.07	<	0.44	<	0.07	<	0.44	<	0.07	<	0.44	<	0.07	<	0.30	<	0.05
Cyclohexane	ug/m^3	6,000	NE	1,050,000		0.19		0.03		0.29		0.05		0.36		0.06		0.31		0.05	<	0.33	<	0.06	<	0.33	<	0.05	<	0.57	<	0.10	<	2.80	<	0.47	<	2.80	<	0.47	<	2.80	<	0.47	<	2.80	<	0.47	<	0.23	<	0.04
Dichloromethane	ug/m^3	1,000	2	88,250		1.20		0.20		1.93		0.32		1.20		0.20		2.00		0.33	<	0.67	<	0.11	<	0.66	<	0.11	<	1.13	<	0.19	<	33.33	<	5.56	<	33.33	<	5.56	<	1.33	<	0.22	<	1.33	<	0.22		0.49		0.08
Ethanol	ug/m^3	NE	NE	1,900,000		6.33		1.06		2.67		0.44		1.60		0.27		20.67		3.44	<	0.93	<	0.16		3.40		0.57		2.27		0.38	<	0.20	<	0.03	<	0.20	<	0.03		8.20		1.37		4.27		0.71		6.06		1.01
Ethylbenzene	ug/m^3	3000	NE	435,000		0.30		0.05		0.22		0.04		0.11		0.02		0.29		0.05	<	0.42	<	0.07	<	0.41	<	0.07	<	0.73	<	0.12	<	0.78	<	0.13	<	0.78	<	0.13	<	0.78	<	0.13	<	0.78	<	0.13	<	0.29	<	0.05
Freon-11	ug/m^3	1,000	NE	5,600,000		6.13		1.02		2.33		0.39		3.80		0.63		14.67		2.44		3.20		0.53		1.47		0.24		0.87		0.14		2.15		0.36		3.49		0.58		1.99		0.33	<	1.05	<	0.17		1.09		0.18
Freon 113	ug/m^3	NE	NE	7,600,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	1.55	<	0.26	<	1.55	<	0.26	<	1.55	<	0.26	<	0.51	<	0.09
Freon 114	ug/m^3	NE	NE	1,900,000		0.27		0.05	<	0.65	<	0.11	<	0.73	<	0.12	<	0.73	<	0.12	<	0.67	<	0.11	<	0.67	<	0.11	<	1.20	<	0.20	<	1.91	<	0.32	<	1.91	<	0.32	<	1.91	<	0.32	<	1.91	<	0.32	<	0.47	<	0.08
Freon 12	ug/m^3	NE	NE	5,600,000		1.90		0.63		2.20		0.37		2.47		0.41		3.20		0.53		4.53		1.09		2.27		0.38		1.13		0.19		1.90		0.32		4.80		0.81		2.29		0.38		141.33		23.56		1.45		0.24
Hexachloro-1,3-Butadiene	ug/m^3	0.5	NE	240	<	4.73	<	0.79	<	5.00	<	0.83	<	5.80	<	0.97	<	5.53	<	0.92	<	5.20	<	0.87	<	5.07	<	0.84	<	8.67	<	1.44	<	2.03	<	0.34	<	2.03	<	0.34	<	2.03	<	0.34	<	2.03	<	0.34	<	0.71	<	0.12
Hexane	ug/m^3	NE	700	1,800,000		0.41		0.07		0.45		0.08		0.45		0.07		0.67		0.11	<	0.34	<	0.06	<	0.33	<	0.06		0.25		0.04	<	2.94	<	0.49	<	2.94	<	0.49	<	2.93	<	0.49	<	2.93	<	0.49	<	1.17	<	0.20
Isopropylbenzene	ug/m^3	400	NE	245,000		0.13		0.03	<	0.46	<	0.08	<	0.54	<	0.09	<	0.51	<	0.08	<	0.48	<	0.08		0.06		0.01	<	0.80	<	0.13	<	1.33	<	0.22	<	1.33	<	0.22	<	1.35	<	0.22	<	1.33	<	0.22	<	0.33	<	0.05
Methyl N-Butyl Ketone	ug/m^3	NE	NE	NE	<	1.80	<	0.30	<	1.93	<	0.32	<	2.27	<	0.38	<	2.13	<	0.36	<	2.00	<	0.33	<	1.93	<	0.32	<	3.40	<	0.57	<	3.40	<	0.57	<	3.40	<	0.57	<	3.39	<	0.56	<	3.39	<	0.56	<	0.27	<	0.05
Methyl Tert-Butyl Ether	ug/m^3	3,000	NE	NE	<	0.32	<	0.05		0.06		0.01		0.09		0.01	<	0.37	<	0.06	<	0.35	<	0.06	<	0.35	<	0.06	<	0.60	<	0.10	<	3.01	<	0.50	<	3.01	<	0.50	<	3.00	<	0.50	<	3.00	<	0.50	<	0.24	<	0.04
Methylbenzene	ug/m^3	NE	300	766,000		2.20		0.37		1.93		0.32		1.00		0.17		3.20		0.53	<	0.37	<	0.06	<	0.36	<	0.06		0.80		0.13	<	1.19	<	0.20	<	1.19	<	0.20		2.03		0.34	<	1.19	<	0.20	<	0.23	<	0.04
Naphthalene	ug/m^3	3	0.03	50,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)	ug/m^3	1,000	100	433,000		0.11		0.02		0.09		0.01	<	0.47	<	0.08		0.09		0.01	<	0.41	<	0.07	<	0.41	<	0.07	<	0.73	<	0.12	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11	<	0.29	<	0.05
Tetrachloroethene	ug/m^3	NE	0.3	689,000		0.4*		0.08		0.27		0.05		0.27		0.04		0.39		0.06	<	0.66	<	0.11		0.17		0.03	<	1.13	<	0.19	<	0.67	<	0.11	<	0.67	<	0.11	<	0.16	<	0.03		0.23		0.04	<	0.45	<	0.08
trans-1,2-Dichloroethene	ug/m^3	70	NE	660,000	<	0.35	<	0.06	<	0.37	<	0.06	<	0.43	<	0.07	<	0.41	<	0.07	<	0.39	<	0.06	<	0.38	<	0.06	<	0.67	<	0.11	<	3.31	<	0.55	<	3.31	<	0.55	<	3.30	<	0.55	<	3.30	<	0.55	<	0.27	<	0.04
trans-1,3-Dichloropropene	ug/m^3	20	0.2	NE	<	0.41	<	0.07	<	0.43	<	0.07	<	0.49	<	0.08	<	0.47	<	0.08	<	0.44	<	0.07	<	0.43	<	0.07	<	0.73	<	0.12	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.30	<	0.05
Tribromomethane	ug/m^3	70	0.9	5,000	<	0.93	<	0.16	<	0.93	<	0.16	<	1.13	<	0.19	<	1.07	<	0.18	<	1.00	<	0.17	<	1.00	<	0.17	<	1.73	<	0.29	<	0.54	<	0.09	<	0.54	<	0.09	<	0.54	<	0.09	<	0.54	<	0.09	<	0.69	<	0.11
Trichloroethylene	ug/m^3	500	0.5	546,000		0.25		0.04		0.10		0.02		0.73		0.12		0.12		0.02	<	0.52	<	0.09	<	0.51	<	0.09	<	0.87	<	0.14	<	0.61	<	0.10	<	0.61	<	0.10	<	0.61	<	0.10	<	0.61	<	0.10	<	0.36	<	0.06
Vinyl chloride	ug/m^3	100	0.2	2,300	<	0.23	<	0.04	<	0.24	<	0.04	<	0.28	<	0.05		0.07		0.01		1.53		0.26	<	0.24	<	0.04	<	0.43	<	0.07	<	1.33	<	0.22	<	1.33	<	0.22	<	0.13	<	0.02	<	0.13	<	0.02	<	0.17	<	0.03
Xylenes (Total)	ug/m^3	3,000	100	435,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.58	<	0.10

Notes
1 "<" indicates that the parameter is not detected. "NT" indicates that the parameter was not tested. U-1 samples were collected upwind of the active landfill face and samples D-1 through D-4 were collected downwind of the active landfill face.
2 Orange highlight indicates an exceedance of the Rhode Island Department of Environmental Management's (RIDEM) 24-hour Acceptable Ambient Levels (AAL) (as set forth in RIDEM Air Pollution Regulation No. 22. An orange highlight of the 24-hour AAL indicates that the highest method reporting limit exceeds the 24-hour AAL.
3 Green highlight indicates an exceedance of the RIDEM Annual AAL taken from RIDEM Air Pollution Regulation No. 22. An orange highlight of the Annual AAL indicates that the highest method reporting limit exceeds the Annual AAL.
4 Concentrations adjusted using RIDEM's time scale factor from the Air Toxics Modeling Guidelines (RIDEM June 2005)
5 OSHA PEL is the Permissible Exposure Limits as identified in the Occupational Safety and Health Standards Part Number 1910 subpart Z Tables Z-1 and Z2

TABLE 7
Volatile Organic Compound Ambient Air Monitoring Results
2009 through 2012
Five-Year Review Report
Central Landfill, Johnston, RI

Compound	Units	Average AAL 24-hour	Average AAL Annual	OSHA PEL	D-4 1/26/2011 24-Hour		D-4 1/26/2011 Annual		D-4 4/22/2011 24-Hour		D-4 4/22/2011 Annual	
1,1,1,2-Tetrachloroethane	ug/m³	100	NE	NE	<	0.46	<	0.08	<	0.46	<	0.08
1,1,1-Trichloroethane	ug/m³	6,000	5,000	1,900,000	<	0.37	<	0.06	<	0.37	<	0.06
1,1,2,2-Tetrachloroethane	ug/m³	2,000	NE	7,000	<	0.46	<	0.08	<	0.46	<	0.08
1,1,2-Trichloroethane	ug/m³	10	NE	45,000	<	0.37	<	0.06	<	0.37	<	0.06
1,1-Dichloroethane	ug/m³	NE	0.6	400,000	<	0.27	<	0.04	<	0.27	<	0.04
1,1-Dichloroethylene	ug/m³	200	70	400,000	<	0.27	<	0.04	<	0.27	<	0.04
1,2,4-Trichlorobenzene	ug/m³	30	NE	NE	<	0.49	<	0.08	<	0.49	<	0.08
1,2,4-Trimethylbenzene	ug/m³	NE	NE	NE	<	0.33	<	0.05	<	0.33	<	0.05
1,2-Dibromoethane	ug/m³	9	0.02	156,200	<	0.51	<	0.09	<	0.51	<	0.09
1,2-Dichlorobenzene	ug/m³	NE	300	300,000	<	0.40	<	0.07	<	0.40	<	0.07
1,2-Dichloroethane	ug/m³	NE	0.04	205,500	<	0.27	<	0.04	<	0.27	<	0.04
1,2-Dichloropropane	ug/m³	4	0.2	350,000	<	0.31	<	0.05	<	0.31	<	0.05
1,3,5-Trimethylbenzene	ug/m³	NE	NE	NE	<	0.33	<	0.05	<	0.33	<	0.05
1,3-Butadiene	ug/m³	NE	0.03	2,250,000	<	0.15	<	0.02	<	0.15	<	0.02
1,3-Dichlorobenzene	ug/m³	NE	NE	NE	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dichlorobenzene	ug/m³	800	0.09	450,000	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dioxane	ug/m³	NE	0.3	360,000	<	1.20	<	0.20	<	1.20	<	0.20
2,2,4-Trimethylpentane	ug/m³	NE	3,000	NE	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	ug/m³	5,000	NE	590,000		1.39		0.23		0.87		0.14
2-Chloro-1,3-Butadiene	ug/m³	NE	1	3,600	NT	NT	NT	NT	NT	NT	NT	NT
2-Phenylbutane	ug/m³	NE	NE	NE	<	0.37	<	0.06	<	0.37	<	0.06
4-Ethyltoluene	ug/m³	NE	NE	NE	<	0.33	<	0.05	<	0.33	<	0.05
4-Methyl-2-Pentanone	ug/m³	3,000	NE	410,000	<	0.27	<	0.05	<	0.27	<	0.05
Acetone	ug/m³	3,000	NE	2,400,000		4.59		1.10		7.16		1.19
Benzene	ug/m³	30	0.2	32,500		1.11		0.18		0.23		0.04
Bromodichloromethane	ug/m³	70	0.03	NE	<	0.45	<	0.07	<	0.45	<	0.07
Bromomethane	ug/m³	NE	5	80,000	<	0.26	<	0.04	<	0.26	<	0.04
Carbon Disulfide	ug/m³	NE	700	62,200	<	1.04	<	0.17	<	1.04	<	0.17
Carbon Tetrachloride	ug/m³	200	0.07	62,900	<	0.42	<	0.07	<	0.42	<	0.07
Chlordane	ug/m³	0.7	0.001	0.5	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	ug/m³	NE	1,000	350,000	<	0.31	<	0.05	<	0.31	<	0.05
Chlorodibromomethane	ug/m³	70	NE	NE	<	0.57	<	0.09	<	0.57	<	0.09
Chloroethane	ug/m³	10,000	NE	2,600,000	<	0.17	<	0.03	<	0.17	<	0.03
Chloroform	ug/m³	NE	0.2	240,000	<	0.33	<	0.05	<	0.33	<	0.05
Chloromethane	ug/m³	400	90	210,000		0.70		0.12		0.66		0.11
cis-1,2-Dichloroethene	ug/m³	3,000	NE	NE	<	0.27	<	0.04	<	0.27	<	0.04
cis-1,3-Dichloropropene	ug/m³	20	0.2	NE	<	0.30	<	0.05	<	0.30	<	0.05
Cyclohexane	ug/m³	6,000	NE	1,050,000	<	0.23	<	0.04	<	0.23	<	0.04
Dichloromethane	ug/m³	1,000	3	88,250		2.2*		0.38	<	2.64	<	0.44
Ethanol	ug/m³	NE	NE	1,900,000		4.36		0.73		43.10		7.10
Ethylbenzene	ug/m³	3000	NE	435,000	<	0.29	<	0.05	<	0.29	<	0.05
Freon-11	ug/m³	1,000	NE	5,600,000		1.09		0.18		1.23		0.21
Freon 113	ug/m³	NE	NE	7,600,000	<	0.51	<	0.09		0.92		0.15
Freon 114	ug/m³	NE	NE	1,900,000	<	0.47	<	0.08	<	0.47	<	0.08
Freon 12	ug/m³	NE	NE	5,600,000		1.65		0.27		1.88		0.31
Hexachloro-1,3-Butadiene	ug/m³	0.7	NE	240	<	0.71	<	0.12	<	0.71	<	0.12
Hexane	ug/m³	NE	700	1,800,000	<	1.17	<	0.20		1.55		0.26
Isopropylbenzene	ug/m³	400	NE	245,000	<	0.33	<	0.05	<	0.33	<	0.05
Methyl N-Butyl Ketone	ug/m³	NE	NE	NE	<	0.27	<	0.05	<	0.27	<	0.05
Methyl Tert-Butyl Ether	ug/m³	3,000	NE	NE	<	0.24	<	0.04	<	0.24	<	0.04
Methylbenzene	ug/m³	NE	300	766,000		1.08		0.18		1.41		0.23
Naphthalene	ug/m³	3	0.03	50,000	<	1.75	<	0.29	<	1.75	<	0.29
Styrene (Monomer)	ug/m³	1,000	100	435,000	<	0.29	<	0.05	<	0.29	<	0.05
Tetrachloroethene	ug/m³	NE	0.8	689,000	<	0.45	<	0.08		0.91		0.15
trans-1,2-Dichloroethene	ug/m³	70	NE	660,000	<	0.27	<	0.04	<	0.27	<	0.04
trans-1,3-Dichloropropene	ug/m³	20	0.2	NE	<	0.30	<	0.05	<	0.30	<	0.05
Tribromomethane	ug/m³	70	0.5	5,000	<	0.69	<	0.11	<	0.69	<	0.11
Trichloroethylene	ug/m³	500	0.5	546,000	<	0.36	<	0.06	<	0.36	<	0.06
Vinyl chloride	ug/m³	100	0.2	2,500	<	0.17	<	0.03	<	0.17	<	0.03
Xylenes (Total)	ug/m³	3,000	100	435,000	NT	NT	NT	NT	NT	NT	NT	NT

