FOURTH FIVE-YEAR REVIEW REPORT FOR
THE LIPARI LANDFILL SUPERFUND SITE
GLOUCESTER COUNTY, NEW JERSEY

Prepared by

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Region 2
New York , New York

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Date

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LIST OF ABBREVIATIONS & ACRONYMS

BCEE	Bis-2-Chloroethyl Ether
CDM	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulation
COC	Contaminant of Concern
DPE	Dual Phase Extraction
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
MCL	Maximum Contaminant Level
NJDEP	New Jersey Department of Environmental Protection
NJGWQS	New Jersey Groundwater Quality Standards
NPL	National Priorities List
O&M	Operation and Maintenance
POTW	Publicly Owned Treatment Works
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SVE	Soil Vapor Extraction
TOU	Thermal Oxidation Unit
USACE	United States Army Corps of Engineers
VI	Vapor Intrusion
VGAC	Vapor Phase Granular Activated Carbon
VOC	Volatile Organic Compound

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fourth FYR for the Lipari Landfill Superfund Site, located in the Town of Mantua, Gloucester County, New Jersey. The triggering action for this tatutory review is the completion date of the previous FYR on August 7, 2012. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of three operable units (OUs), and all three OUs will be addressed in this FYR. The OU1 remedy, which consists of a containment system used for source control including an underground soil/clay cutoff wall and cap for the contaminated landfill area, is completed. The OU2 remedy includes batch flushing to clean the soil and trash within the containment system of water-soluble contaminants with on-site pretreatment of groundwater and leachate, and discharge to the local Publicly Owned Treatment Works (POTW). The OU2 remedy is ongoing. The OU3 remedy, which addresses the cleanup of contiguous contaminated areas outside the containment system, i.e., the off-site areas including soil, sediment and groundwater, has been completed; associated groundwater capture for treatment is continuing.

The Lipari Landfill Superfund Site FYR was led by Tanya Mitchell, the EPA Remedial Project Manager (RPM). Participants included Robert Alvey, EPA hydrologist, Urszula Kinahan, EPA human health risk assessor, Michael Burlingame, New Jersey Department of Environmental Protection (NJDEP), Steve Wohleb, NJDEP, John Skurat, NJDEP, Francisco Barba, United States Army Corp of Engineers (USACE) project manager, Dan Sirkis, USACE hydrologist, and Daryl Solomam, USACE engineer.

Site Background

The Lipari Landfill site is located in Mantua Township, adjacent to Pitman, Glassboro, and Harrison Townships in Gloucester County, New Jersey, in a mixed agricultural, commercial, and residential area. The site is approximately 16 acres in size, and is bordered by two streams, Rabbit Run to the northwest and Chestnut Branch to the northeast, which flow into the 26 acre Alcyon Lake about 1,500 feet downstream from the site.

Landfill dumping was confined to an area of approximately 6 acres, at the former sand and gravel borrow pit. Initially, landfilling consisted of the disposal of municipal wastes; however, later operations included the disposal of liquid and solid industrial wastes, including cleaning solvents, paint thinners, waste solvents, formaldehyde, phenol and amine wastes, dust collector residues, and resin and ester-containing press cakes. An estimated 12,000 cubic yards of solid waste and 2.9 million gallons of liquid wastes were dumped in the landfill. Wastes were dumped into trenches 30 to 50 feet wide by 50 to 85 feet long by 6 to 15 feet deep. Although most liquid wastes were dumped out of their containers into the landfill cells, the possibility remains that drummed wastes may be present underground.

The landfill operations were closed in 1971 by the State of New Jersey. In 1983, the EPA installed a cutoff/slurry wall and synthetic cap containment system around the 16-acre area in order to isolate the regions of greatest contamination. The Lipari Landfill site was included on the EPA's National Priorities List (NPL) on September 8, 1983. The site was addressed in three phases or operable units, each covered by a separate Record of Decision (ROD).

FOURTH FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Lipari Landfill Superfund Site		
EPA ID: NJD980505416		
Region: 2	**State:** NJ	**City/County:** Town of Mantua/Gloucester County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: EPAEPA ***[If "Other Federal Agency", enter Agency name]*:**		
Author name (Federal or State Project Manager): Tanya Mitchell		
Author affiliation: EPA		
Review period: 8/7/2012 - 7/21/2017		
Date of site inspection: 9/14/2016		
Type of review: Discretionary		
Review number: 4		
Triggering action date: 8/07/12		
Due date *(five years after triggering action date)*: 8/07/17		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The first signs of a potential problem at the Lipari Landfill were observed in 1970 by Mr. Lipari and New Jersey Department of Health (NJDOH) personnel. NJDOH noted that leachate was emanating from the landfill side-slope and had received complaints by residents of chemical odors. After unsuccessful efforts to correct the problem, a number of investigators sampled various media of interest including groundwater in the Cohansey formation beneath the site, groundwater discharge into Chestnut Branch, and surface water from Chestnut Branch, Rabbit Run, and Alcyon Lake. In 1982, a report was completed by EPA's contractor, Radian Corporation, which included investigation results and remedial alternatives for OU1 source control. In 1985, the remedial investigation (RI) and feasibility study (FS) reports, for OU2 treatment of contained waste, were completed by EPA's contractor, CDM Smith. The following contaminants of concern (COCs) were identified: Volatile Organic Compounds (VOCs): benzene, chlorobenzene, ethylbenzene, 1,2-dichloroethane (1,2-DCA), 4-methyl-2-pentanone, methylene chloride, toluene, xylenes and chloroform; Semi-Volatile Organic Compounds (SVOCs): bis(2-chloroethyl)ether (BCEE) and phenol; Metals: chromium, nickel, lead, mercury, selenium, arsenic, zinc, and silver. In 1987 and 1988, EPA's contractor, CDM, completed the RI/FS reports for OU3 contaminated off-site

areas. These investigations and studies found that COCs had migrated from the landfill source area to the nearby wetlands, including Chestnut Branch marsh, Chestnut Branch, Rabbit Run, and Alcyon Lake.

