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# Preliminary Closeout Report



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## ROSE HILL REGIONAL LANDFILL SITE South Kingstown, Rhode Island



E.T.S.L. Corp.

Rhode Island Department of Environmental Management  
US Environmental Protection Agency  
Towns of South Kingstown and Narragansett, RI

THE LOUIS BERGER  
GROUP INC.



September 2008

Prepared by:  
The United States Environmental Protection Agency  
Region 1, New England  
Boston, Massachusetts

## I. INTRODUCTION

This Preliminary Close Out Report (PCOR) documents the completion of all physical, remedial construction activities at the Rose Hill Regional Landfill Superfund Site (the "Site") (EPA ID # RID 980521025) as required by the Record of Decision for the Site, dated December 20, 1999 (the ROD). This PCOR was prepared in accordance with *Close Out Procedures for National Priorities List Sites* (OSWER Directive 9320.2-09A-P). EPA and the State of Rhode Island conducted a pre-final inspection of the landfill on September 25, 2007 and September 26, 2008 and concluded that the construction was substantially complete in accordance with remedial design plans and specifications. No outstanding construction items are identified. Therefore, no additional construction activities are anticipated at the Site.

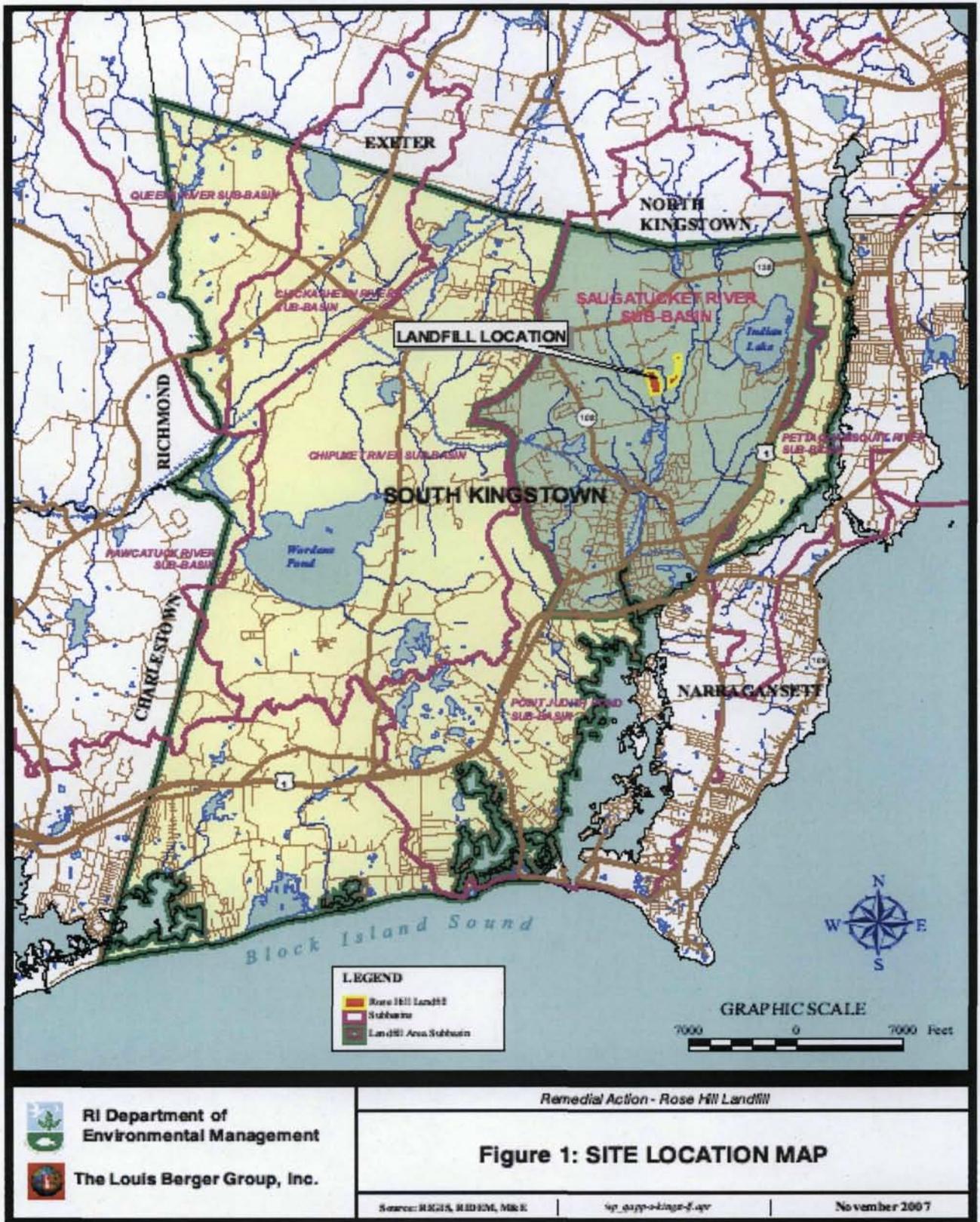
Further information concerning the Site, including the Rose Hill Regional Landfill Administrative Record, is maintained by the Rhode Island Department of Environmental Management (RIDEM) and is available to the public. For an appointment to view the Administrative Record locally, RIDEM may be contacted at 235 Promenade Street, Providence, RI, 02908 or by calling (401) 222-2797, Ext. 7307. The Administrative Record may also be viewed at the South Kingstown Public Library, 1057 Kingstown Road, Peace Dale, RI, or otherwise by calling for an appointment to visit the EPA New England Records Center, One Congress Street, Boston, MA 02114 (617) 918-1440. Additional information can be obtained by visiting the EPA Rose Hill Regional Landfill website at: <http://www.epa.gov/region1/superfund/sites/rosehill>.

