FOURTH FIVE-YEAR REVIEW REPORT FOR CORTESE LANDFILL SUPERFUND SITE SULLIVAN COUNTY, NEW YORK

Prepared by

U.S. Environmental Protection Agency
Region 2
New York, New York
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Date

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
AS	Air Sparge
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FYR	Five-Year Review
HHRA	Human-Health Risk Assessment
ICs	Institutional Controls
ISCO	*In-Situ* Chemical Oxidation
MCL	Maximum Contaminant Level
MNA	Monitored Natural Attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and Maintenance
OM&M	Operation, Maintenance, and Monitoring
OU	Operable Unit
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SVE	Soil Vapor Extraction
SVOCs	Semi-volatile Organic Compounds
SVI	Soil Vapor Investigation
TBC	To be considered
VOCs	Volatile Organic Compounds

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Cortese Landfill Superfund Site		
EPA ID: NYD980528475		
Region: 2	**State:** NY	**City/County:** Narrowsburg, New York

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

REVIEW STATUS
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**
Author name (Federal or State Project Manager): Mark Granger
Author affiliation: EPA
Review period: 7/11/2011 - 7/11/2016
Date of site inspection: 11/9/2015
Type of review: Statutory
Review number: 4
Triggering action date: 7/11/2011
Due date *(five years after triggering action date)*: 7/11/2016

Executive Summary

This is the fourth five-year review for the Cortese Landfill Superfund site, located in Town of Tusten (Hamlet of Narrowsburg), Sullivan County, New York. The purpose of this five-year review is to review information to determine if the remedy is and will continue to be protective of human health and the environment. The triggering action for this statutory five-year review is the signature date of the previous five-year review.

This five-year review concluded that the selected remedy is protective of human health and the environment.

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 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 Cortese Landfill Superfund site. The triggering action for a subsequent FYR is the signature date of the last review. The trigger for this fourth FYR is July 11, 2011, the approval date of the last review. The FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

The work at the site has been divided into four operable units. Operable Unit (OU) 1, which was completed in 1996, addressed the removal of more than 5,000 drums and associated contaminated soil above the water table from the drum-disposal areas of the landfill. OU2, which involved the capping of the landfill, was completed in 1998. OU3 involves the groundwater contamination at and downgradient of the landfill. OU4 addresses the source contamination present below the water table beneath the former drum-disposal areas. The OU1 excavations removed the targeted contaminated materials from the vadose zone and therefore OU1 is not addressed in this FYR. OUs 2, 3, and 4 are in the operations and maintenance phase and are part of this review.

The Cortese Landfill Superfund site FYR was led by Mark Granger, the EPA Remedial Project Manager (RPM). Participants included Kathryn Flynn (EPA hydrogeologist), Lora Smith (EPA human-health risk assessor), Michael Clemetson (EPA ecological risk assessor), and Larisa Romanowski (EPA community involvement coordinator). The Cortese Landfill Potentially Responsible Party Group (PRP Group) was notified of the initiation of the FYR. The FYR began on October 14, 2015.

Site Background

The Cortese Landfill site, located within the Town of Tusten (Hamlet of Narrowsburg), Sullivan County, New York, is bounded to the northeast by a steep bedrock escarpment and to the southwest by the Norfolk Southern railroad embankment. The Delaware River is located approximately 400 feet west of the landfill. The property encompasses approximately 3.75 acres of land owned by the John Cortese Construction Corp. and another 1.53-acre parcel along the northern margin of the Cortese property owned by the Town of Tusten, which purchased the property from Mr. Cortese in 1973 (see **Appendix A, Figure 1**). On the landfill-side of the railroad embankment, areas to the southeast, east, and northeast are wooded. Areas south of the landfill are seasonally flooded as a result of perched water conditions. In addition, there are several small wetlands in the immediate

area of the landfill. Along the western perimeter of the landfill is an unpaved road and a railroad embankment. The unpaved road, which is between the landfill and the railroad embankment, is used by Norfolk Southern employees for access to the railroad tracks.