During the on-site remedial investigation, it was determined that, should no action be taken, two pathways of potential risk to the environment and human health would persist: seepage of contaminants into the downgradient Cohansey aquifer and into the nearby surface streams, and eventually into Alcyon Lake; and seepage of contaminants downward through the Kirkwood clay into the Kirkwood aquifer, which flows towards Alcyon Lake.

Furthermore, the public health evaluation characterized the risk associated with exposure to off-site Lipari Landfill indicator chemicals. A lifetime excess cancer risk greater than 1×10^{-6} was characterized for the following exposure pathways: direct contact with soils in the leachate seep areas; consumption of fish from Alcyon Lake; and inhalation of ambient air in the Howard Avenue residential area.

An ecological risk assessment was not conducted to support the 1988 ROD.

Response Actions

In July 1971, the NJDEP notified Mr. Lipari to correct the landfill contents from seeping into adjacent surface waters. After consulting with engineers, he constructed surface water runoff diversions, re-graded areas of the landfill, and spread fresh dirt and lime to mitigate the problem. These efforts proved to be ineffective. The NJDEP filed suit in 1972 against Mr. Lipari for violation of the New Jersey Water Quality Act. Various agencies including EPA, NJDEP, and New Jersey Solid Waste Administration conducted sampling at the site between 1978 and 1981. EPA installed and sampled 16 monitoring wells to determine the direction of groundwater flow and the extent of contamination. A security fence was installed to restrict access to the landfill in 1982. Additional fencing was installed between 1983 and 1985 to restrict access to neighboring wetlands which had been impacted.

OU1 Selected Remedy – Containment System – ROD Signed August 3, 1982

- Phase I: Placement of a 360-degree soil bentonite cutoff wall with synthetic impermeable cap over 16 acres, which encompassed the six-acre landfill site and 10 additional acres of contaminated property; and
- Phase II: Installation of groundwater collection wells located within the contaminated zone, including the waste body itself, with treatment of the groundwater contained within the cutoff wall.

The OU1 remedy was constructed from 1983 through 1984.

In a 2017 Explanation of Significant Differences (ESD), EPA documented the imposition of institutional controls to limit land and groundwater usage at the site, as well as modifications for a portion of the containment cutoff wall.

OU2 Selected Remedy – Batch Flushing and On-Site Pretreatment – ROD signed September 30, 1985

- Construction of a leachate pretreatment plant and water injection/leachate extraction wells to cleanse the landfill containment system of water transportable contaminants. The containment system,which was selected in the OU1 ROD, included a cap and a 360-degree slurry wall keyed to an underlying clay layer;
- Operation of a batch flushing system to cleanse the landfill containment system of water-transportable contaminants, by alternatively emptying the landfill of leachate by pumping to an on-site pretreatment plant and filling the landfill with fresh water to form more leachate, until no further contaminant reduction is seen; discharge of the pretreated leachate to a local POTW, pending approval by the State of New Jersey and the POTW; and coordination of the operation with the off-site OU3 remedial action, especially with regard to leachate treatment; and
- Groundwater monitoring downgradient of the site within the Kirkwood aquifer, which underlies the clay layer beneath the site.

A 1992 ESD called for an increase in the pumping capacity of the well system, an increase in the size of the air stripper and granular activated carbon adsorption unit, and additional facilities as part of the pretreatment operation.

A 2017 ESD documents the remedy selected in the 1985 OU2 ROD, as clarified in a 1986 ROD clarification letter, and explained in the 1992 ESD, is still the most appropriate means of protecting human health and the environment, but that operation of the batch flushing system at the site has reached the limits of technology. Because the batch flushing no longer is effective in removing contaminants from the groundwater within the containment wall, the operation will be changed permanently to discontinue batch flushing and lower the water level to maintain an inward gradient within the containment wall; and the continued operation of the soil vapor extraction system to remove contaminants present in the soil vapor within the containment. This containment remedy requires long-term Operation and Maintenance (O&M), which, as required by CERCLA, will be performed by the State.

OU3 Selected Remedy – Off-Site Marsh, Streams, Lake & Groundwater Contamination – ROD signed July 11, 1988

- Collection of groundwater/leachate in the Cohansey and Kirkwood aquifers, followed by on-site treatment and discharge to a POTW;
- Excavation of contaminated soils in the Chestnut Branch marsh, followed by thermal treatment to remove organic contaminants and placement as a non-hazardous material;
- Dredging and dewatering of contaminated sediments in Alcyon Lake, followed by thermal treatment to remove organic contaminants and placement as a non-hazardous material;
- Dredging and dewatering of contaminated sediments in Rabbit Run, followed by thermal treatment to remove organic contaminants and placement as a non-hazardous material;
- Temporary measures, if necessary, to reduce volatile emissions from leachate seepage areas in the Chestnut Branch marsh; and
- Integration of sampling in the off-site areas with the on-site monitoring plan to monitor the effectiveness of the on-site flushing action.

An ESD signed on June 7, 1993 called for:

- Increasing the volume of soils/sediments to be excavated from Chestnut Branch marsh, Chestnut Branch, and Rabbit Run to 58,100 cubic yards from the original ROD estimate of 31,250 cubic yards;
- Thermal treatment of Chestnut Branch marsh soils to remove BCEE, volatile organic compounds, and other organic contaminants to levels acceptable for placement on Alcyon Racetrack;
- Removal of Alcyon Lake sediments to their interface with clean lake sand;
- Removal of Alcyon Lake sediments by draining the lake and excavation rather than by hydraulic dredging, as described in the ROD;
- Placement of Alcyon Lake, Chestnut Branch, and Rabbit Run sediments directly as non-hazardous material at Alcyon Racetrack except for any sediments containing average BCEE levels greater than 180 ppb, which would require thermal treatment before placement;
- Increasing the wastewater flow volume from off-site activities from 40 gpm to approximately 120 gpm;
- Installation of a temporary wellpoint interception system alongside the future alignment of the permanent drainage system to collect leachate seepage and allow on-site cleanup to proceed; and
- Increased cost estimate to implement the remedy as modified from about $21 million up to $75 million.

The 2017 ESD documented the imposition of institutional controls to protect the remedial groundwater collection system and limit land usage.