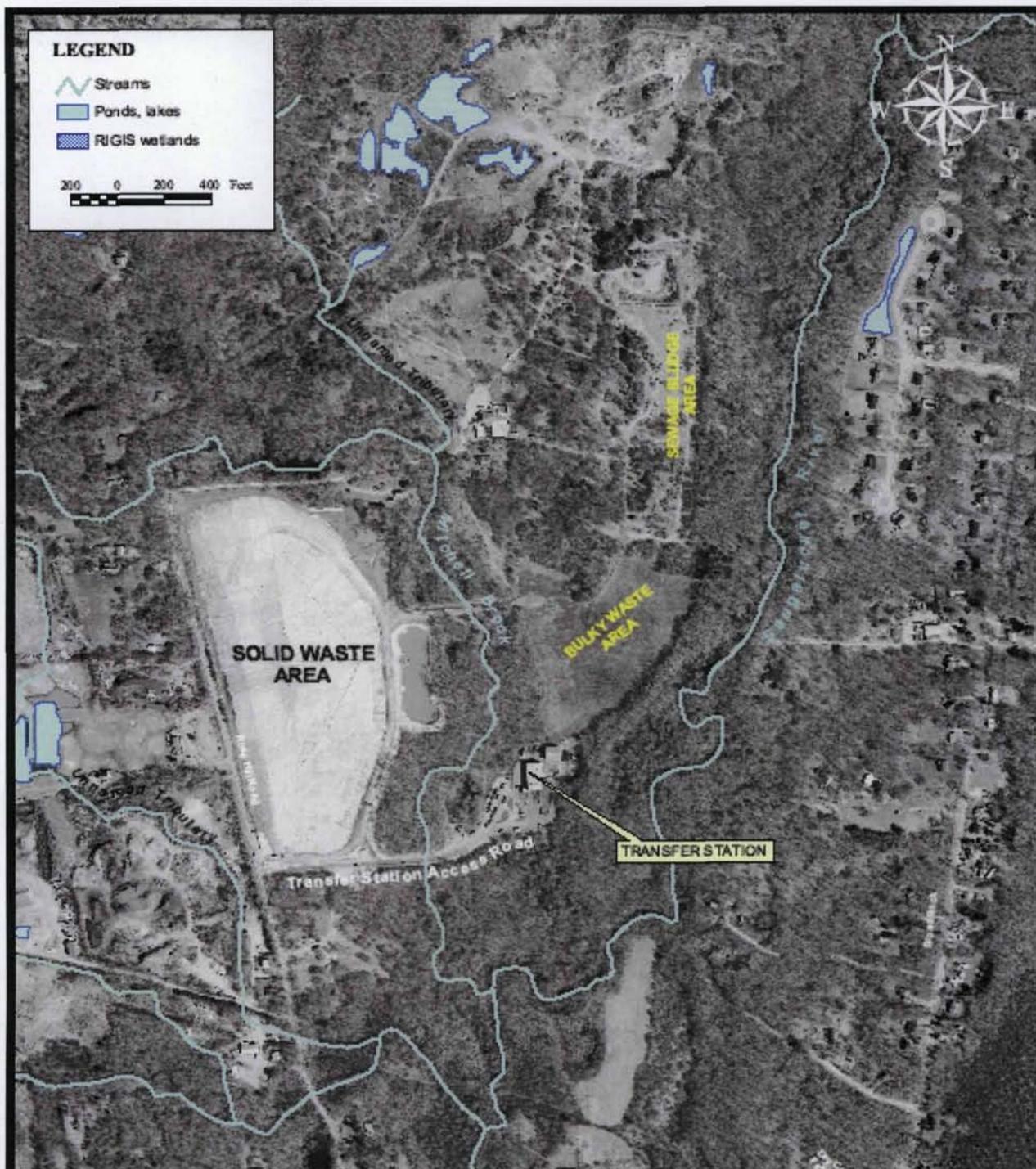
## II. SUMMARY OF SITE CONDITIONS

### **Background**

The Site is located within the town of South Kingstown, Rhode Island in the village of Peace Dale within Washington County. It lies approximately five miles inland from Narragansett Bay and two miles north of Wakefield, Rhode Island. The Site is bordered by Rose Hill Road to the west, the Saugatucket River to the east and residential private property to the north and south. Figure 1 illustrates the Site location with reference to the Town of South Kingstown and other abutting Towns. The Site began operation in 1967 and was operated by the Town of South Kingstown under a state permit from RIDEM. For approximately 16 years, the Site received domestic and industrial wastes from residents and industries in the Towns of South Kingstown and Narragansett. In October 1983, the Site reached its state permitted maximum capacity and active landfilling operations ceased.

The Site is located in an abandoned sand and gravel quarry and encompasses approximately 70 acres. As shown in Figure 2, the Site consists of three separate and inactive disposal areas or landfills, referred to herein as the Solid Waste Area (SWA), the Bulky Waste Area (BWA) and the Sewage Sludge Area (SSA).






**RI Department of Environmental Management**  

**The Louis Berger Group, Inc.**

Remedial Action - Rose Hill Landfill

**Figure 2: SITE AERIAL EXISTING FEATURES MAP**

Source: RIGIS, RIDEM, M&E | [em.louisberggroup.com](http://em.louisberggroup.com) | November 2007