Compound	D-4 7/20/2011 24-Hour		D-4 7/20/2011 Annual		D-4 10/18/2011 24-Hour		D-4 10/18/2011 Annual		D-4 1/19/2012 24-Hour		D-4 1/19/2012 Annual	
1,1,1,2-Tetrachloroethane	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08
1,1,1-Trichloroethane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1,2,2-Tetrachloroethane	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08
1,1,2-Trichloroethane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1-Dichloroethane	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,1-Dichloroethylene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2,4-Trichlorobenzene	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08
1,2,4-Trimethylbenzene		0.39		0.07		0.33		0.05		0.33		0.05
1,2-Dibromoethane	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09
1,2-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,2-Dichloroethane	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2-Dichloropropane	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05
1,3,5-Trimethylbenzene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
1,3-Butadiene	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02
1,3-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dioxane	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20
2,2,4-Trimethylpentane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone		2.77		0.46		0.53		0.09		0.37		0.06
2-Chloro-1,3-Butadiene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Phenylbutane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
4-Ethyltoluene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
4-Methyl-2-Pentanone	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05
Acetone		14.5*		2.43		5.10		0.85	<	2.98	<	0.50
Benzene		0.41		0.07		0.31		0.04		0.32		0.05
Bromodichloromethane	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07
Bromomethane	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04
Carbon Disulfide	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17
Carbon Tetrachloride		0.42		0.07	<	0.42	<	0.07	<	0.42	<	0.07
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05
Chlorodibromomethane	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09
Chloroethane	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03
Chloroform	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
Chloromethane		0.73		0.12		0.67		0.11		0.73		0.12
cis-1,2-Dichloroethene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
cis-1,3-Dichloropropene	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05
Cyclohexane		0.23		0.04	<	0.23	<	0.04	<	0.23	<	0.04
Dichloromethane		0.39		0.07		1.16		0.20	<	0.42	<	0.07
Ethanol		10.04		1.67		8.81		1.47		1.65		0.27
Ethylbenzene		0.41		0.07	<	0.29	<	0.05	<	0.29	<	0.05
Freon-11		2.59		0.43		1.61		0.27		1.01		0.17
Freon 113	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09
Freon 114	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08
Freon 12		2.21		0.37		1.61		0.27		1.71		0.29
Hexachloro-1,3-Butadiene	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12
Hexane		6.41		1.07	<	1.17	<	0.20	<	1.17	<	0.20
Isopropylbenzene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
Methyl N-Butyl Ketone		0.38		0.06	<	0.27	<	0.05	<	0.27	<	0.05
Methyl Tert-Butyl Ether	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04
Methylbenzene		2.43		0.41		0.69		0.11		0.33		0.05
Naphthalene	<	1.75	<	0.29	<	1.75	<	0.29	<	1.75	<	0.29
Styrene (Monomer)		0.31		0.05	<	0.29	<	0.05	<	0.29	<	0.05
Tetrachloroethene	<	0.45	<	0.08	<	0.45	<	0.08	<	0.45	<	0.08
trans-1,2-Dichloroethene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
trans-1,3-Dichloropropene	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05
Tribromomethane	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11
Trichloroethylene	<	0.36	<	0.06	<	0.36	<	0.06	<	0.36	<	0.06
Vinyl chloride	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Compound	D-4 4/18/2012 24-Hour		D-4 4/18/2012 Annual		D-4 5/14/2012 24-Hour		D-4 5/14/2012 Annual		U-1 2/1/2009 24-Hour		U-1 2/1/2009 Annual	
1,1,1,2-Tetrachloroethane	<	0.46	<	0.08	<	0.46	<	0.08	NT	NT	NT	NT
1,1,1-Trichloroethane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.49	<	0.08
1,1,2,2-Tetrachloroethane	<	0.46	<	0.08	<	0.46	<	0.08	<	0.62	<	0.10
1,1,2-Trichloroethane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.49	<	0.08
1,1-Dichloroethane	<	0.27	<	0.04	<	0.27	<	0.04	<	0.37	<	0.06
1,1-Dichloroethylene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.34	<	0.06
1,2,4-Trichlorobenzene	<	0.49	<	0.08	<	0.49	<	0.08	<	3.33	<	0.56
1,2,4-Trimethylbenzene	<	0.33	<	0.05	<	0.37	<	0.05	<	0.45	<	0.07
1,2-Dibromoethane	<	0.51	<	0.09	<	0.51	<	0.09	<	0.67	<	0.11
1,2-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.55	<	0.09
1,2-Dichloroethane	<	0.27	<	0.04	<	0.27	<	0.04	<	0.37	<	0.06
1,2-Dichloropropane	<	0.31	<	0.05	<	0.31	<	0.05	NT	NT	NT	NT
1,3,5-Trimethylbenzene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.45	<	0.07
1,3-Butadiene	<	0.15	<	0.02	<	0.15	<	0.02	<	0.20	<	0.03
1,3-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	NT	NT	NT	NT
1,4-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.55	<	0.09
1,4-Dioxane	<	1.20	<	0.20	<	1.20	<	0.20	<	0.33	<	0.05
2,2,4-Trimethylpentane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	<	0.19	<	0.03		3.25		0.54		0.93		0.16
2-Chloro-1,3-Butadiene	NT	NT	NT	NT	NT	NT	NT	NT	<	3.13	<	0.52
2-Phenylbutane	<	0.37	<	0.06	<	0.37	<	0.06	NT	NT	NT	NT
4-Ethyltoluene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.45	<	0.07
4-Methyl-2-Pentanone	<	0.27	<	0.05	<	0.27	<	0.05	<	1.87	<	0.31
Acetone		5.59		0.93		21.55		3.59		5.40		0.90
Benzene	<	0.21	<	0.04		0.25		0.04		0.51		0.08
Bromodichloromethane	<	0.45	<	0.07	<	0.45	<	0.07	<	0.61	<	0.10
Bromomethane	<	0.26	<	0.04	<	0.26	<	0.04		0.20		0.03
Carbon Disulfide	<	1.04	<	0.17	<	1.04	<	0.17		0.13		0.02
Carbon Tetrachloride	<	0.42	<	0.07		0.50		0.08		0.43		0.07
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.31	<	0.05	<	0.31	<	0.05	<	0.42	<	0.07
Chlorodibromomethane	<	0.57	<	0.09	<	0.57	<	0.09	<	0.80	<	0.13
Chloroethane	<	0.17	<	0.03	<	0.17	<	0.03	<	0.24	<	0.04
Chloroform	<	0.33	<	0.05	<	0.33	<	0.05	<	0.44	<	0.07
Chloromethane	<	0.14	<	0.02		1.01		0.17		0.8*		0.14
cis-1,2-Dichloroethene	<	0.27	<	0.04		0.47		0.08	<	0.36	<	0.06
cis-1,3-Dichloropropene	<	0.30	<	0.05	<	0.30	<	0.05	<	0.41	<	0.07
Cyclohexane	<	0.23	<	0.04	<	0.23	<	0.04	<	0.31	<	0.05
Dichloromethane		3.96		0.66		5.97		1.00	<	0.63	<	0.10
Ethanol	<	8.90	<	1.48		14.33		2.39		2.40		0.40
Ethylbenzene	<	0.29	<	0.05	<	0.29	<	0.05	<	0.39	<	0.07
Freon-11		0.90		0.15		3.03		0.51		1.00		0.17
Freon 113	<	0.51	<	0.09	<	0.51	<	0.09	NT	NT	NT	NT
Freon 114	<	0.47	<	0.08	<	0.47	<	0.08	<	0.63	<	0.11
Freon 12		2.34		0.39		2.70		0.45		2.00		0.33
Hexachloro-1,3-Butadiene	<	0.71	<	0.12	<	0.71	<	0.12	<	4.80	<	0.80
Hexane	<	1.17	<	0.20		4.03		0.67		0.12		0.02
Isopropylbenzene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.45	<	0.07
Methyl N-Butyl Ketone	<	0.27	<	0.05	<	0.27	<	0.05	<	1.87	<	0.31
Methyl Tert-Butyl Ether	<	0.24	<	0.04	<	0.24	<	0.04	<	0.33	<	0.05
Methylbenzene		0.45		0.08		1.03		0.17		0.6*		0.11
Naphthalene	<	1.75	<	0.29	<	1.75	<	0.29	NT	NT	NT	NT
Styrene (Monomer)	<	0.29	<	0.05	<	0.29	<	0.05	<	0.39	<	0.06
Tetrachloroethene		4.75		0.79		1.76		0.29	<	0.61	<	0.10
trans-1,2-Dichloroethene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.36	<	0.06
trans-1,3-Dichloropropene	<	0.30	<	0.05	<	0.30	<	0.05	<	0.41	<	0.07
Tribromomethane	<	0.69	<	0.11	<	0.69	<	0.11	<	0.93	<	0.16
Trichloroethylene	<	0.36	<	0.06		6.02		1.00	<	0.49	<	0.08
Vinyl chloride	<	0.17	<	0.03	<	0.17	<	0.03	<	0.23	<	0.04
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Compound	U-1 3/7/2009 24-Hour		U-1 3/7/2009 Annual		U-1 6/26/2009 24-Hour		U-1 6/26/2009 Annual		U-1 7/22/2009 24-Hour		U-1 7/22/2009 Annual		U-1 10/24/2009 24-Hour		U-1 10/24/2009 Annual	
1,1,1,2-Tetrachloroethane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane		0.06		0.01	<	0.62	<	0.10	<	0.67	<	0.11	<	0.52	<	0.09
1,1,2,2-Tetrachloroethane	<	0.61	<	0.10	<	0.80	<	0.13	<	0.80	<	0.13	<	0.66	<	0.11
1,1,2-Trichloroethane	<	0.49	<	0.08	<	0.67	<	0.10	<	0.67	<	0.11	<	0.52	<	0.09
1,1-Dichloroethane	<	0.36	<	0.06	<	0.46	<	0.08	<	0.49	<	0.08	<	0.39	<	0.06
1,1-Dichloroethylene	<	0.35	<	0.06	<	0.45	<	0.08	<	0.48	<	0.08	<	0.38	<	0.06
1,2,4-Trichlorobenzene	<	3.33	<	0.56	<	4.20	<	0.70	<	4.53	<	0.76	<	3.53	<	0.59
1,2,4-Trimethylbenzene		0.08		0.01		0.08		0.01		0.07		0.01	<	0.47	<	0.08
1,2-Dibromoethane	<	0.67	<	0.11	<	0.87	<	0.14	<	0.93	<	0.16	<	0.73	<	0.12
1,2-Dichlorobenzene	<	0.53	<	0.09	<	0.67	<	0.11	<	0.73	<	0.12	<	0.57	<	0.10
1,2-Dichloroethane	<	0.36	<	0.06	<	0.46	<	0.08	<	0.49	<	0.08	<	0.39	<	0.06
1,2-Dichloropropane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,3,5-Trimethylbenzene		0.04		0.01	<	0.56	<	0.09	<	0.60	<	0.10	<	0.47	<	0.08
1,3-Butadiene	<	0.20	<	0.03	<	0.25	<	0.04	<	0.27	<	0.04	<	0.21	<	0.04
1,3-Dichlorobenzene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,4-Dichlorobenzene	<	0.53	<	0.09	<	0.67	<	0.11		0.21		0.04	<	0.57	<	0.10
1,4-Dioxane	<	0.32	<	0.05	<	0.41	<	0.07	<	0.44	<	0.07	<	0.35	<	0.06
2,2,4-Trimethylpentane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone		1.73		0.29		0.41		0.07		2.13		0.36	<	0.28	<	0.05
2-Chloro-1,3-Butadiene	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52	<	3.13	<	0.52
2-Phenylbutane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4-Ethyltoluene		0.11		0.02		0.06		0.01		0.06		0.01	<	0.47	<	0.08
4-Methyl-2-Pentanone	<	1.80	<	0.30	<	2.33	<	0.39	<	2.47	<	0.41		0.28		0.05
Acetone		26.67		4.44		4.33		1.06		13.33		2.22	<	1.11	<	0.19
Benzene		0.64		0.11	<	0.37	<	0.06		0.27		0.05	<	0.31	<	0.05
Bromodichloromethane	<	0.60	<	0.10	<	0.73	<	0.12	<	0.80	<	0.13	<	0.64	<	0.11
Bromomethane	<	0.35	<	0.06	<	0.44	<	0.07		0.21		0.03	<	0.37	<	0.06
Carbon Disulfide	<	1.40	<	0.23		0.09		0.02		0.93		0.16	<	1.47	<	0.24
Carbon Tetrachloride		0.27		0.05		0.26		0.04		0.26		0.04		0.73		0.12
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene		0.07		0.01	<	0.53	<	0.09	<	0.56	<	0.09	<	0.44	<	0.07
Chlorodibromomethane	<	0.73	<	0.12	<	0.93	<	0.16	<	1.07	<	0.18	<	0.80	<	0.13
Chloroethane	<	0.22	<	0.04	<	0.30	<	0.05	<	0.32	<	0.05	<	0.25	<	0.04
Chloroform		0.07		0.01	<	0.55	<	0.09	<	0.59	<	0.10	<	0.47	<	0.08
Chloromethane		0.49		0.08		0.93		0.16		0.80		0.13		0.73		0.12
cis-1,2-Dichloroethene	<	0.35	<	0.06	<	0.45	<	0.08	<	0.48	<	0.08	<	0.38	<	0.06
cis-1,3-Dichloropropene	<	0.41	<	0.07	<	0.52	<	0.09	<	0.55	<	0.09	<	0.43	<	0.07
Cyclohexane		0.07		0.01	<	0.39	<	0.07	<	0.42	<	0.07	<	0.33	<	0.06
Dichloromethane		2.27		0.38		4.40		0.73		4.44		0.74	<	0.67	<	0.11
Ethanol	<	0.87	<	0.14	<	1.07	<	0.18		3.33		0.56	<	0.93	<	0.16
Ethylbenzene		0.16		0.03	<	0.49	<	0.08		0.12		0.02	<	0.41	<	0.07
Freon-11		2.53		0.42		0.93		0.16		1.33		0.22		1.27		0.21
Freon 113	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Freon 114	<	0.63	<	0.10	<	0.80	<	0.13	<	0.87	<	0.14	<	0.67	<	0.11
Freon 12		1.53		0.26		1.87		0.31		1.67		0.28	<	0.47	<	0.08
Hexachloro-1,3-Butadiene	<	4.73	<	0.79	<	6.07	<	1.01	<	6.53	<	1.09	<	5.13	<	0.86
Hexane		0.28		0.05		0.20		0.03	<	0.43	<	0.07	<	0.34	<	0.06
Isopropylbenzene	<	0.44	<	0.07	<	0.56	<	0.09	<	0.60	<	0.10	<	0.47	<	0.08
Methyl N-Butyl Ketone		0.23		0.04	<	2.33	<	0.39		0.13		0.02		0.47		0.08
Methyl Tert-Butyl Ether	<	0.32	<	0.05	<	0.41	<	0.07	<	0.44	<	0.07	<	0.35	<	0.06
Methylbenzene		1.13		0.19		0.33		0.05		0.39		0.07	<	0.36	<	0.06
Naphthalene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)		0.07		0.01	<	0.49	<	0.08	<	0.53	<	0.09	<	0.41	<	0.07
Tetrachloroethene	<	0.61	<	0.10	<	0.80	<	0.13	<	0.80	<	0.13	<	0.63	<	0.11
trans-1,2-Dichloroethene	<	0.35	<	0.06	<	0.45	<	0.08	<	0.48	<	0.08	<	0.38	<	0.06
trans-1,3-Dichloropropene	<	0.41	<	0.07	<	0.52	<	0.09	<	0.55	<	0.09	<	0.43	<	0.07
Tribromomethane	<	0.93	<	0.16	<	1.20	<	0.20	<	1.27	<	0.21	<	1.00	<	0.17
Trichloroethylene		0.05		0.01	<	0.61	<	0.10		0.09		0.01	<	0.51	<	0.09
Vinyl chloride	<	0.23	<	0.04	<	0.29	<	0.05	<	0.31	<	0.05	<	0.23	<	0.04
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Notes
1. "<" indicates that the parameter is not detected. "NT" indicates that the parameter was not tested. U-1 samples were collected upwind of the active landfill face and samples D-1 through D-4 were collected downwind of the active landfill face.
2. Orange highlight indicates an exceedance of the Rhode Island Department of Environmental Management's (RIDEM) 24-hour Acceptable Ambient Levels (AAL) set in from RIDEM Air Pollution Regulation No. 22. An orange highlight of the 24-hour AAL indicates that the typical method reporting limit exceeds the 24-hour AAL.
3. Green highlight indicates an exceedance of the RIDEM's Annual AAL taken from RIDEM Air Pollution Regulation No. 22. An orange highlight of the Annual AAL indicates that the typical method reporting limit exceeds the Annual AAL.
4. Concentrations adjusted using RIDEM's time scale factor from the Air Toxics Modeling Guidelines (RIDEM June 2005)
5. OSHA PEL is the Permissible Exposure Limits as described in the Occupational Safety and Health Standards Part Number 1910 subpart Z Tables Z-1 and Z2.