Status of Implementation

OU1 Selected Remedy – Containment System

In 1983 and 1984, EPA directed the construction of a slurry wall and membrane cap designed to limit the migration of contaminants from the site. The project was completed in the spring of 1984. In 2011 and 2012, an additional slurry wall was completed in order to surround an area of trash and contaminated soil on the northern portion of the site that was outside of the then existing slurry wall. This slurry wall and HDPE cap have been continuously monitored since construction and both appear to be functioning as designed. However, in some areas of the cap, particularly on the western side, consolidation of the the buried trash has caused depressions in the cap. EPA completed repairs on some of these cap depressions in April 2013, additional depressions may need to be repaired. EPA has funded a pilot study to evaluate a potentially more cost effective approach for addressing landfill cap depressions at the site.

Current Status of the Containment Syetem is complete with ongoing operation and maintenance

OU2 Selected Remedy – Batch Flushing and On-Site Pretreatment

Construction of a "batch flushing" system began in 1990 and was put into operation in 1992. The process consisted of injecting uncontaminated water from the Mt. Laurel aquifer into the contained landfill area, extracting contaminated water from the contained landfill area, treating the extracted water at the on-site treatment facility, and discharging the treated water to the Gloucester County Utilities Authority (GCUA). The batch flushing method was modified in August 1996 such that the injection of clean water into the containment system and the extraction of contaminated water by pumping of the extraction wells occurred simultaneously. The modified flushing method was used from September 1996 to May 2008.

In 2008, when batch flushing operations ceased and landfill interior water levels dropped, new areas of vapor contamination were exposed resulting in additional vapor contamination removal. The continued operation of the soil vapor extraction/dual phase extraction (SVE/DPE) blower provides several benefits to the on-site remedy, as follows: it maintains a negative pressure on the containment system which prevents the release of landfill vapors into the neighborhood; it maintains an aerobic environment that allows naturally occurring microorganisms to degrade BCEE the site's primary COC (*Lipari Landfill Microcosm Report, Phase I,* Shaw, 2006); and it prevents the buildup of potentially explosive methane concentrations.

Although the SVE wells are currently being utilized periodically to vent methane, in the future these wells might be used to accelerate remediation in the area between the slurry wall and the French Drain.

OU3 Selected Remedy – Off-Site Marsh, Streams, Lake & Groundwater Contamination

In 1988, EPA selected a remedy to clean up off-site groundwater, soil and sediment contamination that was not secured in the landfill containment system. The major components of this remedy included: (1) collecting groundwater and leachate in the aquifers outside the containment system for on-site treatment and discharge to the local county sewage treatment system; (2) excavating contaminated soils in Chestnut Branch Marsh, and dredging and dewatering contaminated sediments in Alcyon Lake, Chestnut Branch and Rabbit Run, followed by removing organic contaminants with a low temperature volatilization system (LTVS); and (3) monitoring off-site areas to ensure the effectiveness of the on-site cleanup. Treatment of contaminated soil and sediment with the LTVS was completed in late summer 1995. The lake, which had been closed for recreational use for a number of years due to contamination from the Lipari Landfill, was reopened in October 1995.

In 1995, a French Drain system was constructed to protect the marsh and surface water bodies from shallow seepage that may have been emanating from the site. The French Drain is keyed into the Kirkwood clay and is lined with a flexible membrane liner on the marsh side to prevent migration of water from the marsh. In addition, sheet piling was installed along the portion of the French Drain that is aligned with Rabbit Run to prevent any

contamination from entering into Rabbit Run. Intercepted groundwater is collected via slotted plastic pipe and gravel, pumped to the Off-Site Collection Tank, and ultimately sent to GCUA for treatment.

The Kirkwood Pumping wells were a series of six extraction wells (K-6, K-1 lA, K-19, K-20, K-22, and K-30) designed to keep contaminated Kirkwood groundwater from entering Chestnut Branch. They were activated in August 1995 but were found to be insufficient to fully control contaminated Kirkwood groundwater thus were replaced by the Interceptor Trench in 1996. The Kirkwood pumping well infrastructure was demolished around 2003, however the wells remain and are occasionally used for groundwater monitoring**.**

In July1996, two groundwater interceptor trenches were installed in the Chestnut Branch Marsh northeast of the landfill containment system. This Interceptor Trench system was designed to prevent groundwater contamination within the alluvium and Kirkwood aquifer from impacting the northeast marsh area and the surface water bodies, including Chestnut Branch and Alcyon Lake. Interceptor Trench A is located in the Berm Area (an area of soil excavation between the central portion of the French Drain and Chestnut Branch), and Interceptor B is located in the Confluence Area (an area of soil excavation at the confluence of Rabbit Run and Chestnut Branch).

In November 1997, a Seep Collection System was completed to capture groundwater seepage at the Off-Site Collection Tank and the North French Drain Sump locations and to prevent new seeps from appearing in other locations in the future. Groundwater captured by the Seep Collection system is conveyed to the French Drain Sumps, pumped to the Off-Site Collection Tank, and ultimately sent to GCUA for treatment.

The off-site soil remediation, Rabbit Run Drain are complete. Some contaminated groundwater exists in the off-site area adjacent to (west of) Chestnut branch but is fully captured by the Interceptor Trench.

The off-site groundwater collection and French Drain, Seep Collection, systems are ongoing.

EPA continues to capture and treat contaminated groundwater from beneath the landfill. EPA routinely monitors off-site surface and groundwater.

IC Summary Table

Table 1: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater	Yes	Yes	OU1 and OU2 site Parcels	Restrict groundwater and property use at or in the vicinity of the site.	CEA/WRA and Deed Notice 2018

Systems Operations/Operation & Maintenance

The Lipari Landfill Environmental Monitoring Program (EMP), Revision #4, February 2001 and Lipari Landfill Superfund Site Uniform Federal Policy Quality Assurance Project Plan, November 2015 (QAPP) contain the procedures for verifying that the on-site and off-site remediation systems are adequately protecting the off-site marsh area, the surface water bodies, and the water supply aquifers. Repairs are to be made to the cap, drainage, and leachate collection systems as necessary, to control the effects of settling, subsidence, erosion or other events

that might interfere with the performance of the remedy. No significant chages, modifications or completions were made to the EMP or QAPP since the last FYR.