Six residences are located between the railroad embankment and the Delaware River. The residences are connected to the Narrowsburg public water supply. The water supply is currently provided by three wells, one of which is located approximately 750 feet northwest of the landfill. These wells are hydraulically upgradient or sidegradient of the site and are, thus, not affected by site-related contamination. The National Park Service classifies the Delaware River in the vicinity of the site as a "Wild and Scenic River." The river in this area is used primarily for recreational boating and fishing.

For more details related to site background, physical characteristics, geology/hydrogeology, land/resource use, and history related to the site, please refer to:

https://semspub.epa.gov/src/collections/02/SC/NYD980528475

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Following the listing of the site on the National Priorities List, the New York State Department of Environmental Conservation (NYSDEC) oversaw the performance of a remedial investigation (RI) from 1987-1989. The results revealed numerous volatile organic compounds (VOCs), most notably toluene; semi-volatile organic compounds (SVOCs)(primarily, polycyclic aromatic hydrocarbons); and metals detected at varying concentrations in site media.

In April 1990, after NYSDEC and a PRP, SCA Services, Inc., which had transported wastes to the site, were unable to agree upon appropriate investigative actions, NYSDEC formally transferred the lead to EPA. EPA subsequently oversaw the PRP's completion of a test pit program (March 1991), an ecological assessment (May 1992), RI field work, including the sampling of surface soil, subsurface soil, sediment, surface water, and groundwater (June 1993), an RI report (March 1994), a baseline human health risk assessment (HHRA) and ecological risk assessment (June 1994), and a feasibility study (FS) report (September 1994).

The 1994 HHRA concluded that an unacceptable risk existed for hypothetical future residents' consumption of groundwater; this was primarily driven by vinyl chloride and arsenic concentrations in groundwater. The 1994 ecological assessment concluded that ecological receptors could be be at risk from exposure to contaminants if the site is not remediated; this future risk was primarily driven by 1,4-dichlorobenzene and arsenic levels in a few discrete areas where surface water and sediment were present.

Response Actions

A Record of Decision (ROD) was signed in September 1994 (1994 ROD). The ROD addressed OU1 (the former drum disposal area), OU2 (the landfill cap), and OU3 (groundwater contamination at and downgradient of the landfill). The remedial action objectives (RAOs) specified in the 1994 ROD were:

- to restore the aquifer as a potential source of drinking water by reducing contaminant levels downgradient of the landfill to federal and state Maximum Contaminant Levels (MCLs);
- to reduce or eliminate the potential for migration of contaminants downgradient of the landfill;
- to reduce or eliminate the potential for vadose-zone source areas to release hazardous compounds to groundwater;
- to reduce or eliminate any site-related contaminant load on the Delaware River, the embayment, and White's Pond; and
- to reduce or eliminate site-related contaminant seeps along the bank of the Delaware River.

The 1994 ROD selected remedy included:

- the removal and off-site treatment and/or disposal of the intact-drum diposal areas on the landfill property. Any contaminated soil beneath these drum diposal areas may potentially be removed at this time as well;
- construction of a low permeability cover system over the landfill meeting the requirements of 6 NYCRR Part 360 (Part 360 cap);
- regrading and storm-water management improvements at the landfill;
- extraction and treatment of contaminated groundwater at the site;
- discharge of treated groundwater to the existing Town of Tusten wastewater treatment plant outfall, Delaware River, or reinjection to groundwater;
- long-term groundwater and surface-water monitoring;
- implementation of institutional controls (ICs) to protect the integrity of the landfill cover system and to reduce the potential future use of groundwater within the plume area;
- implementation of long-term maintenance of the landfill cap and operation and maintenance of the groundwater extraction and treatment system; and
- long-term groundwater and surface water monitoring to evaluate remedy effectiveness.