TABLE 7
Volatile Organic Compound Ambient Air Monitoring Results
2008 through 2012
Five-Year Review Report
Central Landfill, Johnston, RI

Compound	Units	24-hour AAL	Annual AAL	OSHA PEL	U-1 10/2/2008 24-Hour		Annual		U-1 4/15/2009 24-Hour		Annual		U-1 7/21/2009 24-Hour		Annual		U-1 10/28/2009 24-Hour		Annual	
1,1,1,2-Tetrachloroethane	ug/m^{3}	100	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,1,1-Trichloroethane	ug/m^{3}	6,000	5,000	1,900,000	<	0.54	<	0.09	<	0.59	<	0.10		0.53		0.09	<	0.73	<	0.12
1,1,2,2-Tetrachloroethane	ug/m^{3}	2,000	NE	7,000	<	0.67	<	0.11	<	0.73	<	0.12	<	1.07	<	0.18	<	1.17	<	0.19
1,1,2-Trichloroethane	ug/m^{3}	10	NE	45,000	<	0.54	<	0.09	<	0.59	<	0.10	<	0.87	<	0.14	<	0.73	<	0.12
1,1-Dichloroethane	ug/m^{3}	NE	0.6	400,000	<	0.40	<	0.07	<	0.43	<	0.07	<	0.64	<	0.11	<	0.55	<	0.09
1,1-Dichloroethylene	ug/m^{3}	200	70	400,000	<	0.39	<	0.07	<	0.43	<	0.07		0.34		0.06	<	0.81	<	0.13
1,2,4-Trichlorobenzene	ug/m^{3}	30	NE	NE	<	3.67	<	0.61	<	4.00	<	0.67	<	5.87	<	0.98	<	2.74	<	0.46
1,2,4-Trimethylbenzene	ug/m^{3}	NE	NE	NE		0.11		0.02	<	0.55	<	0.09		0.19		0.03	<	1.39	<	0.23
1,2-Dibromoethane	ug/m^{3}	9	0.02	156,200	<	0.73	<	0.12	<	0.80	<	0.13	<	1.20	<	0.20	<	0.95	<	0.16
1,2-Dichlorobenzene	ug/m^{3}	NE	300	300,000	<	0.60	<	0.10	<	0.65	<	0.11	<	0.93	<	0.16	<	1.60	<	0.27
1,2-Dichloroethane	ug/m^{3}	NE	0.04	205,500	<	0.40	<	0.07	<	0.43	<	0.07	<	0.64	<	0.11	<	0.60	<	0.10
1,2-Dichloropropane	ug/m^{3}	4	0.2	350,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,3,5-Trimethylbenzene	ug/m^{3}	NE	NE	NE	<	0.49	<	0.08	<	0.53	<	0.09	<	0.89	<	0.15	<	1.05	<	0.17
1,3-Butadiene	ug/m^{3}	NE	0.03	2,250,000	<	0.22	<	0.04	<	0.24	<	0.04	<	0.15	<	0.06	<	0.19	<	0.03
1,3-Dichlorobenzene	ug/m^{3}	NE	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,4-Dichlorobenzene	ug/m^{3}	800	0.09	450,000	<	0.60	<	0.10	<	0.65	<	0.11	<	0.93	<	0.16	<	1.62	<	0.27
1,4-Dioxane	ug/m^{3}	NE	0.2	360,000	<	0.36	<	0.06	<	0.39	<	0.06		0.20		0.03	<	0.67	<	0.11
2,2,4-Trimethylpentane	ug/m^{3}	NE	1,000	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	ug/m^{3}	5,000	NE	590,000		0.80		0.13		0.87		0.14		1.27		0.21	<	2.45	<	0.41
2-Chloro-1,3-Butadiene	ug/m^{3}	NE	1	3,600	<	3.13	<	0.52	<	3.13	<	0.52	<	2.87	<	0.48	NT	NT	NT	NT
2-Phenylbutane	ug/m^{3}	NE	NE	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4-Ethyltoluene	ug/m^{3}	NE	NE	NE		0.12		0.02	<	0.53	<	0.09		0.13		0.02	<	4.07	<	0.68
4-Methyl-2-Pentanone	ug/m^{3}	3,000	NE	410,000	<	2.00	<	0.33	<	2.20	<	0.37	<	0.65	<	0.11	<	3.73	<	0.62
Acetone	ug/m^{3}	3,000	NE	2,400,000		4.53		0.76		3.67		0.61		6.67		1.11		7.07		1.18
Benzene	ug/m^{3}	20	0.1	32,500		1.20		0.20		0.27		0.04		0.24		0.04	<	0.41	<	0.07
Bromodichloromethane	ug/m^{3}	70	0.02	NE	<	0.67	<	0.11	<	0.73	<	0.12	<	1.07	<	0.18	<	0.20	<	0.03
Bromomethane	ug/m^{3}	NE	5	80,000		0.19		0.03	<	0.41	<	0.07		0.47		0.08	<	0.85	<	0.14
Carbon Disulfide	ug/m^{3}	NE	700	63,200		0.47		0.08	<	1.67	<	0.28	<	2.47	<	0.41	<	2.53	<	0.42
Carbon Tetrachloride	ug/m^{3}	300	0.07	63,900		0.35		0.06		0.25		0.04		0.35		0.06	<	0.47	<	0.08
Chlordane	ug/m^{3}	0.7	0.001	0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	ug/m^{3}	NE	1,000	350,000	<	0.45	<	0.08	<	0.49	<	0.08	<	0.73	<	0.12	<	0.68	<	0.11
Chlorodibromomethane	ug/m^{3}	70	NE	NE	<	0.87	<	0.14	<	0.93	<	0.16	<	1.33	<	0.22	<	33.33	<	5.56
Chloroethane	ug/m^{3}	10,000	NE	2,600,000	<	0.26	<	0.04	<	0.28	<	0.05	<	0.41	<	0.07	<	0.99	<	0.17
Chloroform	ug/m^{3}	NE	0.5	240,000	<	0.49	<	0.08		0.06		0.01	<	0.80	<	0.13	<	0.79	<	0.13
Chloromethane	ug/m^{3}	400	90	210,000		0.90		0.13		0.57		0.10		2.13		0.36	<	0.55	<	0.09
cis-1,2-Dichloroethene	ug/m^{3}	1,000	NE	NE	<	0.39	<	0.07	<	0.43	<	0.07	<	0.63	<	0.10	<	0.53	<	0.09
cis-1,3-Dichloropropene	ug/m^{3}	20	0.2	NE	<	0.45	<	0.08	<	0.49	<	0.08	<	0.73	<	0.12	<	0.44	<	0.07
Cyclohexane	ug/m^{3}	6,000	NE	1,050,000		0.13		0.02		0.04		0.01	<	0.54	<	0.09	<	2.80	<	0.47
Dichloromethane	ug/m^{3}	1,000	2	88,250		0.62		0.10	<	0.73	<	0.12		0.44		0.07	<	33.33	<	5.56
Ethanol	ug/m^{3}	NE	NE	1,900,000		1.87		0.31		14.67		2.44	<	1.47	<	0.24	<	0.20	<	0.03
Ethylbenzene	ug/m^{3}	3000	NE	435,000		0.17		0.03	<	0.47	<	0.08		0.19		0.03	<	0.78	<	0.13
Freon-11	ug/m^{3}	1,000	NE	5,600,000		1.27		0.21		0.80		0.13		0.73		0.12	<	1.05	<	0.17
Freon 113	ug/m^{3}	NE	NE	7,600,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Freon 114	ug/m^{3}	NE	NE	1,900,000	<	0.67	<	0.11	<	0.73	<	0.12	<	1.07	<	0.18	<	1.91	<	0.32
Freon 12	ug/m^{3}	NE	NE	5,600,000		2.00		0.33		1.73		0.29		1.20		0.20	<	0.67	<	0.11
Hexachloro-1,3-Butadiene	ug/m^{3}	0.7	NE	240	<	5.27	<	0.88	<	5.73	<	0.96	<	8.00	<	1.33	<	2.03	<	0.34
Hexane	ug/m^{3}	NE	700	1,800,000		0.26		0.04		0.21		0.03		0.28		0.05	<	2.94	<	0.49
Isopropylbenzene	ug/m^{3}	400	NE	245,000	<	0.49	<	0.08	<	0.53	<	0.09	<	0.89	<	0.15	<	1.33	<	0.22
Methyl N-Butyl Ketone	ug/m^{3}	NE	NE	NE	<	2.00	<	0.33	<	2.20	<	0.37	<	3.20	<	0.53	<	3.40	<	0.57
Methyl Tert-Butyl Ether	ug/m^{3}	3,000	NE	NE	<	0.36	<	0.06	<	0.39	<	0.06	<	0.57	<	0.09	<	3.01	<	0.50
Methylbenzene	ug/m^{3}	NE	300	766,000		1.67		0.28		0.45		0.08		0.93		0.16	<	1.19	<	0.20
Naphthalene	ug/m^{3}	3	0.03	50,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)	ug/m^{3}	1,000	100	433,000	<	0.42	<	0.07	<	0.45	<	0.08	<	0.67	<	0.11	<	0.68	<	0.11
Tetrachloroethene	ug/m^{3}	NE	0.3	689,000	<	0.67	<	0.11	<	0.73	<	0.12		0.24		0.04	<	0.67	<	0.11
trans-1,2-Dichloroethene	ug/m^{3}	70	NE	660,000	<	0.39	<	0.07	<	0.43	<	0.07	<	0.63	<	0.10	<	3.31	<	0.55
trans-1,3-Dichloropropene	ug/m^{3}	20	0.2	NE	<	0.45	<	0.08	<	0.49	<	0.08	<	0.73	<	0.12	<	0.53	<	0.09
Tribromomethane	ug/m^{3}	70	0.5	5,000	<	1.00	<	0.17	<	1.13	<	0.19	<	1.60	<	0.27	<	0.54	<	0.09
Trichloroethylene	ug/m^{3}	500	0.5	546,000	<	0.53	<	0.09	<	0.57	<	0.10		1.33		0.22	<	0.61	<	0.10
Vinyl chloride	ug/m^{3}	100	0.2	2,500	<	0.25	<	0.04	<	0.27	<	0.05	<	0.40	<	0.07	<	1.33	<	0.22
Xylenes (Total)	ug/m^{3}	3,000	100	435,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Compound	U-1 1/21/2010 24-Hour		Annual		U-1 4/27/2010 24-Hour		Annual		U-1 10/6/2010 24-Hour		Annual		U-1 10/28/2010 24-Hour		Annual	
1,1,1,2-Tetrachloroethane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.46	<	0.08
1,1,1-Trichloroethane	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.37	<	0.06
1,1,2,2-Tetrachloroethane	<	1.17	<	0.19	<	1.17	<	0.19	<	1.17	<	0.19	<	0.46	<	0.08
1,1,2-Trichloroethane	<	0.73	<	0.12	<	0.73	<	0.12	<	0.73	<	0.12	<	0.37	<	0.06
1,1-Dichloroethane	<	0.55	<	0.09	<	0.55	<	0.09	<	0.55	<	0.09	<	0.27	<	0.04
1,1-Dichloroethylene	<	0.81	<	0.13	<	0.81	<	0.13	<	0.81	<	0.13	<	0.27	<	0.04
1,2,4-Trichlorobenzene	<	2.74	<	0.46	<	2.74	<	0.46	<	2.74	<	0.46	<	0.49	<	0.08
1,2,4-Trimethylbenzene		70.00		11.67	<	1.39	<	0.23	<	1.39	<	0.23	<	0.33	<	0.05
1,2-Dibromoethane	<	0.95	<	0.16	<	0.95	<	0.16	<	0.95	<	0.16	<	0.51	<	0.09
1,2-Dichlorobenzene	<	1.60	<	0.27	<	1.60	<	0.27	<	1.60	<	0.27	<	0.40	<	0.07
1,2-Dichloroethane	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10	<	0.27	<	0.04
1,2-Dichloropropane	<	0.59	<	0.10	<	0.58	<	0.10	<	0.58	<	0.10	<	0.31	<	0.05
1,3,5-Trimethylbenzene		26.87		4.48	<	1.05	<	0.17	<	1.05	<	0.17	<	0.33	<	0.05
1,3-Butadiene	<	0.18	<	0.03	<	0.18	<	0.03	<	0.18	<	0.03	<	0.15	<	0.02
1,3-Dichlorobenzene	<	0.60	<	0.10	<	0.60	<	0.10	<	0.60	<	0.10	<	0.40	<	0.07
1,4-Dichlorobenzene	<	1.62	<	0.27	<	0.53	<	0.09		0.44		0.07	<	0.40	<	0.07
1,4-Dioxane	<	0.67	<	0.11	<	0.67	<	0.11	<	0.67	<	0.11	<	1.20	<	0.20
2,2,4-Trimethylpentane	<	1.87	<	0.64	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	<	2.45	<	0.41	<	2.45	<	0.41	<	2.45	<	0.41		0.45		0.08
2-Chloro-1,3-Butadiene	NT	NT	NT	NT	<	0.48	<	0.08	<	0.48	<	0.08	NT	NT	NT	NT
2-Phenylbutane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.37	<	0.06
4-Ethyltoluene		177.33		29.56	<	4.06	<	0.68	<	4.06	<	0.68	<	0.33	<	0.05
4-Methyl-2-Pentanone	<	3.73	<	0.62	<	3.74	<	0.62	<	3.74	<	0.62	<	0.27	<	0.05
Acetone	<	1.98	<	0.33		3.40		0.57		4.87		0.81		4.66		0.78
Benzene		3.11		0.52	<	0.41	<	0.07	<	0.41	<	0.07	<	0.21	<	0.04
Bromodichloromethane	<	0.20	<	0.03	<	0.20	<	0.03	<	0.20	<	0.03	<	0.45	<	0.07
Bromomethane	<	0.85	<	0.14	<	0.85	<	0.14	<	0.85	<	0.14	<	0.26	<	0.04
Carbon Disulfide	<	2.55	<	0.42	<	2.55	<	0.42	<	2.55	<	0.42	<	1.04	<	0.17
Carbon Tetrachloride	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.42	<	0.07
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.31	<	0.05
Chlorobenzene	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11	<	0.31	<	0.05
Chlorodibromomethane	<	33.33	<	5.56	<	33.33	<	5.56	<	33.33	<	5.56	<	0.57	<	0.09
Chloroethane	<	0.99	<	0.17	<	0.99	<	0.17	<	0.99	<	0.17	<	0.17	<	0.03
Chloroform	<	0.79	<	0.13	<	0.79	<	0.13	<	0.79	<	0.13	<	0.33	<	0.05
Chloromethane	<	0.55	<	0.09		0.70		0.12		0.55		0.09		0.62		0.10
cis-1,2-Dichloroethene	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.27	<	0.04
cis-1,3-Dichloropropene	<	0.44	<	0.07	<	0.44	<	0.07	<	0.44	<	0.07	<	0.30	<	0.05
Cyclohexane	<	2.80	<	0.47	<	2.80	<	0.47	<	2.80	<	0.47	<	0.23	<	0.04
Dichloromethane		83.33		13.89	<	1.33	<	0.22	<	1.33	<	0.22		0.69		0.12
Ethanol	<	0.20	<	0.03		1.91		0.32		3.27		0.54		6.16		1.03
Ethylbenzene		13.53		2.26	<	0.78	<	0.13	<	0.78	<	0.13	<	0.29	<	0.05
Freon-11	<	1.05	<	0.17	<	1.05	<	0.17	<	1.05	<	0.17		0.97		0.16
Freon 113	<	1.55	<	0.26	<	1.55	<	0.26	<	1.55	<	0.26	<	0.51	<	0.09
Freon 114	<	1.91	<	0.32	<	1.91	<	0.32	<	1.91	<	0.32	<	0.47	<	0.08
Freon 12		3.76		0.63		1.37		0.23		1.25		0.21		1.42		0.24
Hexachloro-1,3-Butadiene	<	2.03	<	0.34	<	2.03	<	0.34	<	2.03	<	0.34	<	0.71	<	0.12
Hexane	<	2.94	<	0.49	<	2.93	<	0.49	<	2.93	<	0.49	<	1.17	<	0.20
Isopropylbenzene	<	1.33	<	0.22	<	1.33	<	0.22	<	1.33	<	0.22	<	0.33	<	0.05
Methyl N-Butyl Ketone	<	3.40	<	0.57	<	3.39	<	0.56	<	3.39	<	0.56	<	0.27	<	0.05
Methyl Tert-Butyl Ether	<	3.01	<	0.50	<	3.00	<	0.50	<	3.00	<	0.50	<	0.24	<	0.04
Methylbenzene		3.34		0.56	<	1.19	<	0.20	<	1.19	<	0.20		0.33		0.05
Naphthalene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene (Monomer)	<	0.68	<	0.11	<	0.68	<	0.11	<	0.68	<	0.11	<	0.29	<	0.05
Tetrachloroethene	<	0.67	<	0.11	<	0.16	<	0.03		0.23		0.04	<	0.45	<	0.08
trans-1,2-Dichloroethene	<	3.31	<	0.55	<	3.30	<	0.55	<	3.30	<	0.55	<	0.27	<	0.04
trans-1,3-Dichloropropene	<	0.53	<	0.09	<	0.53	<	0.09	<	0.53	<	0.09	<	0.30	<	0.05
Tribromomethane	<	0.54	<	0.09	<	0.54	<	0.09	<	0.54	<	0.09	<	0.69	<	0.11
Trichloroethylene	<	0.61	<	0.10	<	0.61	<	0.10	<	0.61	<	0.10	<	0.36	<	0.06
Vinyl chloride	<	1.33	<	0.22	<	0.13	<	0.02	<	0.13	<	0.02	<	0.17	<	0.03
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<	0.58	<	0.10