Operations at the site include the following:

- Contaminated groundwater is collected from the French Drain and Interceptor Trench systems, pumped to the clarifier effluent sump.
- Off-site water from the clarifier effluent sump is equalized and pH adjusted with hypochlorite and discharged to the GCUA.
- The landfill cap is inspected for signs of erosion, excessive settlement, surface water ponding, seedling growth, impacts from terrestrial receptors (i.e., burrowing), and stressed vegetation.
- The Lipari containment system relies on the slurry wall to reduce the amount of groundwater infiltration into the landfill. The water level across the slurry wall is measured in 15 monitoring well pairs in order to maintain an inward hydraulic gradient. The slurry wall has a maximum permitted groundwater head differential of 22.5 feet which was put in place to prevent degradation of the slurry wall. The head differential is calculated by measuring water levels from paired wells (one inside the wall and one nearby outside the wall) and subtracting the difference in elevation. The water levels outside the slurry wall on the western side are higher than the internal wells thus, there is an inward groundwater gradient on the western side of the containment area. The water levels on the eastern side of the wall are higher inside than out thus, there is an outward gradient on the eastern side of the containment area. The head differential water levels are taken on a monthly basis. Since the batch flushing ceased, there have been no head differential exceedances.
- Water quality samples are collected annually from groundwater monitoring and extraction wells, collection systems, and surface water stations. Appendix C contains a map of the annual samling locations.

Table 2: Annual Sampling Summary

Sampling Location	**Analytical Parameter**
Extraction Wells: E-13A, E-17B, PW-1A, and PW-2; French Drain Sump Locations: FD01, FD02, and FD03; Interceptor Trench Sump Locations: Trench-A and Trench-B	VOCs, SVOCs
Mt. Laurel Supply Well	VOCs, BCEE by selected ion monitoring, Nitrate and Total Coliform
Vincentown Well: V-5; Kirkwood Wells: MW-K8, K-7, K-8, and K-31; and Sentinel Wells: SA-63B, SA-64B, SA-65B, and SA-66B	Metals, BCEE by selected ion monitoring
Vincentown Wells: V-6, V-7; Surface Water Locations: SW01, SW05, SW06, and SW07; and Peach Country	BCEE by selected ion monitoring

- Soil gas extraction by the SVE system is ongoing and treated by the VGAC system. This on-site system also brings oxygenated air into the landfill and is likely contributing to aerobic degradation of BCEE, as demonstrated by the non-detect results for BCEE in the aquesous samples from the 2016 annual samples.

Climate Change

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate changes in the region and near the site.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR, completed in 2012, and the current status of those recommendations.

Table 3: Protectiveness Determinations/Statements from the 2012 FYR

OU #	Protectiveness Determination	Protectiveness Statement
OU1	Short-term Protective	The remedy at OU1 currently protects human health and the environment because the cutoff wall and cap have reduced the potential for leachate and contaminated groundwater to migrate from the landfill. The cap has also eliminated direct exposure to hazardous contaminants. However, in order for the remedy to be protective in the long-term, institutional controls need to be put in place.
OU2	Will be Protective	The remedy at OU2 is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.
OU3	Short-term Protective	The remedy at OU3 is protective of human health and the environment. Off-site contamination was cleaned up to allow direct contact and unrestricted use, thereby eliminating any exposure pathways. Annual groundwater and surface water sampling data are compared to the most recent human health and ecological screening levels to ensure continued protectiveness.

Table 4: Status of Recommendations from the 2012 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description*	Completion Date (if applicable)
OU1, OU2	Institutional controls are not currently in place to restrict groundwater use at or in the vicinity of the site. Property use (residential, commercial, etc.) restrictions for the site are similarly not in place.	Institutional controls restricting groundwater use and reuse of the site property should be developed and put in place.	Ongoing	A CEA/WRA request was submitted to the state of New Jersey Deed Notices are being prepared.	N/A
Sitewide	Modifications to the selected remedies for the site have not been documented after the 1982 ROD and 1992 ESD for OU1 and OU2.	A decision document to memorialize modifications to the selected remedies should be developed.	A 2017 ESD for the site was prepared.	The 2017 sitewide ESD was finalized September 2017.	

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On November 14, 2016, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 38 Superfund sites in New York and New Jersey, including the Lipari Landfill site. The announcement can be found at the following web address: https://www.epa.gov/sites/production/files/2016-11/documents/five_year_reviews_fy2017_final.pdf. In addition to this notification, a public notice was made available via email to the Township with a request that the notice be posted to the town's website and in appropriate municipal offices. The notification was posted on the Town's website, www.pitman.org, on August 24, 2017. The purpose of the public notice is to inform the community about the FYR and to list where the final report will be posted. The notice also includes the RPM and the CIC address and telephone numbers for questions or comments related to the five-year review process or the site. Once the FYR is completed, the results will be made available on EPA's webpage www.epa.gov/superfund/lipari and at the site repositories located at the following locations: Mc Cowan Memorial Library, 15 Pitman Avenue, Pitman, New Jersey and US EPA Records Center, 290 Broadway, 18th floor, New York, New York. In addition, efforts will be made to reach out to local public officials to inform them of the results.

Data Review

Soil Vapor Extraction System

Soil gas samples from the SVE system remain low and have shown overall decreases in contaminant concentrations. Total VOC concentrations in the soil gas samples were observed at a maximum of about 100 ppmv in October 2012 to 16.5 ppmv in December 2016. In December 2016, the SVE system was removing 0.32 pound per hour of contaminants with a total mass removal estimated at 321 kilograms for the entire year.

Containment System

The Lipari containment system relies on the slurry wall to reduce the amount of groundwater infiltration into the landfill.