Two primary surface water bodies, the Saugatucket River and Mitchell Brook, flow through/near the Site. An unnamed brook, west of the Site, flows into the Saugatucket River and an unnamed tributary, in the northern portion of the Site, flows into Mitchell Brook. The Saugatucket River is classified by the State of Rhode Island as a Class B water body that is suitable for fishing and swimming. Wetland and flood plain habitats are also found adjacent to the disposal areas. An open excavated area approximately 400 feet north of the disposal areas is currently used for target and skeet shooting. A former sand and gravel bank exists approximately 200 feet west of the disposal areas.

### **Initial Response Activities**

In 1985, the Utilities Department of the Town of South Kingstown extended the municipal water line to residences on Rose Hill Road where testing of residential water supply wells indicated that contaminants had migrated from the landfill into the local groundwater. The Site was proposed for listing on the National Priorities List on June 24, 1988 and on October 4, 1989 the listing became final.

The Remedial Investigation (RI) and Feasibility Study (FS) were conducted by EPA beginning in 1990 with field work commencing in the Spring of 1991. As part of the investigation EPA installed permanent soil gas sampling wells on the three landfill disposal areas and along the perimeter of the Site. Initial sampling results indicated the presence of explosive levels of combustible and hazardous gases in the vicinity of residential dwellings abutting the landfill. As a result of further testing, EPA issued a Unilateral Administrative Order (RCRA Docket 1-93-1055), directing the Towns of Narragansett and South Kingstown to install methane gas sensors/alarms at two residences. The Order also directed the Towns to install a methane gas ventilation system and a gas sensor/alarm at a third home; however, the Towns elected to relocate the residents and raze the building.