Compound	U-1 1/26/2011 24-Hour		Annual		U-1 4/12/2011 24-Hour		Annual		U-1 7/20/2011 24-Hour		Annual		U-1 10/17/2011 24-Hour		Annual	
1,1,1,2-Tetrachloroethane	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.91	<	0.15
1,1,1-Trichloroethane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.73	<	0.12
1,1,2,2-Tetrachloroethane	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.91	<	0.15
1,1,2-Trichloroethane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.73	<	0.12
1,1-Dichloroethane	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.54	<	0.09
1,1-Dichloroethylene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.53	<	0.09
1,2,4-Trichlorobenzene	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08	<	0.99	<	0.16
1,2,4-Trimethylbenzene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.65	<	0.11
1,2-Dibromoethane	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09	<	1.03	<	0.17
1,2-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.80	<	0.13
1,2-Dichloroethane	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.54	<	0.09
1,2-Dichloropropane	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.61	<	0.10
1,3,5-Trimethylbenzene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.65	<	0.11
1,3-Butadiene	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02	<	0.29	<	0.05
1,3-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.80	<	0.13
1,4-Dichlorobenzene	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.80	<	0.13
1,4-Dioxane	<	1.20	<	0.20	<	1.20	<	0.20	<	1.20	<	0.20	<	2.40	<	0.40
2,2,4-Trimethylpentane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone		0.87		0.14		2.16		0.36		1.63		0.27		1.14		0.19
2-Chloro-1,3-Butadiene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Phenylbutane	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.73	<	0.12
4-Ethyltoluene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.65	<	0.11
4-Methyl-2-Pentanone	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05	<	0.55	<	0.09
Acetone		6.47		1.08		5.04		0.84		9.21		1.53		9.09		1.52
Benzene		1.15		0.19		0.21		0.04		0.32		0.05	<	0.43	<	0.07
Bromodichloromethane	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07	<	0.89	<	0.15
Bromomethane	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04	<	0.52	<	0.09
Carbon Disulfide	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17	<	2.07	<	0.35
Carbon Tetrachloride	<	0.42	<	0.07	<	0.42	<	0.07		0.42		0.07	<	0.84	<	0.14
Chlordane	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Chlorobenzene	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.61	<	0.10
Chlorodibromomethane	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09	<	1.13	<	0.19
Chloroethane	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03	<	0.35	<	0.06
Chloroform	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.65	<	0.11
Chloromethane		0.62		0.10		0.54		0.09		0.65		0.11		0.69		0.11
cis-1,2-Dichloroethene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.53	<	0.09
cis-1,3-Dichloropropene	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.61	<	0.10
Cyclohexane	<	0.23	<	0.04	<	0.23	<	0.04	<	0.23	<	0.04	<	0.46	<	0.08
Dichloromethane		0.90		0.15	<	2.17	<	0.36		0.35		0.06		1.43		0.24
Ethanol		3.72		0.62		0.92		0.15		3.61		0.60		2.99		0.50
Ethylbenzene	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05	<	0.58	<	0.10
Freon-11		1.01		0.17		0.64		0.11		1.31		0.22		0.90		0.15
Freon 113	<	0.51	<	0.09		0.87		0.14	<	0.51	<	0.09	<	1.02	<	0.17
Freon 114	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08	<	0.93	<	0.16
Freon 12		1.51		0.25		1.25		0.21		1.91		0.32		1.58		0.26
Hexachloro-1,3-Butadiene	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12	<	1.42	<	0.24
Hexane	<	1.17	<	0.20	<	1.17	<	0.20		4.04		0.67	<	2.35	<	0.39
Isopropylbenzene	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.65	<	0.11
Methyl N-Butyl Ketone	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05	<	0.55	<	0.09
Methyl Tert-Butyl Ether	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04	<	0.48	<	0.08
Methylbenzene		1.01		0.17	<	0.25	<	0.04		1.11		0.18	<	0.50	<	0.08
Naphthalene	<	1.75	<	0.29	<	1.75	<	0.29	<	1.75	<	0.29	<	3.49	<	0.58
Styrene (Monomer)	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05	<	0.57	<	0.09
Tetrachloroethene	<	0.45	<	0.08	<	0.45	<	0.08		0.86		0.14	<	0.91	<	0.15
trans-1,2-Dichloroethene	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.53	<	0.09
trans-1,3-Dichloropropene	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05	<	0.61	<	0.10
Tribromomethane	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11	<	1.38	<	0.23
Trichloroethylene	<	0.36	<	0.06	<	0.36	<	0.06	<	0.36	<	0.06	<	0.71	<	0.12
Vinyl chloride	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03	<	0.34	<	0.06
Xylenes (Total)	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Notes
1. "<" indicates that the parameter is not detected. "NT" indicates that the parameter was not tested. U-1 samples were collected upwind of the active landfill face and samples D-1 through D-4 were collected downwind of the active landfill face.
2. Orange highlight indicates an exceedance of the Rhode Island Department of Environmental Management's (RIDEM) 24-hour Acceptable Ambient Levels (AALs) set forth in RIDEM Air Pollution Regulation No. 22. An orange highlight of the 24-hour AAL indicates that the typical method reporting limit exceeds the 24-hour AAL.
3. Green highlight indicates an exceedance of the RIDEM's Annual AALs set forth from RIDEM Air Pollution Regulation No. 22. An orange highlight of the Annual AAL indicates that the typical method reporting limit exceeds the Annual AAL.
4. Concentrations adjusted using RIDEM's time scale factor from the Air Toxics Modeling Guidelines (RIDEM June 2005)
5. OSHA PEL is the Permissible Exposure Limits as described in the Occupational Safety and Health Standards Part Number 1910 subpart Z Tables Z-1 and Z2