Within the containment system, concentrations of all VOCs are below their OU2 ROD cleanup criteria. BCEE concentrations exceeded the OU2 ROD cleanup criteria of 1.4 micrograms per liter (µg/L) in one sample (well E-13a) that had an estimated concentration of 4.3 µg/L. BCEE concentrations in extraction wells have significantly decreased over this five-year review period from a maximum of 1200 µg/L to 4.3 µg/L. Note that concentrations of BCEE initially in the flushing process were as high as 590,000 ug/L in extraction well E-14 (1993). Xylenes do not have established cleanup criteria but were found at maximum concentrations within the containment system of 1,160 µg/L in 2016 at well E-17B, which is above the state groundwater quality standard of 1,000 µg/L.

Based on a review of the most current groundwater data collected in 2015, the off-site sentinel wells contaminant concentrations do not exceed the more stringent current New Jersey Groundwater Quality (NJGWQ) standards for organic compounds.

BCEE contamination has been observed beneath the containment system in the top of the Kirkwood sand formation, in a 10-foot zone below the Kirkwood clay formation. This Kirkwood contamination is found in locations associated with the original landfill waste materials deposited in the Cohansey formation. In 2016, eight wells were sampled in the Kirkwood and BCEE was detected at very low levels in three of these wells. None of the results were above the cleanup levels for BCEE.

Groundwater Outside Containment System

All organic contaminants, except for BCEE, are below OU2 ROD cleanup levels within the French Drain system. Maximum BCEE concentrations have decreased over this five-year review period from a maximum of 370 µg/L in 2014 to 66 µg/L in 2016. Similarly, in the Interceptor Trench, only BCEE was above cleanup levels. BCEE was observed above the cleanup criteria in 2012 at maximum concentrations of 1500 µg/L but has dropped to 370 µg/L in 2016.

The Mount Laurel water supply well, screened in an aquifer 198 to 258 feet below the ground surface, is monitored along with nearby wells MW-K8 and V-5. All three have consistently shown non-detect levels or levels far below cleanup criteria for organic contaminants including BCEE and only sporadic anomalous exceedances over the entire five-year review period. The Vincentown aquifer, located below the Kirkwood formation, on average about 110 feet below the surface, is also monitored by wells V-6 and V-7. Over the five-year review period, one detection of chloroform at 0.24 µg/L was found. No other detections of organic compounds were found.

Off-site monitoring wells indicate that constituent concentrations are generally undetected with the exception of Kirkwood monitoring well K-07. This monitoring well, K-07, and its surrounding wells along with those located past the French Drain system, are either nondetect or do not show exceedances of ROD cleanup levels, which indicates that the collection system is effectively capturing contaminated groundwater.

Surface Water

All surface water samples taken at the site and off-site in Chestnut Branch and Alcyon Lake exhibit non-detect levels for all organic contaminants including BCEE.

In summary, groundwater monitoring data from this five-year review period exceeded Federal Water Quality Criteria (40 CFR Part 131.36) or EPA Maximum Contaminant Levels (MCLs) for a few contaminants in the groundwater monitoring wells and sample points located in off site areas. Overall the number of VOCs that were detected and their concentrations across the site, have decreased steadily.

Groundwater samples taken from inside the containment area generally do not show exceedances of Lipari cleanup criteria for organics. One sample had an estimated value slightly higher than the BCEE cleanup standard. There are some compounds inside the landfill that do not have ROD cleanup levels but exceed NJGWQ standards. Also, one inorganic analyte, nickel, exceeds NJGWQ standards.

For groundwater outside of the containment area, contaminant concentrations in the French Drain have decreased and only BCEE has been found to exceed the site cleanup standards by a single order of magnitude. Contaminant concentrations in the Interceptor Trench have also decreased, but BCEE concentrations are still two orders of magnitude above the cleanup levels. No exceedances of any site COCs were found in any of the groundwater samples beyond the site perimeter.

Site Inspection

The inspection of the site was conducted on 9/14/2016. In attendance were EPA RPM Tanya Mitchell, EPA hydrologist Robert Alvey, and EPA Human Health Risk Assessor Urszula Kinahan, NJDEP representatives Michael Burlingame, Steve Wohleb, and John Skurat, and USACE representatives Francisco Barba, Dan Sirkis and Daryl Solomam. The purpose of the inspection was to assess the protectiveness of the remedy.

During the site inspection, the five-year review team toured the site and the facilities (including the slurry wall, SVE system, and cap improvements). Several depressed areas within the landfill cap were observed and will be

monitored and repaired, as needed. In general the overall system and operating procedures appear to be well maintained, working and functioning in accordance with the the design.

V. TECHNICAL ASSESSMENT

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

Consistent with the ROD, the remedy is functioning as intended by the decision documents (1982, 1985, 1988, RODs and 1992, 1993, and 2017 ESDs). Direct contact to site-related constituents has been addressed by the installation of perimeter fencing, capping of the landfill and dredging of nearby affected sediment. Containment of landfill waste has been successful through the installation of the landfill cap and the leachate collection system. There has been no leaks in the landfill cap; the French Drain and Interceptor Trench systems continues to capture contaminated groundwater; and the groundwater gradient across the slurry wall have remained consistent with no head differential exceedances. Thus, these remedies effectively reduce the potential for contaminants leaching into the groundwater and negatively impacting regional groundwater, surface water and sediment quality. In addition, EPA's decision to cease batch flushing and continue SVE at lower groundwater elevation seems to have resulted in the cleanup of organics in the landfill to levels below ROD cleanup levels. Currently, the French Drain and Inceptor Trench effectively capture low levels of contaiminated groundwater outside of the containment area. Groundwater entering into the French Drain and Interceptor Trench systems continue to exhibit BCEE levels above Federal Water Quality Criteria, although there are no longer VOCs in these drains.

Groundwater data from on-site wells outside the containment zone indicate contaminant levels below cleanup criteria. Off-site monitoring wells also indicate that contaminant levels are generally undetected which indicates that the collection system is effectively capturing contaminated groundwater. Continued monitoring will ensure the remedy remains protective and functions as intended by the decision documents. The analysis for BCEE with lower detection limits is conducted using the SIM method to ensure that the on-site groundwater meets current NJGWQS.

The landfill cap is monitored and maintained as part of the Site Environmental Monitoring Plan, and appeared to be in relatively good condition during the September 2016 site visit. There are several depressed areas and will be monitored and repaired, as needed.