### **Basis for Remedial Action**

The principal threats at the Site continue to be direct contact with and ingestion of contaminated groundwater and inhalation risks of landfill gas.

The Operable Unit 1 (OU1) Human Health Risk Assessment concluded that compounds of concern in groundwater and air at the SWA may present an unacceptable human health risk (e.g., cancer risk  $>10^{-4}$  or HI  $>1$ ) to area adult residents and adult visitors via ingestion and inhalation.

Results of the baseline ecological risk assessment identified concentrations of iron and aluminum in surface waters throughout the Site that frequently exceeded criteria levels, especially in areas downstream of leachate seeps near the SWA and BWA. Such concentrations posed a risk to aquatic organisms in the surface waters from exposure to these chemicals of ecological concern. Concentrations of iron and aluminum in leachate also exceeded ambient water quality criteria (AWQC) by up to four orders of magnitude for iron and up to three orders of magnitude for aluminum. The risk to aquatic organisms

was confirmed by results from leachate toxicity testing, which indicated that the leachate is acutely toxic to aquatic organisms. Additionally, the correlation analysis between benthic community composition and chemical concentrations showed a significant negative correlation between iron concentration and species densities in the surface water of the brook and the river.

Based on these findings, the remedial action objectives established in the OU1 ROD required that the remedy: 1) reduce risk to human health from consumption of, and direct contact with, groundwater, 2) reduce the potential exposure of area residents and those at the landfill to landfill gases in ambient and indoor air via inhalation, and 3) reduce contaminant migration via leachate to surface waters and sediments of local water bodies of the State in order to improve water quality and designated uses, including aquatic life support.

### **Selected Remedy**

The OU1 ROD selected a source control remedy for the Site, consisting of the following remedial components:

- Excavate and consolidate BWA landfill materials onto SWA;
- Collect and effectively manage leachate and waters collected from runoff and dewatering operations during excavation of BWA;
- Construct a multi-layer hazardous waste cap using innovative and cost-efficient materials over the limits of SWA and consolidated BWA;
- Inspect and monitor the effectiveness of landfill cap over time;
- Assess, control, collect, and treat landfill gas emissions by an active internal and perimeter gas collection system and thermal destruction system;
- Monitor landfill gas emissions to assess effectiveness of landfill gas collection and treatment system;
- Institute access restrictions and institutional controls on land use and groundwater;
- Install a chain link fence and/or physical barrier to prevent site access, injury, and/or exposure;
- Long-term monitoring of surface water, groundwater, air and leachate seeps;
- Perform long-term operation and maintenance activities throughout life of remedy; and
- Conduct five-year statutory reviews.

In the Summer of 2001, the EPA and RIDEM entered into a Cooperative Agreement (CA) which provided EPA's share of the funding for the Remedial Design (RD) phase of the cleanup and identified RIDEM as the lead agency (with EPA oversight) for the RD work.

In a Consent Decree entered in March 2003 (Consent Decree) the Towns of Narragansett and South Kingstown (the Towns), the State of Rhode Island and EPA agreed to share in the cost of the cleanup of the Site. The Consent Decree identified the State of Rhode

Island as the lead agency for the design and construction phases with EPA participating in an oversight role.

In anticipation of the completion of the design, in September 2004, EPA and the State entered into a second CA focused on construction of the source control remedial action. The State completed the remedial design in January 2005 and immediately advertised the project for bid. The construction project was cast in two phases, with Phase 1 being consolidation of the BWA onto the SWA and shaping the landfill prior to capping, and Phase 2 being the construction of the cap. Actual construction of the remedy began in May 2005 with RIDEM's Notice to Proceed on Phase 1 of the project. An estimated 160,000 cubic yards of waste material was excavated from the BWA and consolidated onto the SWA. Consolidation and shaping was completed by early February 2006. In the late Summer of 2006, RIDEM initiated Phase 2 of the construction project by starting cap construction. As a part of the Phase 2 project, the organic rich soils from the SSA neighboring the Site was mixed with top soils to provide a fertile base for the vegetative layer of the cap. The cap construction work was deemed substantially complete as of September 25, 2007. RIDEM and EPA also completed the reporting requirements, such as producing as-built drawings, a remedial action report, and various post-construction work plans for demonstrating compliance and providing for long-term maintenance and monitoring during the Summer of 2008 and beyond.