TABLE 7
Volatile Organic Compounds Ambient Air Monitoring Results
2008 through 2012
Five-Year Review Report
Central Landfill Johnston, RI

	Units	Ambient AALs [1]		OSHA PELs [5]	D-1				D-2				D-3				D-4			
		24-hour	Annual		11/19/2012				11/19/2012				11/19/2012				11/19/2012			
					24-hour		Annual		24-hour		Annual		24-hour		Annual		24-hour		Annual	
1,1,1,2-Tetrachloroethane	ug/m³	100	NE	NE	<	0.44	<	0.08	<	0.44	<	0.08	<	0.44	<	0.08	<	0.44	<	0.08
1,1,1-Trichloroethane	ug/m³	6,000	5,000	1,900,000	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1,2,2-Tetrachloroethane	ug/m³	2,000	NE	7,000	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08	<	0.46	<	0.08
1,1,2-Trichloroethane	ug/m³	10	NE	45,000	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06
1,1-Dichloroethane	ug/m³	NE	0.4	400,000	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,1-Dichloroethylene	ug/m³	200	70	400,000	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2,4-Trichlorobenzene	ug/m³	30	NE	NE	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08	<	0.49	<	0.08
1,2,4-Trimethylbenzene	ug/m³	NE	NE	NE	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
1,2-Dibromoethane	ug/m³	9	0.04	156,200	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09	<	0.51	<	0.09
1,2-Dichlorobenzene	ug/m³	NE	300	300,000	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,2-Dichloroethane	ug/m³	NE	0.038	205,500	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04
1,2-Dichloropropane	ug/m³	4	0.5	350,000	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05
1,3,5-Trimethylbenzene	ug/m³	NE	NE	NE	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05
1,3-Butadiene	ug/m³	NE	0.04	2,210,000	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02	<	0.15	<	0.02
1,3-Dichlorobenzene	ug/m³	NE	NE	NE	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dichlorobenzene	ug/m³	800	0.09	450,000	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07	<	0.40	<	0.07
1,4-Dioxane	ug/m³	NE	0.14	360,000	<	1.29	<	0.20	<	1.29	<	0.20	<	1.29	<	0.20	<	1.29	<	0.20
2,2,4-Trimethylpentane	ug/m³	NE	1,000	NE	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-Butanone	ug/m³	5,000	NE	590,000		0.29		0.05	<	0.19	<	0.03		1.97		0.33				
2-Chloro-1,3-Butadiene	ug/m³	NE	1	3,600	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT				
2-Phenylbutane	ug/m³	NE	NE	NE	<	0.37	<	0.06	<	0.37	<	0.06	<	0.37	<	0.06				
4-Ethyltoluene	ug/m³	NE	NE	NE	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05				
4-Methyl-1,2-Pentadiene	ug/m³	5,000	NE	410,000	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05				
Acetone	ug/m³	5,000	NE	2,400,000	<	3.72	<	0.62		3.74		0.62		14.47		2.75				
Benzene	ug/m³	20	0.3	32,500		0.27		0.05		0.36		0.05	<	0.21	<	0.04				
Bromodichloromethane	ug/m³	70	0.03	NE	<	0.45	<	0.07	<	0.45	<	0.07	<	0.45	<	0.07				
Bromomethane	ug/m³	NE	5	80,000	<	0.26	<	0.04	<	0.26	<	0.04	<	0.26	<	0.04				
Carbon Disulfide	ug/m³	NE	700	47,300	<	1.04	<	0.17	<	1.04	<	0.17	<	1.04	<	0.17				
Carbon Tetrachloride	ug/m³	200	0.17	63,900	<	0.42	<	0.07	<	0.42	<	0.07		0.58		0.09				
Chloroform	ug/m³	0.7	0.001	0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT				
Chlorobenzene	ug/m³	NE	1,000	350,000	<	0.31	<	0.05	<	0.31	<	0.05	<	0.31	<	0.05				
Chlorodibromomethane	ug/m³	70	NE	NE	<	0.57	<	0.09	<	0.57	<	0.09	<	0.57	<	0.09				
Chloroethane	ug/m³	10,000	NE	2,600,000	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03				
Chloroform	ug/m³	NE	0.2	240,300	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05				
Chloromethane	ug/m³	400	90	210,000		0.49		0.11	<	0.14	<	0.02		0.99		0.17				
cis-1,2-Dichloroethene	ug/m³	1,000	NE	NE	<	0.27	<	0.04	<	0.27	<	0.04		0.93		0.15				
cis-1,3-Dichloropropene	ug/m³	20	0.2	NE	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05				
Cyclohexane	ug/m³	6,000	NE	1,030,000	<	0.23	<	0.04	<	0.23	<	0.04	<	0.23	<	0.04				
Dichloromethane	ug/m³	1,000	2.1	88,250	<	1.14	<	0.19	<	0.23	<	0.04		4.91		0.82				
Ethanol	ug/m³	NE	NE	1,900,000		6.75		1.13	<	0.63	<	0.10		5.67		0.94				
Ethylbenzene	ug/m³	1000	NE	435,000	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05				
Freon-11	ug/m³	1,000	NE	3,000,000		0.93		0.16		0.86		0.14		1.23		0.21				
Freon 113	ug/m³	NE	NE	7,600,000	<	0.31	<	0.05	<	0.31	<	0.05	<	0.51	<	0.09				
Freon 114	ug/m³	NE	NE	1,900,000	<	0.47	<	0.08	<	0.47	<	0.08	<	0.47	<	0.08				
Freon 12	ug/m³	NE	NE	3,600,000		1.71		0.29		2.23		0.37		2.54		4.42				
Hexachloro-1,3-Butadiene	ug/m³	0.2	NE	240	<	0.71	<	0.12	<	0.71	<	0.12	<	0.71	<	0.12				
Hexane	ug/m³	NE	700	1,800,000	<	1.17	<	0.20	<	1.17	<	0.20		1.34		0.56				
Isopropylbenzene	ug/m³	400	NE	245,000	<	0.33	<	0.05	<	0.33	<	0.05	<	0.33	<	0.05				
Methyl Ethyl Ketone	ug/m³	NE	NE	NE	<	0.27	<	0.05	<	0.27	<	0.05	<	0.27	<	0.05				
Methyl Tert-Butyl Ether	ug/m³	3,000	NE	NE	<	0.24	<	0.04	<	0.24	<	0.04	<	0.24	<	0.04				
Methylene	ug/m³	NE	100	764,000	<	0.25	<	0.04		0.40		0.07		0.53		0.09				
Naphthalene	ug/m³	3	0.02	50,000	<	1.75	<	0.29	<	1.75	<	0.29	<	1.75	<	0.29				
Styrene (Monomer)	ug/m³	1,000	100	433,000	<	0.29	<	0.05	<	0.29	<	0.05	<	0.29	<	0.05				
Tetrachloroethene	ug/m³	NE	0.2	695,000	<	0.45	<	0.08	<	0.45	<	0.08		1.58		0.26				
trans-1,2-Dichloroethene	ug/m³	70	NE	866,000	<	0.27	<	0.04	<	0.27	<	0.04	<	0.27	<	0.04				
trans-1,3-Dichloropropene	ug/m³	20	0.2	NE	<	0.30	<	0.05	<	0.30	<	0.05	<	0.30	<	0.05				
Tribromomethane	ug/m³	70	0.9	5,000	<	0.69	<	0.11	<	0.69	<	0.11	<	0.69	<	0.11				
Trichloroethylene	ug/m³	500	0.5	546,000	<	0.36	<	0.06	<	0.36	<	0.06		0.60		0.11				
Vinyl chloride	ug/m³	100	0.2	2,200	<	0.17	<	0.03	<	0.17	<	0.03	<	0.17	<	0.03				
Xylenes (Total)	ug/m³	1,000	100	435,000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT				

Notes
1. "<" indicates that the parameter is not detected. "NT" indicates that the parameter was not tested. D-1 samples were collected upwind of the active landfill fires and samples D-2 through D-4 were collected downwind of the active landfill fires.
2. Orange highlight indicates an exceedance of the Rhode Island Department of Environmental Management (RIDEM) Ambient Air Quality Standard Levels (AALs) when Reg. RIDEM Air Pollution Regulation No. 22. An orange highlight also indicates that the laboratory method reporting limit exceeds the AAL.
3. Green highlight indicates an exceedance of the RIDEM's annual AAL, more from RIDEM Air Pollution Regulation No. 22. An green highlight also indicates that the laboratory method reporting limit exceeds the annual AAL.
4. Concentrations adjusted using RIDEM's time scale factor from the Air Toxics Modeling Guidelines (RIDEM June 2005).
5. OSHA PEL is the Permissible Exposure Limits as described in the Occupational Safety and Health Standards Part Number 1910 subpart Z Tables Z-1 and Z-2

ATTACHMENT C

DOCUMENTS REVIEWED OR CITED

Documents Reviewed or Cited

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ATTACHMENT D

AIR PATHWAY HUMAN HEALTH RISK ASSESSMENT EVALUATION

GZA
GeoEnvironmental, Inc.

Engineers and Scientists

VIA EMAIL

January 25, 2013
File No. 03.0032412.05

Mr. William Anderson, P.E.
Engineering Manager
Rhode Island Resource Recovery Corporation
65 Shun Pike
Johnston, Rhode Island 02919-4512

Re: 5-Year Progress Review for Operable Unit 1
Air Pathway Human Health Risk Assessment (HHRA)
Central Landfill
Johnston, Rhode Island

380 Harvey Road
Manchester
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Dear Bill:

In accordance with the work order addendum dated September 1, 2012, GZA GeoEnvironmental Inc. (GZA) is pleased to present the following HHRA review evaluation. This report describes GZA's evaluation process, results, and opinions and is subject to the limitations provided in **Attachment A.**

BACKGROUND

As part of the upcoming Superfund Comprehensive 5-Year Review for Operable Unit 1 (OU1), the Environmental Protection Agency (EPA) is requiring that Rhode Island Resource Recovery Corporation (RIRRC) review and evaluate the February 2006 Final HHRA prepared by GZA. The objective of our current evaluation was to assess whether changes in landfill gas characteristics or applicable risk screening methods or benchmarks have occurred over the last five years which would impact the findings of the 2006 study.

The 2006 HHRA was prepared to comply with Section IV.G. of the Superfund Consent Decree and Record of Decision. To complete this review, GZA conducted a review of recent OU1 landfill gas analytical data for comparison against the data used in the 2006 HHRA.

LANDFILL GAS ANALYTICAL DATA EVALAUATION

GZA reviewed the landfill gas constituent concentrations used in the May 2005 Revised Ambient Air Evaluation and Exposure Point Concentration Determination (the 2005 Revised EPC Report which formed the basis for the 2006 HHRA) and OU1 landfill gas analytical data collected by GZA in 2012 to assess whether changes in landfill gas constituent concentrations have the potential to impact the findings of the 2006 HHRA. The results of this evaluation are summarized in **Table 1**. As shown in **Table 1**, aggregate volatile organic compound (VOC) concentrations (exclusive of methane and hydrogen sulfide) decreased between the two sampling events from approximately 150 parts per million volume (ppmv) in 2005 to 50 ppmv in the 2012.

There are 10 newly detected pollutants and five pollutants with increased landfill gas constituent concentrations compared to the concentrations used for the 2006 HHRA. These include 1,2-dichlorobenzene, benzene, chlorobenzene, propene and 11 reduced sulfur compounds. 10 of these pollutants were below detectable levels in previous analyses, and recently detected at levels

slightly above laboratory detection limits. Hydrogen sulfide concentrations increased most significantly between 2005 and 2012, rising from 116.33 ppmv to 210 ppmv. Whereas, 32 other VOCs exhibited a decrease in reported concentrations or were reported as non-detect in 2012 as compared to the 2005 levels.

AMBIENT AIR EVALUATION AND EXPOSURE POINT CONCENTRATION REVIEW

GZA also reviewed the Exposure Point Concentrations (EPCs) from the 2006 HHRA and compared these values to air quality dispersion modeling results from the 2008 Rhode Island Air Pollution Control Regulation 9 Permit Application for the proposed Phase VI Landfill (prepared by GZA). This effort was intended to assess whether the results of recent air dispersion modeling were consistent with the EPCs used in the 2006 HHRA and whether any differences in the predicted impacts have the potential to alter the findings of the 2006 HHRA with respect to landfill gas emissions from OU1. **Table 2** summarizes the results of this evaluation. As shown in **Table 2**, four pollutants had higher predicted ambient air concentrations as compared to the EPCs used in the 2006 HHRA. Of these four pollutants, only three (1,4-dichlorobenze, carbonyl sulfide, and hydrogen sulfide) have been detected in landfill gas from OU1. As discussed further in our conclusions below, gas generation and emissions from OU1 have steadily declined since the OU1 air pathway risk assessment was performed in 2006 and will continue to decline in future years. For this reason, the relative contribution of landfill gas emissions from OU1 to the air pathway risk from the larger landfill facility would also be expected to decline proportionally.

FINAL HUMAN HEALTH RISK ASSESSMENT REVIEW

GZA reviewed the chemicals of potential concern (COPC) from the 2006 HHRA and evaluated the screening and toxicity values used at that time in order to identify whether new or revised values exist for the COPCs. This review included the Rhode Island Department of Environmental Management (RIDEM) Ambient Air Levels (AALs), EPA Acute Exposure Guideline Levels (AEGLs), California EPA Reference Exposure Levels (RELs), and American Industrial Hygiene Association (AIHA) Emergency Response Planning Guidelines (ERPGs). The results of this evaluation are presented in **Table 3**. As shown in **Table 3**, all pollutant impacts are well below the toxicity levels reported in **Table 3**.

GZA also reviewed the cancer risk data presented in the 2006 HHRA to evaluate whether the changes in OU1 constituent concentrations or the predicted ambient concentrations may impact the results of the 2006 HHRA. The 2006 HHRA showed cancer risks which ranged from 1e-10 to 5E-9 across all exposure points. These values are three to six orders of magnitude lower than the acceptable risk benchmarks established by EPA and RIDEM and provide a large margin between the estimated cancer risk and the acceptable risk benchmarks, which is sufficient to offset the anticipated variation in landfill gas quality and constituent concentrations.