Annual surface water data are collected from Rabbit Run and Chestnut Branch. The most recent surface water data reviewed (2016) indicate no exceedances of chronic ecological surface water screening values for BCEE.

Institutional Controls

Instiutional controls to limit land use and prevent use of groundwater were documented in a 2017 ESD. The June 2017 Classification Exception Area/Well Restriction Area (CEA/WRA) request will restrict use of potentially impacted groundwater from the site to ensure that nearby wells do not alter the current groundwater flow around the site resulting in the spread of contamination. Both vehicles are in the process of being implemented. In addition, EPA is in the process of preparing Deed Notices for the site which will ensure that activities that would pose a risk to human health and the environment are prohibited in the future. Currently, fencing of the on-site area further prevents contact with contamination.

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

There have been no physical changes to the site that would adversely affect the protectiveness of the remedy. Land use assumptions and exposure assumptions considered in the decision document followed the Risk Assessment Guidance for Superfund used by the Agency at the time and remain valid. Although specific parameters may have changed since the time the risk assessment was completed, the process that was used

remains valid. Since VOCs are present in site groundwater, the potential for vapor intrusion into indoor air was evaluated as part of this five-year review; the results of the evaluation are presented at the end of this section.

Although RAOs were not explicitly described in all of the early decision documents (as they would be in present-day ROD format), the primary cleanup objectives were: to contain landfill wastes and leachate, improve the reliability of the containment system, prevent contaminated groundwater migration, prevent off-site surface water contamination, and eliminate off-site contaminant exposure pathways. These cleanup objectives remain valid.

Currently, the groundwater remediation goals for 1,2-dichloroethane, benzene, chlorobenzene, chloroform, ethylbenzene, methylene chloride, phenol, toluene and nickel exceed EPA's current Regional Screening Levels (RSLs) for tapwater. However, based on a review of the most current groundwater data collected in 2015, the off-site sentinel wells contaminant concentrations do not exceed the more stringent current NJGWQS for organic compounds.

Surface water bodies surrounding the landfill have been monitored to verify that landfill contamination is not impacting the off-site surface waters. Six surface water samples are collected as part of the annual sampling activities and analyzed for the organic monitoring compound BCEE. The surface water samples did not exceed the ROD cleanup criteria.

Although the potential for subsurface vapor intrusion (VI) into indoor air was not evaluated at the time of the decision documents, it was assessed as part of this five-year review.

To ensure the conclusions of the 2012 VI assessment have not changed, the most recent detected concentrations of volatile organic compounds found in extraction well E-13A (located in close proximity to the on-site treatment building) were compared to EPA's vapor intrusion screening level (VISL) for groundwater based on a commercial/industrial land use. The VISLs are chemical-specific groundwater vapor intrusion screening values associated with an indoor air concentration that represent a cancer risk ranging from 1 x 10-4 and 1 x 10-6 or a noncancer hazard quotient of 1. Concentrations higher than these screening levels indicate the potential for vapor intrusion. The maximum concentrations detected in groundwater samples collected in 2015 did not exceed the non-carcinogenic screening value and fell within an acceptable risk range for the carcinogenic endpoint. Therefore, the potential for the VI pathway to impact indoor air on the on-site building, remains below levels of concern. Currently, there are no off-site buildings within 100 feet of the site perimeter or the drainage systems, consequently the VI pathway is incomplete for offsite buildings. If buildings were to be constructed within the area of contaminated groundwater they would be subject to a vapor intrusion study or built with a vapor mitigation system in place.

An ecological risk assessment was not conducted to support the remedy decision documents; however, the remedy is protective of ecological resources as contaminated sediments and soil were dredged/excavated and contained within the capped landfill cap. In addition, the groundwater to surface water pathway has been addressed via the groundwater treatment system. BCEE in surface water has not been detected within the past 5 years. The actions taken have eliminated any potential risk from surface soil contaminants to terrestrial receptors and will prevent infiltration and or releases to groundwater and surface water. Consequently, the exposure assumptions remain appropriate and thus the remedy remains protective of ecological resources.

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

No.

VI. ISSUES/RECOMMENDATIONS

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1, 2, and 3	**Issue Category: Institutional Controls**			
	Issue: Deed restrictions need to be put into place to ensure future use of site wide groundwater remains an incomplete exposure pathway, to protect exposure to buried waste and to protect the integrity of the cap.			
	Recommendation: Institutional controls restricting use of the site property should be developed and put in place.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	3/30/2018

Other Findings

- In 2012, depressions in the landfill cap were identified. The depressions have not been completely addressed. During the 2017 site visit and an inspection of the cap by contractors, the cap is currently intact and no tears in cap were apparent. Since the cap is intact, currently the exposure to site-related contaminants has been interrupted. A pilot study has been proposed to address the depressions and settling of landfill debris under the cap for implementation this year. It is expected that once the actions are taken to repair the depressions, the remedy will continue to be protective of ecological receptors.

VII. PROTECTIVNESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: OU1	*Protectiveness Determination:* Short-term Protective	*Planned Addendum Completion Date:* 3/30/2018
Protectiveness Statement: The remedy at OU1 currently protects human health and the environment because the cutoff wall and cap have reduced the potential for leachate and contaminated groundwater to migrate from the landfill. The cap has also eliminated direct exposure to hazardous contaminants. Institutional controls are also in place to prevent groundwater use. However, in order for the remedy to be protective in the long-term, deed notices need to be implemented to ensure protectiveness.		
Operable Unit: OU2	*Protectiveness Determination:* Short-term Protective	*Planned Addendum Completion Date:* 3/30/2018
Protectiveness Statement: The remedy at OU2 currently protects human health and the environment because the cutoff wall and cap have reduced the potential for landfill waste, leachate and contaminated groundwater to migrate from the landfill. The cap has also eliminated direct exposure to hazardous contaminants. Institutional controls are also in place to prevent groundwater use. However, in order for the remedy to be protective in the long-term, deed notices need to be implemented to ensure protectiveness.		