A ROD/ROD amendment was signed in October 2010 (2010 ROD/ROD amendment). This ROD amendment modified the OU3 (groundwater remedy) and identified a new OU4 which addresses source contamination present below the water table beneath the former drum-disposal areas. The RAOs specified in the 2010 ROD/ROD amendment were:

- to reduce or eliminate the potential for saturated source areas to release contaminants to groundwater;
- to restore the aquifer downgradient of the landfill as a potential source of drinking water by reducing contaminant levels to the federal and state MCLs; and
- to reduce or eliminate the potential for migration of contaminants downgradient of the landfill.

The modified remedy included the following components:

- air sparging (AS) of the source areas for approximately seven years to remove a significant quantity of the petroleum hydrocarbons and other VOCs;
- collection and discharge to the atmosphere after aboveground treatment, if necessary, of the extracted vapors from the AS wells using soil-vapor extraction (SVE) wells;
- amendment additions, such as ozone, to the AS/SVE system for the final phase of the AS/SVE period;
- employment of a subsurface-stabilization period for up to five years after the AS/SVE program has been completed;
- subsequent application of in-situ chemical oxidation (ISCO), if necessary, potentially including a surfactant enhancement, to address the remaining more recalcitrant source materials;
- monitored natural attenuation (MNA) of the groundwater contamination downgradient from the landfill perimeter; and
- long-term monitoring.

The effectiveness of the source-area remedy is to be determined based upon the attainment of specific performance standards and cleanup goals for each step in the treatment process (*e.g.*, attainment of MNA performance monitoring standards, reduction in constituent concentrations and/or mass flux, *etc.*). Should the selected remedy fail to attain these standards and goals or should its implementation prove impracticable, then groundwater extraction and treatment will be evaluated as the contingency remedy.

Negotiations between EPA and the PRP Group to carry out the remedial design (RD) and construction of the remedy selected in the 1994 ROD resulted in the entry of a Consent Decree in U.S. District Court in May 1996. Negotiations between EPA and the PRP Group to carry out the RD and construction of the source-area remedy and modified groundwater remedy selected in the 2010 ROD/ROD amendment resulted in the entry of a Consent Decree amendment in U.S. District Court in August 2012.

Response Action Implementation

Removal Actions

From November 1995 through January 1996, concurrent with the initiation of the RD, the Town of Tusten conducted a removal action (pursuant to a removal order with EPA) whereby contaminated soils from two lagoons in an area south of the landfill were excavated and disposed of off-site and a 1,200-foot storm-water diversion channel was constructed along the eastern perimeter of the landfill. The storm-water diversion channel diverts most of the storm water toward the wetlands, thereby reducing infiltration into the landfill and, thus, leachate production.

OU1 (Former Drum-Disposal Areas)

In early 1996, approximately 300 drums filled with hazardous liquids, solids, and sludges were excavated from an area south of the landfill adjacent to the lagoons and disposed of off-site. The broader drum removal component of the selected remedy, which was performed later in 1996, resulted in the excavation from the landfill of more than 5,000 drums, three tractor-trailer loads of hazardous sludge, and 50 dump-truck loads of contaminated soil.

OU2 (Landfill)

The design of the cap component of the remedy was completed in May 1997. Per the 1994 ROD, the five-acre cap was constructed over the landfill consistent with NYSDEC's Part 360 regulations. Geosynthetic, gas-vent, low-permeability liner, and drainage components are overlain by eighteen inches of cover soil and six inches of topsoil. A vegetative cover was established using a migratory-bird seed mix. Following the completion of the landfill closure, a Remedial Action Report was approved in October 1998.

OU3 (Groundwater)

In scoping out the design of the OU3 groundwater extraction-and-treatment system selected in the 1994 ROD, it was determined that there were logistical problems associated with its construction. These problems included space constraints related to siting the groundwater management system's infrastructure, as well as difficulties related to transmitting the treated effluent either beneath the railroad embankment to the Delaware River or to groundwater. In response to these concerns, after the completion of the cap considerable efforts were devoted to discerning remedial approaches that would reduce the reliance on the full-scale groundwater extraction-and-treatment system contemplated in the 1994 ROD. These efforts took the form of investigations, studies, and bench- and field-scale pilot treatability testing. These activities resulted in the 2010 ROD/ROD amendment which modified the OU3 groundwater remedy to MNA (with a groundwater extraction-and-treatment contingency) and added a new OU4 to address source contamination below the former drum disposal area.