CONCLUSIONS AND RECOMMENDATIONS

The landfill gas generation rates from OU1 (i.e., Phases I, and II/III) have declined significantly since 2006, and will continue to decline in future years as these phases of the landfill stopped accepting waste in 1993 and 2003, respectively. The estimated gas generated from OU1 was 2,457 million standard cubic feet (MMScf) in 2006 compared to 893 MMScf in 2012. Of the six carcinogens evaluated in the 2006 HHRA, three were not detected (methylene chloride, tetrachloroethene, and trichloroethene), and two (tetrahydrofuran and vinyl chloride) were detected at significantly lower concentrations in the OU1 landfill gas in 2012. Only benzene was detected at a higher concentration in the OU1 landfill gas in 2012. The increase in the benzene

concentration is largely offset by the decrease in landfill gas generation from OU1. When adjusted for the reduced flow rate, this increase is approximately 34% higher than the gas concentration data used in the 2006 HHRA. Based on the aggregate decline in carcinogens in the OU1 landfill gas and the reduction in landfill gas generation from OU1 since 2006, and in consideration of the low cancer risk documented in the 2006 HHRA, it is GZA's opinion that no further evaluation of cancer risk from OU1 is warranted at this time.

With respect to non-cancer risk, only five of the 15 compounds with increased OU1 landfill gas concentrations were selected for quantitative analysis in the 2006 HHRA. The remaining compounds were either evaluated on a qualitative basis or excluded from evaluation because they were not detected in the landfill gas or the corresponding EPCs were below risk screening levels. In addition, concentrations of many other landfill gas constituents (approximately 32 compounds) declined over the same time period. In consideration of the reduced landfill gas flow rates from OU1, it is GZAs opinion that no additional contaminants of concern would be added to HHRA as a result of the landfill gas quality data collected in 2012. In addition, for the contaminants evaluated in the 2006 HHRA, there is a sufficient margin between the EPCs and the risk-based levels used in the 2006 HHRA such that the OU1 landfill gas constituent concentration increases observed in 2012 would not be anticipated to significantly alter the findings of the 2006 HHRA. For instance, the OU1 hydrogen sulfide concentration increased by approximately 1.8 times higher than the values used in the 2006 HHRA, while the estimated gas generation rates were approximately 2.8 times lower over the same period, thereby resulting in a reduced risk contribution for hydrogen sulfide from OU1. As a result, it is GZA's opinion that the combination of reduced gas flows from OU1, the general downward trend in the majority of landfill gas constituent concentrations, and the margin between the EPCs and the risk-based levels of the 2006 HHRA are sufficient to account for the inherent variability in landfill gas quality and constituent concentrations.

Please contact Kenneth Boivin at 603-232-8719 or Ed Summerly at 401-427-2707 if you have any questions or comments.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Kenneth D. Boivin, CHMM
Associate Principal

Edward A. Summerly, P.G.
Principal

Michael P. North, P.E.
Consultant/Reviewer

KDB/EAS/MPN:rkl
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Attachments: Limitations
Tables

LIMITATIONS

RISK CHARACTERIZATION LIMITATIONS

Use of Report

1. GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of the Client for the stated purpose(s) and location(s) identified in the Report. Use of this Report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. Our findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Report and/or proposal, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. Conditions other than described in this report may be found at the subject location(s).

3. The interpretations and conclusions presented in the Report were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services. The work described in this report was carried out in accordance with the agreed upon Terms and Conditions.

4. GZA's risk characterization was performed in accordance with generally accepted practices of qualified professionals performing the same type of services at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made. The findings of the risk characterization are dependent on numerous assumptions and uncertainties inherent in the risk assessment process. Sources of uncertainty may include the description of site conditions, the nature and extent of chemical distribution and the reliability of toxicity information. Consequently, the findings of the risk characterization are not an absolute characterization of actual risks, but rather serve to highlight potential sources of risk at the site. Although the range of uncertainties has not been quantified, the use of conservative assumptions and parameters throughout the assessment would be expected to err on the side of protection of human health and the environment.

Reliance on Information from Others

5. In conducting our work, GZA has relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Any inconsistencies in this information which we have noted are discussed in the Report.

Additional Information

6. In the event that the Client, or others authorized to use this Report, obtain information on environmental or hazardous waste issues at the site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the conclusions stated in this report.

Compliance with Codes and Regulations

7. We used reasonable care in identifying and interpreting applicable codes and regulations necessary to execute our scope of work. These codes and regulations are subject to various, and possibly contradictory, interpretations. Interpretations with codes and regulations by other parties are beyond our control.

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TABLES

TABLE 1
LANDFILL GAS ANALYTICAL DATA EVALUATION SUMMARY

Central Landfill
Johnston, Rhode Island

Pollutant	CAS NO.	Phase I	
		2005 EPC	2012 (1)
1,1 Dichloroethane	75-34-3	217.08	< 42
1,1,1-Trichloroethane	71-55-6	ND	< 31
1,1,2,2-Tetrachloroethane	79-34-5		< 24
1,1,2-Trichloroethane	79-00-5		< 31
1,2,4-Trichlorobenzene	120-82-1		< 22
1,2,4-Trimethylbenzene	95-63-6	1,820.83	1,400.00
1,2-Dibromoethane	106-93-4		< 22
1,2-Dichlorobenzene	95-50-1	ND	33.00
1,2-Dichloroethane	107-06-2	ND	< 41
1,2-Dichloropropane	78-87-5	ND	< 36
1,3,5 Trimethylbenzene	108-67-8	662.50	560.00
1,3-Butadiene	106-99-0		< 75
1,3-Dichlorobenzene	541-73-1		< 28
1,4-Dichlorobenzene	106-46-7	544.17	410.00
1,4-Dioxane	123-91-1		< 46
2,5-Dimethylthiophene	638-02-8	ND	52.00
2-Ethylthiophene	872-55-9	ND	54.00
2-Hexanone	591-78-6		< 41
2-Propanol	67-63-0	5,945.83	430.00
3-Methylthiophene	616-44-4	ND	70.00
4-Ethyltoluene	622-96-8	1,908.33	420.00
Acetone	67-64-1	8,079.17	2,300.00
Acrylonitrile	107-13-1		
Benzene	71-43-2	597.50	2,200.00
Benzyl Chloride	100-44-7		<32
Bromodichloromethane	75-27-4		< 25
Bromoform	75-25-2		< 16
Bromomethane	74-83-9		< 43
Carbon Disulfide	75-15-0	2,362.50	< 25
Carbon Tetrachloride	56-23-5		< 27
Carbonyl Sulfide	463-58-1	954.17	< 50
Chlorobenzene	108-90-7	315.83	1,100.00
Chlorodifluromethane	75-45-6		
Chloroethane	75-00-3	193.33	< 63
Chloroform	67-66-3		< 34
Chloromethane	74-87-3		< 81
cis-1,2-Dichloroethene	156-59-2	653.33	88.00
cis-1,3-Dichloropropene	10061-01-5		< 37
Cyclohexane	110-82-7	1,169.58	390.00
Dibromochloromethane	124-48-1		< 20
Dichlorodifluoromethane	75-71-8	1,588.75	140.00
Dichlorotetrafluoroethane	76-14-2	115.00	71.00
Diethyl Disulfide	110-81-6	ND	< 25
Diethyl Sulfide	352-93-2	ND	<50
Dimethyl Disulfide	624-92-0	ND	< 25
Dimethyl Sulfide	75-18-3	962.50	4,300.00
Ethanol	64-17-5	38,708.33	< 880
Ethyl Mercaptan	75-08-1	ND	320.00

TABLE 1
LANDFILL GAS ANALYTICAL DATA EVALUATION SUMMARY

Central Landfill
Johnston, Rhode Island

Pollutant	CAS NO.	Phase I	
		2005 EPC	2012 (1)
Ethyl Methyl Sulfide	624-89-5	ND	76.00
Ethylbenzene	100-41-4	5,200.00	4,300.00
Heptane	142-82-5	1,465.42	520.00
Hexachlorobutadiene	87-68-3		< 16
Hexane	110-54-3	1,251.25	460.00
Hydrogen Sulfide	7783-06-4	116,330.00	210,000.00
Isobutyl Mercaptan	513-44-0	ND	< 50
Isopropyl Mercaptan	75-33-2	754.17	580.00
m,p-Xylenes	179601-23-1	12,020.00	5,300.00
Methane	74-82-8	500,000,000	
Methyl Ethyl Ketone	78-93-3	11,325.00	1,800.00
Methyl Mercaptan	74-93-1	1,350.00	1,900.00
Methyl tert-Butyl Ether	1634-04-4		< 46
Methylene Chloride	75-09-2	425.00	< 48
Methylisobutyl ketone	108-10-1	945.83	350.00
n-Butyl Mercaptan	109-79-5	ND	< 50
n-Propyl Mercaptan	107-03-9	ND	84.00
o-Xylene	95-47-6	12,020.00	1,700.00
Propene	115-07-1		3,200.00
Styrene	100-42-5	986.25	110.00
Terahydrofuran	109-99-9	2,079.17	850.00
tert-Butyl Mercaptan	75-66-1	ND	96.00
Tetrachloroethene	127-18-4	430.00	< 25
Tetrahydrothiophene	110-01-0	ND	< 50
Thiophene	110-02-1	ND	900.00
Toluene	108-88-3	20,125.00	6,200.00
Total Chloride	NA	12,785.00	
trans-1,2-Dichloroethene	156-60-5	ND	< 42
trans-1,3-Dichloropropene	10061-02-6		< 37
Trichloroethene	79-01-6	419.58	< 31
Trichlorofluoromethane	75-69-4	495.83	< 30
Trichlorotrifluoroethane	76-13-1		< 22
Vinyl Acetate	108-05-4		< 470
Vinyl Chloride	75-01-4	722.92	100.00
Xylenes	1330-20-7	12,020.00	7,000.00

Notes:
1. Phase 1 data for 2012 was the result of a single sampling event performed by GZA.
2. No recent sampling results have been representative of Phase II/III gas.
3. Values above are presented as parts per billion volume (ppbv).
4. Shaded cells represent higher recent concentration s found in the landfill gas.

TABLE 2
AMBIENT AIR EVALUATION AND EXPOSURE POINT CONCENTRATION REVIEW SUMMARY

Central Landfill
Johnston, Rhode Island

Pollutant	CAS NO	Total 1-hr Impact (ug/m^3)		Total 24-hr Impact (ug/m^3)		Total Annual Impact (ug/m^3)	
		2005 EPC	2008 PH VI	2005 EPC	2008 PH VI	2005 EPC	2008 PH VI
1,1-Dichloroethane	75-34-3	0.58		0.08		8.50E-03	
1,2,4-Trimethylbenzene	95-63-6	0.34		0.06		0.01	
1,3,5 Trimethylbenzene	108-67-8	0.12		0.02		3.38E-03	
1,4-Dichlorobenzene	106-46-7	0.79	0.73	0.12	0.13	0.01	0.02
2-Propanol	67-63-0	0.56		0.10		0.02	
4-Ethyltoluene	622-96-8	0.36		0.07		0.01	
Acetone	67-64-1	64.05		9.10		0.91	
Benzene	71-43-2	0.68	0.05	0.10	0.01	1.05E-02	1.30E-03
Carbon Disulfide	75-15-0	1.88		0.28		0.04	
Carbonyl Sulfide (2)	463-58-1	0.09	0.11	0.02	0.01	4.43E-03	2.20E-03
Chlorobenzene	108-90-7	0.61		0.09		9.21E-03	
Chloroethane	75-00-3	0.61		0.09		8.82E-03	
cis-1,2-Dichloroethene	156-59-2	0.64		0.10		0.01	
Cyclohexane	110-82-7	0.15		0.03		4.18E-03	
Dichlorodifluoromethane	75-71-8	0.30		0.06		0.01	
Dichlorotetrafluoroethane	76-14-2	0.03		0.01		8.34E-04	
Dimethyl Sulfide	75-18-3	0.09		0.02		4.65E-03	
Ethanol	64-17-5	2.78		0.52		0.08	
Ethylbenzene	100-41-4	3.65		0.56		0.06	
Heptane	142-82-5	0.23		0.04		0.01	
Hexane	110-54-3	0.17		0.03		4.58E-03	
Hydrogen Chloride	7647-01-0	3.54	0.95	6.55		0.68	0.04
Hydrogen Sulfide	7783-06-4	15.12	31.96	3.62		0.69	0.62
Isopropyl Mercaptan	75-33-2	0.10		0.02		5.21E-03	
Methane	74-82-8	12490.52		2350.28		340.26	
Methyl Ethyl Ketone	78-93-3	81.35		11.58		1.16	
Methyl Isobutyl Ketone	108-10-1	3.79		0.54		0.05	
Methyl Mercaptan	74-93-1	0.10		0.02		0.01	
Methylene Chloride	75-09-2	0.06		0.01		1.62E-03	
Styrene	100-42-5	0.68		0.10		0.01	
Tetrachloroethylene	127-18-4	0.11	0.04	0.02	4.11E-03	3.03E-03	9.44E-04
Tetrahydrofuran	109-99-9	0.23		0.04		0.01	
Toluene	108-88-3	10.15	1.31	1.57	0.14	0.18	0.03
Trichloroethene (2)	79-01-6	0.09	0.14	0.02	0.02	2.34E-03	3.90E-03
Trichlorofluoromethane	75-69-4	0.11		0.02		2.89E-03	
Vinyl Chloride	75-01-4	0.61	0.03	0.09	2.60E-03	9.50E-03	6.00E-04
Xylenes	1330-20-7	9.25	1.04	1.40	0.12	0.16	0.02

Notes:
1. Shaded cells represent increased ambient air impacts in 2008 permit application for the Phase VI landfill compared to the 2005 exposure point concentration evaluation.
2. Carbonyl sulfide and trichloroethene observed higher impacts in 2008, however were not detected in recent sampling events.