Operable Unit:	*Protectiveness Determination:*	*Planned Addendum Completion Date:*
OU3	Short-term Protective	3/30/2018

Protectiveness Statement: The remedy at OU3 currently protects human health and the environment because off-site contamination was cleaned up to allow direct contact and unrestricted use, thereby eliminating any exposure pathways. Annual groundwater and surface water sampling data are compared to the most recent human health and ecological screening levels to ensure continued protectiveness. Institutional controls are also in place to prevent groundwater use. However, in order for the remedy to be protective in the long-term, deed notices need to be implemented to ensure protectiveness.

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective

Protectiveness Statement: The remedy at OU1, OU2 and OU3 currently protects human health and the environment because the cutoff wall and cap have reduced the potential for landfill waste, leachate and contaminated groundwater to migrate from the landfill. The cap has also eliminated direct exposure to hazardous contaminants. Off-site contamination was cleaned up to allow direct contact and unrestricted use, thereby eliminating any exposure pathways. Institutional controls are also in place to prevent groundwater use. However, in order for the remedy to be protective in the long-term, deed notices need to be implemented for OU1, OU2 and OU3 to ensure protectiveness.

VIII. NEXT REVIEW

The next FYR for the Lipari Landfill Superfund Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

- 1st Record of Decision, EPA 1982
- 2nd Record of Decision, EPA1985
- 3rd Record of Decision, EPA 1988
- Explanation of Significant Differences, EPA 1992
- Explanation of Significant Differences, EPA 1993
- Explanation of Significant Differences, EPA 2017
- Lipari Landfill Environmental Monitoring Program, Revision #4, February 2001 CDM Federal Programs Corporation, 2000
- Lipari Landfill Superfund Site Uniform Federal Policy Quality Assurance Project Plan, November 2015, Cabrera Services, 2015
- Final 2012-2013 Annual Report Lipari Landfill Superfund Site, USACE February 2016
- Final 2014-2015 Annual Report, Lipari Landfill Superfund Site, USACE December 2016
- 2016 Lipari Annual Sampling Results, USACE August 2016
- 3rd Five-Year Review, EPA 2012

APPENDIX B – SITE MAP

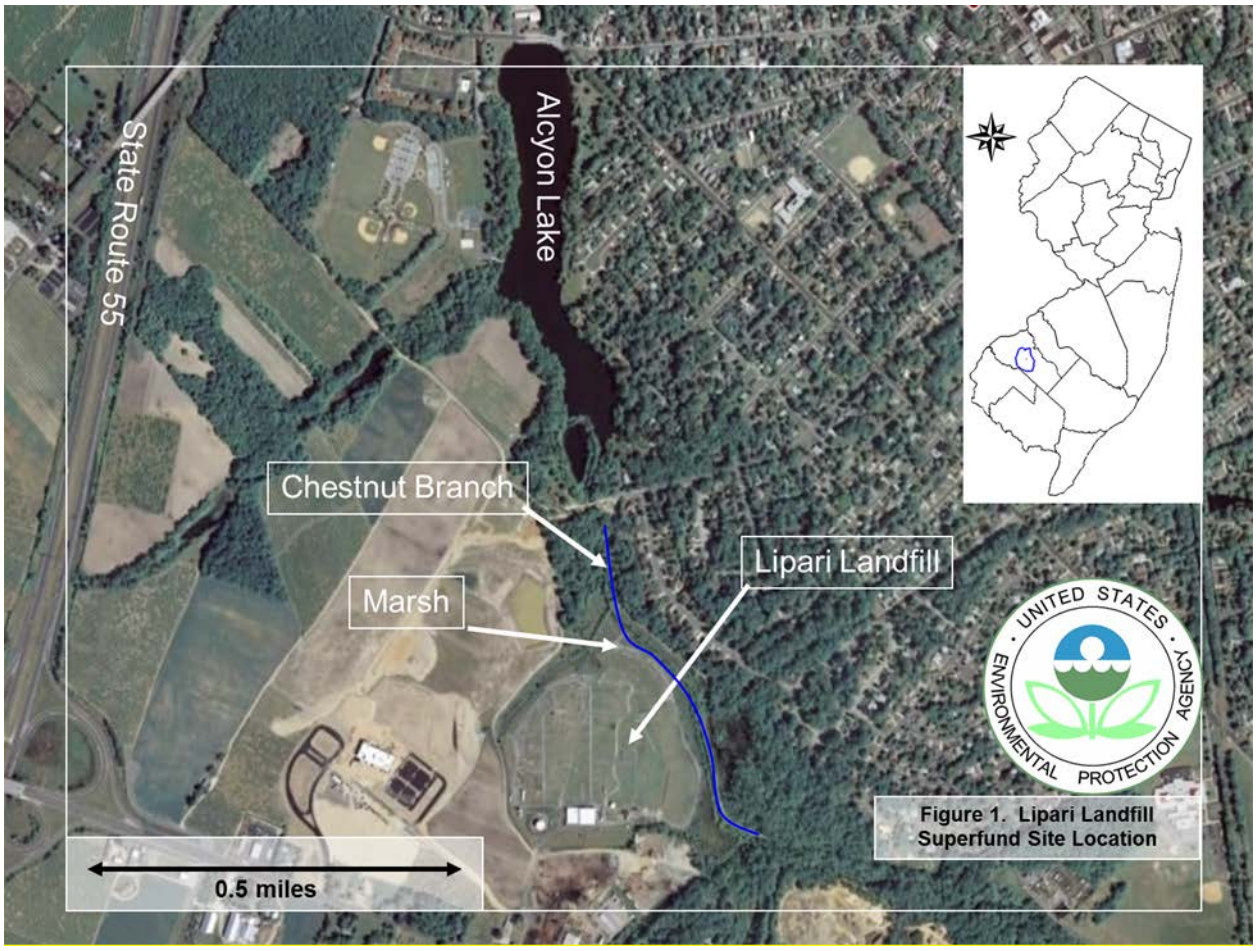
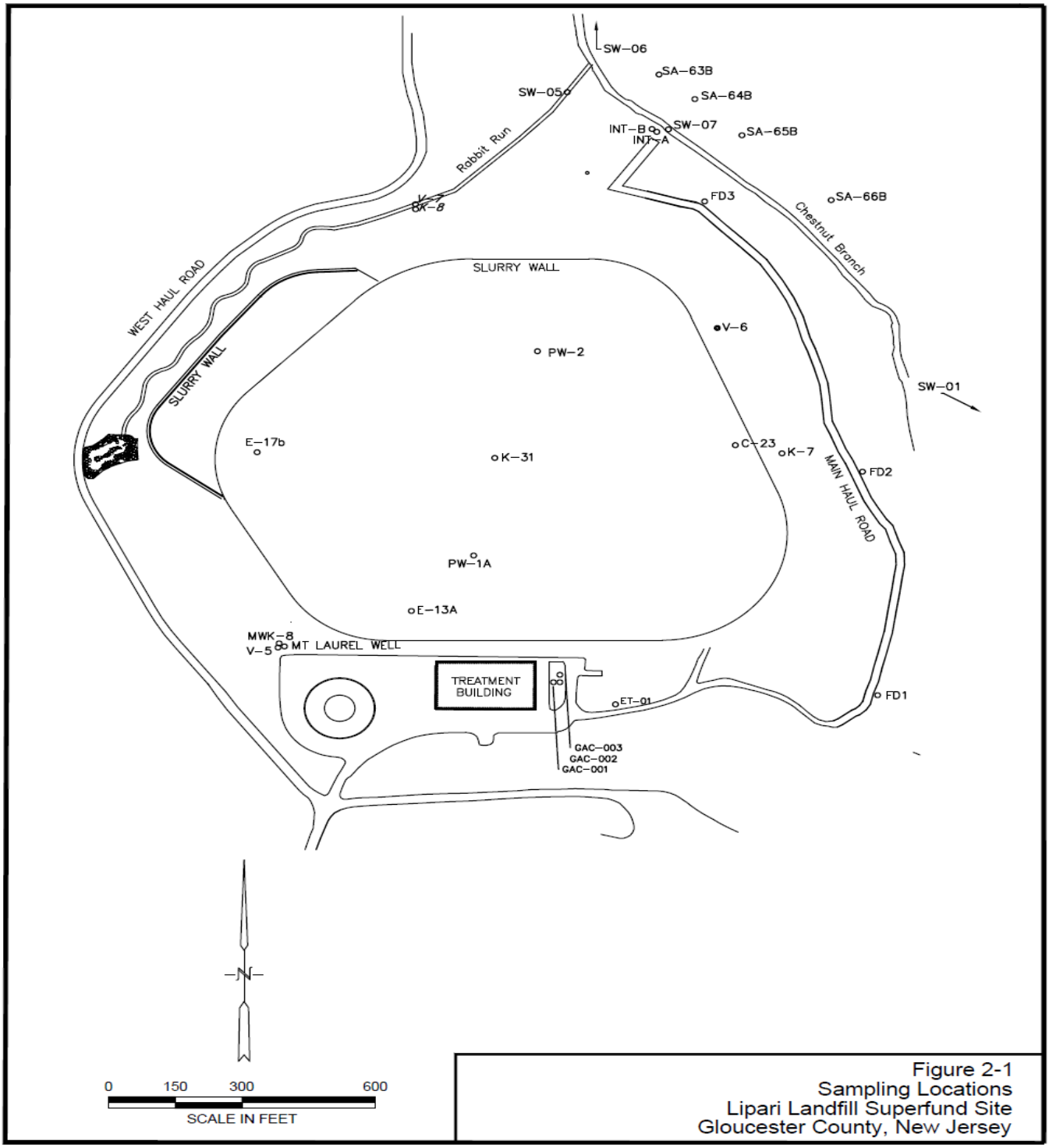