New monitoring wells MW-19, MW-21, and MW-22 were installed in the downgradient area in January 2013 to be included in the OU3 groundwater-monitoring network. The OU3 design was completed in May 2013 and implemented shortly thereafter. Results of the OU3 monitorring are documented in the annual environmental monitoring reports.

OU4 (Source Area Beneath the Water Table)

While groundwater monitoring after the 1998 installation of the Part 360 cap (OU2) showed significant contaminant declines downgradient of the landfill, continued monitoring showed the decline to be leveling off at concentrations significantly above standards (predominantly for VOCs). The results of a 2001 shallow groundwater hot-spot investigation conducted along the downgradient perimeter of the landfill indicated the potential presence of sources of chlorinated- and nonchlorinated-VOC nonaqueous-phase liquid (NAPL) contamination in the saturated soils beneath the former drum-disposal areas (a primary area located beneath the landfill drum-disposal

area and a small, secondary drum-disposal area located south of the landfill adjacent to the septage lagoons). Data from a source-area investigation performed in 2004 showed an area in the soils beneath the primary former drum-disposal area containing previously undocumented sorbed-phase and residual-phase (*i.e.,* NAPL) VOC contamination. Additional source characterization was conducted in 2007 to better evaluate the horizontal and vertical extent of this chlorinated- and non-chlorinated-VOC and petroleum-hydrocarbon source area and to provide data to support the selection and design of potential *in-situ* source-area treatment technologies. Additional samples of soil, groundwater, and NAPL were collected in 2009 for the purpose of conducting in-situ chemical oxidation (ISCO) bench-scale treatability testing.

Soil-boring data collected in association with the installation of the AS wells in the secondary source area indicated that there was very little contamination remaining in this area; more specifically, no material was detected that would constitute a source of contamination to groundwater. The data indicate that the 1996 drum and lagoon soil-removal effort, in conjunction with time, eliminated the potential risk to human health and the environment and, consequently, the need for AS and SVE in this area. The elimination of the need for treatment in this area was documented in EPA's September 2013 *Explanation of Significant Differences* for the site.

The RD for OU4 was completed in March 2012. Construction of the OU4 *in-situ* source-area treatment system began in December 2012 and was completed in September 2013. OU4 efforts included construction of the AS and SVE systems and installation of vapor-phase granular activated carbon units for off-gas treatment. OU4 efforts also included construction of the amendment-addition/ISCO-injection system. With the completion of construction of the AS/SVE and amendment-addition/ISCO-injection systems, and with the AS/SVE remedy operating as designed, an RA report was completed in December 2013. It is anticipated that the AS/SVE system will operate for approximately seven years. The actual operational lifetime will be based upon performance monitoring data and achieving an interim mass flux reduction performance metric. Sequential remedial components to be performed thereafter include amendment additions, a subsurface-stabilization period, application of ISCO (if necessary), and MNA.

EPA approved the groundwater extraction-and-treatment contingency remedy RD in December 2010. This design may be utilized in the event that the OU4 remedy fails to address the RAOs.

Institutional Controls

The 1994 ROD called for the implementation of ICs to prevent the use of contaminated groundwater at and downgradient from the landfill and to protect the integrity of the Part 360 cap. With respect to groundwater, the entire town, including the affected downgradient area, has drinking water provided by public supplies. ICs in the form of local ordinances restrict the withdrawal of groundwater and prohibit the installation of private wells. Specifically, Local Law #1 restricts groundwater use near the site and Local Law #4 requires public water-supply connections anywhere within the Narrowsburg Sewer and Water District, including properties located downgradient from the site.