TABLE 3
FINAL HUMAN HEALTH RISK ASSESSMENT REVIEW SUMMARY

Central Landfill
Johnston, Rhode Island

CAS Number	Chemical	Molecular Weight (1)	1-Hour Impact (mg/m³) (2)	24-Hour Impact (mg/m³) (2)	2006 AEGL-1 (1-Hour) (mg/m³)	2006 AEGL-1 (8-hour) (mg/m³)	Current AEGL-1 (1-Hour) (mg/m³) (3)	Current AEGL-1 (8-hour) (mg/m³) (3)	2006 RIDEM AALs (1hr) (mg/m³)	2006 RIDEM AALs (24hr) (mg/m³)	Current RIDEM AALs (1hr) (mg/m³)	Current RIDEM AALs (24hr) (mg/m³)	2006 CalEPA REL (mg/m³)	2006 CalEPA REL Duration (hours)	Current CalEPA REL (mg/m³)(4)	Current CalEPA REL Duration (hours) (4)	2006 ERPG-1 (1-Hour) (mg/m³)	Current ERPG-1 (1-Hour) (mg/m³) (5)
								Previously Included										
67-64-1	Acetone	58	0.06	9.10E-03	475	475	474	474	60	30	60	30						
71-43-2	Benzene*	78.1	6.84E-04	1.00E-04	165	29	166	29		0.03	0.03	0.02	1.3	6	1.3	6	160	160
75-15-0	Carbon Disulfide	76	1.88E-03	2.82E-04	12.5	6.2	40	21	6		6		6.2	6	6.2	6	3	3
463-58-1	Carbonyl Sulfide	60	1.08E-04	1.77E-05	0.7	0.46	NR (AEGL-2 = 135.0)	NR (AEGL-2 = 56.4)	0.2		0.2						0.14	0.14
108-90-7	Chlorobenzene*	113	6.06E-04	8.83E-05			46	46							NR Chronic = 1			
75-00-3	Chloroethane	65	6.12E-04	8.76E-05							40	10			NR Chronic = 30			
110-82-7	Cyclohexane	84	1.53E-04	2.89E-05						6		6						
106-46-7	1,4-Dichlorobenzene*	147	7.88E-04	1.26E-04					5	0.8	12.0	0.8			NR Chronic = 0.8			
75-71-8	Dichlorodifluoromethane	121	2.99E-04	5.63E-05														
75-34-3	1,1 Dichloroethane	99	5.75E-04	8.30E-05														
156-59-2	cis-1,2-Dichloroethene	97	6.40E-04	9.53E-05	555	555	555	555	3	1	3	1						
76-14-2	Dichlorotetrafluoroethane	171	3.06E-05	5.76E-06														
75-18-3	Dimethyl Sulfide*	62	9.24E-05	1.86E-05													1.3	1.3
64-17-5	Ethanol	46	2.78E-03	5.23E-04														3,387
100-41-4	Ethylbenzene	106	3.65E-03	5.57E-04			143	143		1	40	3			NR Chronic = 2			
622-96-8	4-Ethyltoluene	120	3.57E-04	6.73E-05														
142-82-5	Heptane	100	2.29E-04	4.31E-05														
110-54-3	Hexane	86	1.68E-04	3.16E-05	NR (AEGL-2 =11,600)	NR (AEGL-2 =11,600)	NR (AEGL-2 = 11,607.4)	NR (AEGL-2 = 11,607.4)							NR Chronic = 7			
7647-01-0	Hydrogen Chloride	36.5	3.54E-03	6.55E-03	2.7	2.7	3	3	2		2		2.1	1	2	1	4.5	4.5
7783-06-4	Hydrogen Sulfide(6)*	34.1	0.03	3.62E-03	0.7	0.46	0.7	0.46	0.04		0.04	0.03	0.042	1	0.042	1	0.14	0.14
75-33-2	Isopropyl Mercaptan (7)	76.2	1.03E-04	2.28E-05	NR (AEGL-2 =92.5)	NR (AEGL-2 =37.4)	NR (AEGL-2 = 92.5)	NR (AEGL-2 = 37.4)									0.01	
74-82-8	Methane	16	12.49	2.35														
75-09-2	Methylene Chloride	85	5.96E-05	1.12E-05	695	NR (AEGL-2 =208)	695	NR (AEGL-2 = 208.6)	2	1	2	1	14	1	14	1	695	1,043
78-93-3	Methyl Ethyl Ketone	72	0.08	1.16E-02	590	590	589	589	10	5	10	5	13	1	13	1		
108-10-1	Methyl Isobutyl Ketone	100	3.79E-03	5.43E-04						3		3						
74-93-1	Methyl Mercaptan (8)*	48.1	1.01E-04	2.05E-05	NR (AEGL-2 =92.5)	NR (AEGL-2 =37.4)	NR (AEGL-2 = 92.5)	NR (AEGL-2 = 37.4)									0.01	0.01
67-63-0	2-Propanol	60	5.57E-04	1.05E-04					3		3		3.2	1	3.2	1		
100-42-5	Styrene	104	6.85E-04	1.04E-04	85	85	85	85	20	1	9	1	21	1	21	1	215	213
127-18-4	Tetrachloroethylene	166	1.11E-04	2.09E-05	235	240	238	238	1		1		20	1	20	1		679
109-99-9	Tetrahydrofuran	72	2.33E-04	4.39E-05														294
108-88-3	Toluene	92	0.01	1.57E-03	755	755	753	753	4	0.4	4.0		37	1	37	1	190	188
79-01-6	Trichloroethene	131	1.36E-04	2.12E-05	700	415	697	413	10	0.5	10	0.5			NR Chronic = 0.6		535	536
75-69-4	Trichlorofluoromethane	137	1.06E-04	2.00E-05						1		1						
95-63-6	1,2,4-Trimethylbenzene	120	3.41E-04	6.42E-05			687	221										
108-67-8	1,3,5 Trimethylbenzene	120	1.24E-04	2.33E-05			687	221										
75-01-4	Vinyl Chloride	62.5	6.12E-04	9.00E-05	640	180	639	179	1	0.1	1	0.1	180	1	180	1	130	1,278
1330-20-7	Xylenes	106	0.01	1.40E-03	565	565	564	564	4	3	9	3	22	1	22	1		

Notes:
1. Values are converted from ppm to mg/m³ using molecular weight (Temperature = 25 °C; Pressure = 1 atm, Gas Constant=0.082058 L-atm/K-mol)
   Concentration(mg/m³)=((Pressure*Molecular Weight*Concentration (ppm))/(Gas Constant*(Temperature+273)))
2. 1-hour and 24-hour impacts reported above represent the higher concentration observed during the 2005 EPC evaluation and the 2008 Phase VI permit application.
3. Acute Exposure Guideline Levels (AEGLs) http://www.epa.gov/oppt/aegl/pubs/compiled_aegls_nov072011.pdf. Accessed: January 2013. The AEGL-1 (1-Hour and 8-Hour) is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation or certain asymptomatic, nonsensory effects. However, the effects would not be disabling and would be transient and reversible upon cessation of exposure. The AEGL-2 (1-Hour and 8-Hour) is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape. AEGL Status: p=proposed, i-interim, f=final. AEGL-2s are listed if no AEGL-1 is available.
4. Acute Reference Exposure Levels developed by OEHHA, California EPA as of February 2012. Access online at: http://www.oehha.ca.gov/air/allrels.html.
5. Values represent ERPG-1. American Industrial Hygiene Association, Emergency Response Planning Committee. Emergency Response Planning Guidelines (ERPGs), 2011. Accessed online at: http://www.aiha.org/insideaiha/GuidelineDevelopment/ERPG/Documents/2011erpgweelhandbook_table-only.pdf. The ERPG-1 (1 Hour) is the maximum concentration in air below which it is believed nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.
6. Level of odor awareness for hydrogen sulfide is 0.01 ppm (0.014 mg/m³).
7. Screening values for methyl mercaptan are used for isopropyl mercaptan.
8. Level of odor awareness for methyl mercaptan is 1.9 ppb (0.004 mg/m³).
9. Shaded cells represent lower or new toxicity levels since the 2006 HHRA evaluation.

* - Represents pollutants with higher landfill gas concentrations or impacts indicated in Tables 1 and 2.

ATTACHMENT E

INSPECTION CHECKLIST

Five-Year Review Site Inspection Checklist

("N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Central Landfill OU-1	**Date of inspection:** April 23, 2013
Location and Region: Johnston, RI; Region I	**EPA ID:** RID980520183
Agency, office, or company leading the five-year review: USEPA/AECOM	**Weather/temperature:** Overcast; mist at times/40°F
Remedy Includes: (Check all that apply) X Landfill cover/containment X Access controls X Institutional controls X Groundwater pump and treatment ☐ Surface water collection and treatment X Other LFG evaluation	☐ Monitored natural attenuation X Groundwater containment ☐ Vertical barrier walls
Attachments: ☐ Inspection team roster attached	☐ Site map attached
II. INTERVIEWS	
Interviews were performed by USEPA/AECOM and are included separately.	

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	☐ O&M manual	☐ Readily available	☐ Up to date	☐ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: O&M documents reviewed outside of site visit and appear to be up to date. Based on inspection discussions, they are also readily available in the administration building.			
2.	**Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☐ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: Not reviewed			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: Not reviewed			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☐ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☐ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☐ N/A
	☐ Other permits RIPDES for underdrain	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: There are multiple permits for the site which apply to both OU-1 and other areas of the site. The permits are reviewed by appropriate regulatory personnel and are up to date.			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: Gas generation records were not reviewed as part of the site inspection. As OU-1 is part of an active facility which collects gas from multiple phases, evaluating gas generation specific to OU-1 can be difficult.			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	X N/A
	Remarks: Based on inspection discussion, there are no official settlement monuments, but rather flyovers performed to evaluate changes in elevation			
7.	**Groundwater Monitoring Records**	☐ Readily available	X Up to date	☐ N/A
	Remarks: Reviewed outside of inspection			
8.	**Leachate Extraction Records**	X Readily available	☐ Up to date	☐ N/A
	Remarks: Leachate records were not reviewed as part of the site inspection.			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☐ N/A
	☐ Water (effluent)	X Readily available	X Up to date	☐ N/A
	Remarks: As this is an active facility, discharge compliance records are reviewed constantly by appropriate regulatory authorities and were not reviewed as part of the site inspection.			

10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: Not reviewed			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
X PRP in-house X Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____

2. **O&M Cost Records**

Not reviewed

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: There was a hot spot on Phase I which required maintenance to extinguish underground combustion. This maintenance work is ongoing.

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: Fencing around facility appeared to be in good shape. Fencing does not encompass entire property, but evidence of trespassing at the landfill was not noted. Hunters apparently use the wooded western portion of the site.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: Security personnel drive around the facility 24 hrs/day, 7 days/week; ATV use by trespassers is limited.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented ☐ Yes X No ☐ N/A
   Site conditions imply ICs not being fully enforced ☐ Yes X No ☐ N/A

   Remarks: There is currently no evidence of groundwater extraction wells installed in the area.

2. **Adequacy** X ICs are adequate ☐ ICs are inadequate ☐ N/A
   Remarks_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map X No vandalism evident

   Remarks:_____

2. **Land use changes on site** X N/A
   Remarks_____

3. **Land use changes off site** X N/A

   Remarks: While area is constantly changing, land uses are still the same.

VI. GENERAL SITE CONDITIONS

A. Roads X Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map X Roads adequate ☐ N/A

   Remarks: Minor erosion of Shun Pike noted at culvert for Pond 2 discharge. This was discussed during the inspection and Johnston will be notified.

B. Other Site Conditions

Remarks: While there is random debris (e.g., plastic bags that have blown around) around the site, it is normal for an operating landfill. Overall, the site appears to be maintained well.

VII. LANDFILL COVERS X Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____

Remarks: There is a settlement area in the area around the downchute on the northern side of Phase I. Water still flows (no real evidence of ponding) – it just looks bad due to the material used for the downchute.

2. **Cracks** ☐ Location shown on site map X Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** ☐ Location shown on site map X Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** ☐ Location shown on site map X Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** X Grass X Cover properly established X No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)

Remarks: Landfill vegetation looks good. Vegetation in swales needs to be removed, although flow is not yet impeded. Discussions during inspection indicate that the vegetation is scheduled for removal.

6. **Alternative Cover (armored rock, concrete, etc.)** X N/A
Remarks_____

7. **Bulges** ☐ Location shown on site map X Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** X Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map X No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches X Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map X N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map X N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map X N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____

Remarks: There is a settlement area in the area around the downchute on the northern side of Phase I. Water still flows (no real evidence of ponding) – it just looks bad due to the material used for the downchute.

2. **Material Degradation** ☐ Location shown on site map X No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map X No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map X No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ X No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
X Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____

Remarks: Maintenance/removal of vegetation occurs, but the vegetation had not been removed at the time of inspection.

D. Cover Penetrations X Applicable ☐ N/A

1. **Gas Vents** X Active ☐ Passive
☐ Properly secured/locked X Functioning X Routinely sampled X Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks: There is no evidence of trespassing, so securing the extraction points does not appear to be needed.

2. **Gas Monitoring Probes**
X Properly secured/locked X Functioning X Routinely sampled X Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A

Remarks: Did not inspect monitoring wells within surface area of landfill. Monitoring wells on the edge of the landfill looked to be in good shape and were properly secured.

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance X N/A
Remarks_____

5.	**Settlement Monuments**	☐ Located	☐ Routinely surveyed	X N/A
	Remarks_____			

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
X Flaring ☐ Thermal destruction ☐ Collection for reuse
X Good condition ☐ Needs Maintenance

Remarks: At this time, OU-1 LFG is being flared at RF-2, which appears to be in decent condition and working properly.

2. **Gas Collection Wells, Manifolds and Piping**
X Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A

Remarks: Not inspected

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A

Remarks: Not inspected

2. **Outlet Rock Inspected** X Functioning ☐ N/A

Remarks_____

G. Detention/Sedimentation Ponds X Applicable ☐ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident

Remarks: Pond 3 had a siltation delta at the base of the downchute. This is to be dredged in the near future.