Figure 1. Lipari Landfill Superfund Site Location

APPENDIX C –SAMPLING LOCATIONS



APPENDIX D – ROD CONTAMINANTS of CONCERN

Table 1: Contaminants of Conceren

Chemicals	Cleanup Criteria
Organic	
1,2-Dichloroethane	**99**
4-Methyl-2-pentanone	**NS**
Benzene	**71**
Bis(2-chloroethyl)ether	**1.4**
Chlorobenzene	**21,000**
Chloroform	**470**
Ethylbenzene	**29,000**
Methylene Chloride	**1,600**
Phenol	**4,600,000**
Toluene	**200,000**
Xylenes (total)	**NS**
Metals	
Arsenic	**16/ND/ND**
Chromium	**180**
Lead	**71/20/3.9**
Mercury	**0.15**
Nickel	**4,600**
Selenium	**5**
Silver	**3**
Zinc	**100**

APPENDIX E – SITE CHRONOLOGY

Event	Date(s)
Disposal of Contaminated Wastes Begins	1958
Disposal of Contaminated Wastes Ends	1971
Site placed on National Priorities List	1982
1st Record of Decision for Source Control (OU1)	1982
Superfund State Contract Executed	1982
Construction of OU1 Slurry Wall and Cap Completed	1983-1984
2nd Record of Decision for Batch Flushing (OU2)	1985
3rd Record of Decision for Off-Site Area Remediation (OU3)	1988
Explanation of Significant Differences for 2nd Record of Decision	1992
Construction of OU2 Completed	1992
Batch Flushing Operations Started in Contained Landfill	1993
Explanation of Significant Differences for 3rd Record of Decision	1993
Remedial Action for OU3 Started	1994
1st Five-Year Review	1997
Construction of DPE/SVE System Completed	2000
DPE/SVE System Operations Start	2001
Remedial Action for OU3 Completed	2001
2nd Five-Year Review	2002
Groundwater Flushing and Extraction in Contained Landfill Ended	2008
Slurry Wall Modification Completed	2012
3rd Five-Year Review	2012
Completed Repairs on Some of the Landfill Cap Depressions	2013
Effluent Tank was Taken Out of Service and Re-routed to Clarifier Effluent Sump	2015
TOU was Terminated and Replaced with VGAC	2015
BCEE-SIM Analysis and Sampling Modification for BCEE Results as Indicator of Containment Site COCs.	2015
Explanation of Significant Differences completed	2017