Residents of South Kingstown obtain water from both public and private wells. Private wells within a 3-mile radius of the Site consists of overburden or bedrock wells. Three supply wells for the University of Rhode Island are located approximately 2.7 miles northwest of the Site. Two municipal supply wells for the Kingstown District are located approximately 3-miles northwest of the Site. The University and the District use each other's systems as water supply back up. In 1985, the Town of South Kingstown provided a municipal water line extension to adjacent residences located on Rose Hill Road and dwellings abutting the immediate northern portion of the Site. By 1989, water service was provided to residences on Broad Rock Road. Residences that abut the Site along Rose Hill Road and Pearl's Way north, west, east, and south of the Site are all hooked up to municipal water.

A long-term groundwater, surface water and air monitoring program has remained actively in place for many years and throughout the design and construction phases of the source control remedy. As described in the ROD, chlorinated volatiles detected most often and in the highest concentrations were 1,1 dichloroethane (range of 1 to 220 ug/L), 1,2 dichloroethylene (3 to 730 ug/L), vinyl chloride (3 to 690 ug/L), and chloroethane (4 to 86 ug/L). In comparison, the lower concentrations of the more chlorinated volatiles (i.e., TCE, PCE, 1,1,1-TCA) suggested that degradation processes were active. Aromatic volatiles, primarily benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, were also detected in most of the wells. Although prevalent, it was noted during the Remedial Investigation that volatile concentrations appear to have decreased since landfill operations ceased. During previous studies, the highest concentrations in ground water were measured between 1981 and 1982, and by 1984 concentrations had decreased by as much as several orders of magnitude.

In review of the current data collected at the Site during and after the construction of the cap (2002-2008), only benzene, 1,1 dichloroethane, and manganese remain above health-based standards while tetrahydrofuran, chloroethane, and vinyl chloride remain detected, but below protective standards. Moreover, metals, which exceeded the AWQC for surface water before the ROD, remain unchanged or are slightly decreasing in view of the current data. It is inferred from this data that natural attenuation processes and the impervious cap are likely at work in stabilizing and potentially further reducing contaminant concentrations. Additional monitoring over time is required to further document these observations.

As part of the OUI remedy, the Consent Decree requires the Town of South Kingstown to file a Declaration of Covenants and Environmental Protection/Conservation Easements (Institutional Controls or ICs) with respect to property it owns at the Site. Moreover, the Town is instructed to put in place similar ICs on any abutting properties that may be affected by contamination from the Site. The ICs are restrictive covenants and conservation easements recorded with the land records and are intended to protect the integrity of the cap, prohibit the use of groundwater except for remediation purposes, prohibit the use or installation of groundwater wells on the affected property(s), and prohibit the alteration of the groundwater flow in any way. These ICs are scheduled to be fully implemented by the end of 2009. Security fencing has also been erected around the SWA to limit access and protect the infrastructure of the cap. Collectively, these remedial components were developed and implemented to manage exposure pathways that could result in unacceptable risks.

Further evaluation of the landfill gas collection and combustion system, as required in the ROD, was completed in 2005 during the design phase of the source control remedy. A design team, including RIDEM and its design consultant, EPA, and an independent quality assessment team (IQAT) concluded that landfill gas (LFG) generation could be handled in a phased management approach. A design decision was made to build the LFG collection system such that it could be operated in either a passive (venting) or active (combustion) mode. This alternative LFG collection system is in compliance with state and federal regulations and the air risk assessment performed by EPA. The LFG system will operate by passively venting emissions through a series of vertical ventilation ports.