2. **Erosion** Areal extent_____ Depth_____
X Erosion not evident
Remarks_____

3. **Outlet Works** X Functioning ☐ N/A
Remarks_____

4. **Dam** ☐ Functioning X N/A
Remarks_____

H. Retaining Walls ☐ Applicable X N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge X Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map X Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
X Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** ☐ Location shown on site map X Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** ☐ Functioning X N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable X N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES X Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines X Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   X Good condition X All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   X Good condition ☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   X Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable X N/A

1. **Collection Structures, Pumps, and Electrical**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

C. Treatment System X Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   X Air stripping ☐ Carbon adsorbers
   X Filters (bag)
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   X Good condition ☐ Needs Maintenance
   X Equipment properly identified

   Remarks: Facility appeared to be maintained and operating properly.

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A X Good condition ☐ Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A X Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition ☐ Needs Maintenance

   Remarks: Not inspected

5. **Treatment Building(s)**
   ☐ N/A X Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   X Properly secured/locked ☐ Functioning X Routinely sampled X Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   ☐ Is routinely submitted on time X Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained X Contaminant concentrations are declining

D. Monitored Natural Attenuation			
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance X N/A Remarks_____		

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The source control remedy appears to be operating as designed and the hot spot groundwater collection and treatment system appear to be working properly.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The remedy components appear to be well-maintained, which results in confidence in the long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

None

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

It may be possible to reduce the frequency of discharge sampling from the groundwater treatment system.

ATTACHMENT F

PHOTOGRAPHS

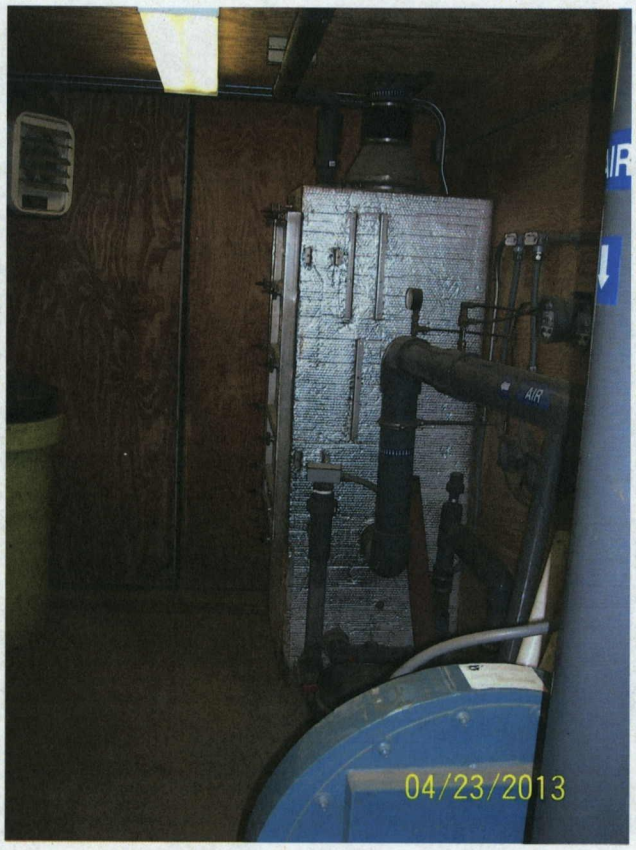
Location on Phase I where underground combustion occurred. To be repaired further. Facing west.

View from top of Phase I looking east towards tip facility; note vegetation in swales

Flare 2, currently taking LFG from Phases I, II, and III

Basin to be used for underdrain treatment

Phase I downchute into Pond 3; sediment delta to be removed; note vegetation in downchute



Groundwater treatment system interior; low-profile air stripper

Groundwater extraction well

Vegetation in swale near groundwater extraction well/system

ATV tracks (made by Broadrock personnel working on the LFG system); Phase I, east side

Downchute on north side of Phase I where settlement occurred

Water in swale feeding downchute on north side of Phase I; water flowing slowly

LFG monitoring well LFG99-12

Pond 2 discharge on south side of Shun Pike flowing towards Upper Simmons Reservoir in distance

ATTACHMENT G

INTERVIEWS

INTERVIEW RECORD

Site Name: Central Landfill Superfund Site	**EPA ID No.:** RID980520183	
Subject: Five Year Review	**Time:**	**Date:**
Type: ☐ Telephone ☒ Visit ☐ Other **Location of Interview:**	☐ Incoming ☐Outgoing	

Contact Made By:

Name:	Title:	Organization:
Warren Diesl	Project Manager/Hydrogeologist	AECOM
Sean Czarniecki	Sr. Project Engineer	AECOM

Individual Contacted:

Name:	Title:	Organization:
William Anderson	Engineering Manager	RI Resource Recovery Corp

Telephone No: 401-942-1430 **Fax No:** **E-Mail Address:** BillA@rirrc.org	**Street Address:** 65 Shun Pike, Johnston, RI

1. What is the extent of property owned or controlled by RIRRC, and what are the land uses (refer to map provided by GZA)?

RIRRC owns a total of about 1300 acres. About 600 acres are developed. The property lines shown on the figure provided are slightly out-of-date but are reasonably accurate.

Groundwater Extraction and Treatment System (GWETS)

2. Who (RIRRC or contractor) currently handles the O&M of the GWETS; how often is the GWETS checked, or are there automatic notifications to someone if any component ceases to operate?

GZA currently handles the O&M. System information is provided directly to GZA by telemetry. RIRRC is currently training an individual to take over the O&M – the target date for the takeover is July 2013. That individual checks the system daily. After RIRRC takes over the O&M, GZA will continue to do the reporting to maintain third-party credibility.

3. What is the status of the connection to the NBC Fields Point POTW sewer system, when will that discharge begin, and where will the discharge point be?

The force main/gravity sewer is scheduled to be completed by July 2013. The sewer goes north from the site to Central Avenue, then east across the Route 295 overpass to

the connection point at the intersection of Central Avenue and Atwood Avenue. The estimated date for the activation of the new sewer is December 2014.

4. What will be the relationship between the new OU1 groundwater treatment system (GWTS) and the leachate treatment system (LTS) for the Phase II-VI landfills (is a new LTS being built; where will the two treatment systems be located; will the effluents be combined; will the treatment of the extracted OU1 groundwater be dependent on the leachate flow rate?

RIRRC is issuing an RFP for a design/build contract for a new leachate treatment system, to be built east of the Materials Recycling Facility. The new facility will use sequencing batch reactor technology to biologically treat Central Landfill wastewaters. SBRs are used by many landfills, since they provide flexibility and good removal of BOD and nitrogen. The existing leachate treatment system will be demolished and replaced with two 750,000 gal storage tanks.

The current plan is to move the OU1 treatment system (in a Conex box) to a location near the new extraction system. The required treatment will depend on the levels of contamination in the water from the new OU1 extraction system; the leachate flow rate; and the NBC discharge requirements.

5. What are the discharge standards for the new POTW discharge, will the existing OU1 groundwater treatment system (GWTS) require any upgrade to meet those standards, and what is the status of the design of the new OU1 GWTS? Is it possible that the groundwater pumped from the proposed new groundwater extraction system will not require treatment prior to discharge to the NBC POTW sewer system?

See response to #4.

6. What is the status of the treatment system for the former Cedar Swamp Brook underdrain discharge at SW-4?

The system is under construction and scheduled for completion by June 30, 2013.

7. What is the currently estimated date on which abandonment of the existing GWETS will be required to begin Phase VI construction?

The baseliner construction for Phase VI will begin in April or May 2014 and be completed by fall 2014. Since the waste will initially be placed in a "mound" east of Phase I, and then the "valley" between that mound and Phase I east slope will be filled, waste will not be placed on the Phase I landfill until 2015 or 2016. Phase V still has capacity, and the current disposal rate is 2300 to 2800 tons/day (700,000 tons/year).

<u>Site Security</u>

8. What is the extent of fencing around the site?

The fence does not extend across the entire western boundary of RIRRC property, an area of swamps and dense woods.

9. What are the hours during which site security is present on site? Do they patrol the site or is their activity exclusively at the gate(s)?

Three RIRRC security personnel are on duty during the day, and one person patrols the site at night. During non-business hours, the gate can be opened with a key card or by security personnel.

10. Is there evidence or sightings of trespassers on the property? If yes, how often and what type of activities do they engage in?

Hunters occasionally trespass into the large undeveloped tract west of the landfill on foot. ATV trespass, which was a problem in the past, has been eliminated by fencing and locking gates.

11. Have there been any events of vandalism at the property?

Copper grounding rods were stolen several years ago, but there have been no recent incidents.

Landfill Gas

12. What are the current and anticipated future gas treatment and disposal operations at the site (is old gas-to-energy plant active/inactive/demolished, what is status of new GTE plant, flares, etc)?

The main (Waukesha) gas-to-energy plant has been offline since January. It will be demolished after Broadrock removes equipment and cleans the site. The new plant is in the testing phase and, if it hasn't done so already, will "go commercial" imminently. After the new plant goes commercial, Broadrock will be paying all costs associated with the landfill gas system.

13. What is the current division of responsibility between RIRRC and Broadrock for operating and maintaining the gas extraction wells, piping, blowers, etc?

BGS is owned by Broadrock. BGS does all of the work at the site. RIRRC currently pays for all of the field work done by BGS.

14. What is the current division of responsibility between RIRRC and Broadrock for performing gas monitoring on and around the landfill and for maintaining gas monitoring wells?

Surface emissions monitoring is done by SCS under contract to RIRRC. Ambient air monitoring (related to Phase V) is done quarterly by CDM Smith.

15. Was the Superfund site ever implicated in the recent episode of odor problems in the downwind area?

No. RIRRC ascribes the problem to insufficient gas extraction from Phases IV and V.

General

15. Have you heard of any cases of people wanting to install wells in the area where they're prohibited by the institutional controls?

No.

16. Are you aware of any activities on, or issues related to, the Simmons Reservoirs?

Fishing has been observed in the Upper Simmons Reservoir. It is assumed that the fishing is catch-and-release.

Wrap-Up

17. Do you have any recommendations for reducing or increasing activities at the site?

No.

18. Is there any other information that you wish to share?

No.

INTERVIEW RECORD

Site Name: Central Landfill Superfund Site	**EPA ID No.:** RID980520183	
Subject: Five Year Review	**Time:** 1:00 pm	**Date:** 05/17/13
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Interview:**	☐ Incoming	☐Outgoing

Contact Made By:

Name:	Title:	Organization:
Warren Diesl	Project Manager/Hydrogeologist	AECOM
Sean Czarniecki	Sr. Project Engineer	AECOM

Individual Contacted:

Name:	Title:	Organization:
Douglas L. McVay	Chief, Office of Air Resources	RIDEM

Telephone No: 401-222-2808 x7011 **Fax No:** **E-Mail Address:** doug.mcvay@dem.ri.gov	**Street Address:** 235 Promenade St, Providence, RI

1. What is your involvement in the Central Landfill project? Please describe any specific involvement with the CERCLA portion of the site (as opposed to the active landfill operations – and recognizing that the CERCLA and the non-CERCLA/active landfill parts of the site seem to be almost inseparable in terms of gas management and ambient air monitoring).

Doug is not specifically involved with the CERCLA portion of the site. His air group deals with the landfill in its entirety.

2. What is your overall impression of the CERCLA project?

He does not know much about the CERCLA project, although he is aware of it. Doug provided information that a Title V air permit has not been issued yet for the facility (still draft). He mentioned that the EPA air group had established a consent action in 2000. Terminating this agreement would make the permit "cleaner" and this is being worked on.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site, specifically related to the CERCLA portion of the site? If so, please give purpose and results.

Nothing specific to the CERCLA portion of the site. Doug mentioned that the gas from Phases I, II, and III is currently going to a remote flare due to tax credit issues. Remote

flare #2 (where the gas is currently going) has minimum performance requirements that need to be achieved when burning the gas.

4. Have there been any complaints, violations, or other incidents related to the CERCLA portion of the site requiring a response by your office? If so, please give details of the events and results of the responses.

There have been odor issues, but theyare not generally considered to be associated with the CERCLA portion of the site. The age of the waste (less gas produced) and the fact that these phases are capped typically takes them out of consideration as the source. When a tear in the liner occurs (as it recently did), releases are usually managed by the solid waste group of RIDEM.

5. Do you feel well informed about the site's activities and progress?

No, but he doesn't feel the need to be more informed.

6. Do you have any comments, suggestions, or recommendations regarding the management or operation of the CERCLA portion of the site?

Doug mentioned that they would like to see the tax credit issue remedied so that all of the gas can go to the gas plant to get cleaned. That would be the best use of the gas.

7. What reporting data (e.g., surface emissions monitoring, LFG monitoring, etc.) do you currently receive related to the CERCLA portion of the site (Phases I through III)? How does this data currently get managed upon arrival?

They receive surface emissions monitoring (SEM) and landfill gas well monitoring data. Staff in the compliance group reviews the data for performance issues.

INTERVIEW RECORD

Site Name: Central Landfill Superfund Site	**EPA ID No.:** RID980520183	
Subject: Five Year Review	**Time:** 11:30 am	**Date:** 08/13/13
Type: Telephone x Visit Other **Location of Interview:**	☐ Incoming	☐Outgoing

Contact Made By:

Name:	Title:	Organization:
Emily Zimmerman	Community Involvement Coordinator	EPA Region 1
Claire Willscher	Remedial Project Manager	EPA Region 1

Individual Contacted:

Name:	Title:	Organization:
Mayor Joseph Polisena	Mayor, Johnston, RI	Town of Johnston
Bernard Nascenzi	Johnston Building Official	Town of Johnston
Arnold Vecchione	Director of Public Works	Town of Johnston

Telephone No: **Fax No:** **E-Mail Address:**	**Street Address:** 1385 Hartford Ave, Johnston, RI

On August 13, 2013, EPA held a Five-Year Review Interview with Johnston Mayor Joseph Polisena, Johnston Building Official Bernard Nascenzi and Johnston Director of Public Works Arnold Vecchione. The City Officials noted that people live in the area around Central Landfill, and they have suffered various impacts through the years. They described historical and current issues regarding Central Landfill, particularly with respect to Phases IV and V, which are not part of the Superfund Site.

In terms of the Superfund Site, EPA described the approximate location of the OU1 groundwater contamination, the performance of the current hydraulic containment and groundwater treatment systems, and the expectation that the hydraulic containment and groundwater treatment systems will be relocated to the toe-of-slope of the waste management area.