With respect to on-property ICs, an easement and a notice to successors in interest to protect the integrity of the cap have been put into place. **Table 1** summarizes the implemented ICs.

Table 1: Summary of Implemented Institutional Controls

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	Areas down-gradient of landfill property	Restrict groundwater use	Local Law #1 1996
Groundwater	Yes	Yes	Areas down-gradient of landfill property	Restrict groundwater use via requirement to hookup to public supply	Local Law #4 1998
Landfill cap and related facilities	Yes	Yes	John Cortese Construction Corp. portion of landfill property	Protect integrity of cap	Notice to Successors in Interest October 2015
Landfill cap and related facilities	Yes	Yes	Town portion of landfill property	Protect integrity of cap	Easement September 2016

Systems Operation/Operation & Maintenance

The operation and monitoring (O&M) plans for the site contain the procedures for inspecting and evaluating the landfill cap, operating and evaluating the AS/SVE systems, maintaining the groundwater monitoring well network, and long-term monitoring of groundwater. Repairs are to be made to the cap, AS/SVE systems, and monitoring network, as necessary, to control effects that might interfere with the performance of the remedy.

The site and related facilities are inspected at least annually as follows:

- the landfill cap is inspected for signs of erosion, excessive settlement, surface water ponding, seedling growth, and stressed vegetation;
- the surface water drainage system is inspected for signs of erosion and/or siltation, seedling growth, etc., in the swales, constructed wetlands, and ditches;
- the landfill gas venting system is inspected for damage to the vents;
- the site is inspected for vectors and damage is reported;
- groundwater monitoring wells are inspected for ease of locating, operation of locks, damage/vandalism, and the condition of the surface seals;

- the site access gates and fence are inspected for operational locks, vandalism, and damage; and
- the site is inspected for debris, litter, and/or waste.

Groundwater is sampled triannually (spring, summer, and fall) for both OU3 and OU4. Surface water is sampled annually in the fall.

The Operation, Maintenance, and Monitoring Plan (OM&M Plan) for OU4 was completed in July 2014. The OM&M Plan is intended to guide *in-situ* source-treatment operations, provide inspection and maintenance procedures and schedules for proper operation, and provide a groundwater monitoring program to evaluate OU4 remedy performance. O&M for OU 4 began in September 2014. It is anticipated that the AS/SVE component of the *in-situ* source-treatment operations will operate for approximately seven years. Sequential remedial components to be performed thereafter include amendment additions, a subsurface-stabilization period, application of ISCO (if necessary), and MNA.

Since the 2011 FYR, inspections relative to the AS/SVE system were added. Specifically, the AS/SVE equipment, piping, and wellheads are inspected regularly for damage and/or malfunctions. In addition, an annual confirmation that the remedy-related O&M continues to be performed and that the ICs required by the 1994 ROD remain in place is included in the annual O&M report.

The only significant problem related to O&M during the review period occurred in April 2015. The media in one of the three off-gas carbon treatment units burned internally to the point of complete combustion. The AS/SVE system was immediately shut down in order to make adjustments that would obviate a recurrence of this situation. Temperature sensors, temperature-related shut-off circuitry, and carbon-monoxide monitoring equipment were subsequently built into the system. The AS/SVE system was restarted in October 2015 and has run without incident since then.

Potential impacts on the Site from climate change were assessed. The performance of the remedy is currently not at risk due to the expected effects of climate change in the region near the Site.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR (2011), as well as the recommendations from the last FYR and the current status of those recommendations. See **Tables 2 and 3**, respectively, below.

Table 2: Protectiveness Determinations/Statements From 2011 Five-Year Review

OU	Protectiveness Determination	Protectiveness Statement
2	Short-term Protective	The Operable Unit 2 (cap) remedy currently protects human health and the environment because the storm-water diversion trench has been constructed to reduce infiltration into the landfill and the cap has been constructed which reduces contaminant migration to groundwater and prevents direct contact with contaminants. However, in order for the on-site remedy to be protective in the long term, the on-property institutional controls need to be implemented.