A robust monitoring plan and sampling infrastructure are in place to assure protectiveness. If ambient air monitoring or modeling identifies a need to proceed with active flaring (combustion) of the LFG, the LFG collection and combustion system can be switched from passive to active mode. Landfill gas sampling will be conducted at least quarterly at each of the landfill gas vents and off-landfill monitoring probes, as described in the Long Term Monitoring (LTM) Work Plan. The laboratory-analyzed landfill gas sampling results will be compared to ambient air criteria as outlined in the RIDEM Air Pollution Control Regulation Number 22 for Air Toxics. If these landfill gas results exceed the RIDEM ambient air criteria, then the landfill gas results will be compared to ambient air criteria using the RIDEM SCREEN3 model. If the results of the

modeling point to an exceedance of the criteria, an expedited ambient air abatement program will be developed in coordination with EPA and RIDEM. The constructed remedy can be converted from the current passive landfill gas migration system to an active landfill gas migration system. This is accomplished by having the proper valves, piping, and flanges already in place at two separate concreted pad locations, located on the northeast and southeast side of the landfill, where a hook up to blowers, flares and supplemental fuel supplies can be installed relatively quickly. The ambient air abatement program will specify the details for the equipment needs necessary to provide a timely response.

The LFG monitoring data collected in 2008 indicates that such a passive LFG management system will provide protection from the ambient air risks identified in the ROD and result in a significant cost savings in fuel and operational costs. Further details concerning this change in design and operation at the Site is described in the Explanation of Significant Difference (ESD) approved in September 2008. The ESD is also included for inclusion in the Administrative Record for the Site.

Based on performance data collected both during and after implementation of the OUI source control remedy, ground water contamination at the Site has diminished significantly. Further monitoring is required to ensure that this trend continues. However, the expected outcome of the source control remedy is that the Solid Waste Area will no longer present an unacceptable risk to area residents or to individuals at the Site through the inhalation of landfill gas. Another expected outcome of the selected remedy is that ground water in the vicinity of the Site will not present an unacceptable risk to area residents through ingestion as a result of the use of institutional controls. The selected remedy will also provide environmental and ecological benefits such as incremental improvement of a riverine and wetland ecosystem by minimizing contaminant migration into wetland habitat adjacent to the River, and by improving the resource of the upland area associated with the former Bulky Waste Area. Therefore, based on existing source control performance monitoring gathered to date, no additional construction activities are anticipated at the Site.

### **Redevelopment Potential**

The Rose Hill Consent Decree required that a beneficial reuse study for the Site be performed early in the RD/RA process to allow for reasonably anticipated future land use options to feed into the design and construction planning processes. In August 2003, the Towns engaged Camp, Dresser and McKee to prepare a beneficial reuse study. The reuse document noted that any anticipated reuse options at the Site needs to factor in the inherent limitations stemming from land use restrictions placed on the property in order to protect the constructed remedy. Additionally, the study noted that reuse of the Site must be consistent with the surrounding residential neighborhoods. Further, local officials insisted that reuse of the Site not alter the risk assessment assumptions developed by USEPA. Conceptual future use options were identified. Such future uses included open space concepts such as a golf range (SWA), nature trails, dog park, and/or sports play areas (utilizing the former BWA). However, no formal proposals concerning reuse have

been made at the present time. Any future development opportunity for the Site would have to go through the Town's capital improvement program (CIP) budget process. EPA and RIDEM remain open to discuss reasonably anticipated reuse opportunities with the Towns that are not inconsistent with the identified land use restrictions, maintain the integrity of the constructed cap, and do not otherwise interfere with the operations and maintenance of the remedy over the long term.

### III. DEMONSTRATION OF CLEANUP ACTIVITY QUALITY ASSURANCE AND QUALITY CONTROL

The methods, procedures, inspections and tests were performed in accordance with the Construction Quality Assurance Plan prepared as part of the RIDEM and EPA approved designs. The construction contractors Quality Control Plans were implemented and verified by the Independent Construction Quality Assurance Team, EPA's remedial project manager, and RIDEM's project manager. Construction completion is consistent with the ROD, the Consent Decree and the remedial design plans and specifications.

### IV. ACTIVITIES AND SCHEDULE FOR SITE COMPLETION

It is estimated that all activities associated with Site completion will be performed according to the schedule below:

**Schedule for Site Completion**

<b>Task</b>	<b>Estimated Date</b>	<b>Responsible Organization</b>
Remedial Action Start	May 2005	RIDEM
Pre Final Inspection (Phase 2)	September 2007 and September 2008	RIDEM/EPA/TOWNS
Final RA Reports (Phase 1 & 2)	September 2008	EPA/RIDEM
Operational & Functional Determination	May 2009	EPA/RIDEM
Operations and Maintenance Start	May 2009	RIDEM/TOWNS
Institutional Controls Implemented	December 2009	RIDEM/TOWNS
First Statutory Five-Year Review	May 2010	EPA/RIDEM
Second Statutory Five Year Review	May 2015	EPA/RIDEM
Final Site Inspection	June 2015	RIDEM/EPA/TOWNS
Decision Document (for ground water)	August 2015	EPA/RIDEM
Final Close Out Report	September 2015	RIDEM/EPA
NPL Site Deletion	September 2015	EPA

All preliminary completion requirements for the Site have been met as specified in OSWER Directive 9320.2-09A-P. Specifically, pre-final inspections were conducted by EPA and the State of Rhode Island which verified that construction activities scheduled and planned as part of the OU1 remedy have been completed. No further "punch list" items (e.g., erosion control, fencing, or other) have been identified.

Under the terms of the Consent Decree, demonstration of compliance through long term monitoring, and operations and maintenance tasks are the sole responsibility of the State and Towns. EPA will oversee these long term response activities.

## V. SUMMARY OF REMEDIATION COSTS

The costs of the selected remedy are summarized below:

### Estimated Remedial Action Construction Costs

Cost Item	Cost
Excavation/Consolidation (Phase 1 Construction Costs)	\$3,900,000.00 approximated*
Cap Construction (Phase 2 Construction Costs)	\$8,559,686.00
Total Construction Costs	\$12,459,686.00
Estimated Annual O&M (with passive LFG system)	\$166,000.00
EPA RD/RA Oversight Costs (2001/2008)	\$214,103.00

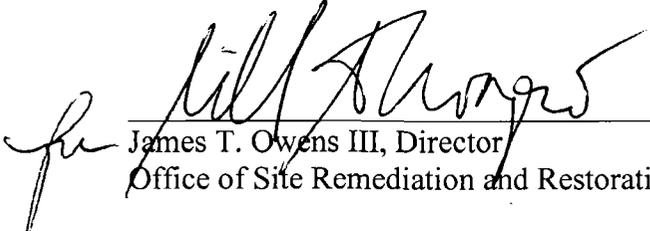
\* Actual Phase 1 construction costs may vary once a resolution of outstanding Phase 1 change orders is resolved.

## VI. FIVE-YEAR REVIEW

Hazardous substances will remain at the Site above levels that allow unlimited use and unrestricted exposure after the completion of the action. Pursuant to CERCLA §121(c) and as provided in the current guidance on Five-Year Reviews (OSWER Directive 9355.7-03B-P, June 2001), EPA must conduct a statutory five-year review. The first Five-Year Review Report for the Rose Hill Regional Landfill Site is scheduled for the third quarter of 2010. In the interim, exposure pathways that could result in unacceptable risks are being controlled. Institutional controls to prevent consumption of groundwater and prevent activities that would compromise the integrity of the remedy are scheduled to be fully implemented by the end of 2009.

## VII. APPROVAL OF PRELIMINARY CLOSE-OUT REPORT

So approved:

  
\_\_\_\_\_  
James T. Owens III, Director  
Office of Site Remediation and Restoration

  
\_\_\_\_\_  
Date

Selected Rose Hill Project Photos



**Grubbing and site prep at Solid Waste Area along Rose Hill Road (Phase 1)**



**Waste removal for consolidation underway at Bulky Waste Area (Phase 1)**



**Waste contouring and consolidation on the Solid Waste Area (Phase 1)**



**Laying the LFG gas collection pipe network (Phase 2)**



**Sequencing the cap installation on the slopes (Phase 2)**



**Capping sequence along top of slope of Solid Waste Area (Phase 2)**



**View of south pond/wetland complex shortly after restorative planting. Pond will act as a storm water retention basin and on-site wetland habitat.**



**Aerial photo taken June 2008 showing SWA, BWA and SSA completed; cover crops taking hold. Operating solid waste transfer station in center right of photo.**