Table 3: Status of Recommendations From 2011 Five-Year Review

OU	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
2	ICs to restrict activities that could affect the integrity of the cap need to be put into place.	A draft easement and restrictive covenant has been submitted by the PRP Group for the on-property institutional controls; it is currently under review by EPA. These controls need to be formalized.	Completed	The required ICs are in place.	8/26/2016

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On November 19, 2015, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 32 Superfund sites and four federal facilities in New York and New Jersey, including the Cortese Landfill site and inviting the public to submit any comments on the FYR to the EPA. The announcement can be found at the following web address:

http://www2.epa.gov/sites/production/files/2015-11/documents/fy_16_fyr_public_website_summary.pdf

In addition to this notification, a notice of the commencement of the FYR was posted on the EPA's Region 2 website and sent to local public officials. The notice was provided to the Town of Tusten on July 18, 2016 with a request that the notice be posted in the Town Hall and on the Town of Tusten webpage. The purpose of the public notice was to inform the community that EPA would be conducting a FYR to ensure that the remedy implemented at the site remains protective of public health and is functioning as designed. In addition, the notice included contact information, including addresses and telephone numbers, for questions related to the FYR process. Once the FYR is completed, the results will be made available at the site information repositories. The site repositories are located at USEPA, 290 Broadway, 18th Floor, New York, New York and at the Tusten-Cochecton Library, 198 Bridge Street, Narrowsburg, New York. In addition, efforts will be made to reach out to local public officials to inform them of the results.

Data Review

Groundwater monitoring data have been collected on a triannual schedule since 1997. Groundwater monitoring continues to be performed triannually across the site per the 2013 MNA Plan (OU3) and 2014 OM&M plan (OU4).

OU4

In the source area, there are seven groundwater monitoring wells sampled along a transect between the source area and the railroad tracks (see **Appendix A, Figure 2**). The groundwater data indicate that benzene, toluene, ethylbenzene, and xylene are the most prevalent VOCs and chlorinated benzenes, phenolic compounds, and 1,4-dioxane are the most prevalent SVOCs (see **Table 4**). The presence of NAPL is also evaluated periodically at three wells in the source area, and small amounts of NAPL were found in two of these wells in 2014 (efforts to remove the small amounts of NAPL encountered are conducted on an ongoing basis, as needed). Arsenic, iron, and manganese are also present above background levels in most of the source-area monitoring wells; these metals are probably naturally occurring and released from the aquifer by the reducing conditions in the source-area groundwater. After almost two years of operation the data from the AS/SVE system shows that the mass of VOC contamination being removed, while remaining substantial, has a declining trend with time.

OU3

Downgradient of the landfill (OU3), transect groundwater monitoring wells are located between the railroad tracks and the Delaware River (see **Appendix A, Figure 2**). An important MNA line of evidence is that the VOC and SVOC compounds detected at these wells were similar to the compounds in the source area wells, but at lower concentrations. More specifically, contaminant concentrations related to OU3 are approximately ten times lower than those associated with the OU4 source area. Unsurprisingly, concentrations of metals are also present above background levels in most of the OU3 monitoring wells.

Groundwater data are included in the annual environmental monitoring reports for the site (please refer to ***Appendix B - Reference List)***. The data shows that the groundwater plume is bounded to the north by MW-5 and to the south by MW-2A/B (see **Appendix A, Figure 2**). In addition, samples collected from the public drinking-water supply well located closest to the site and from monitoring wells located between this drinking-water well and the landfill plume continue to show that site-related contamination is not affecting or threatening the public drinking-water supply.

Surface water from the river is collected during the fall monitoring event from upstream and downstream locations. VOCs and SVOCs have not been detected in either location since 2009.

Table 4: OU4 (Source Area) Transect-Well Data Summary

Chemical Group	Chemical of Concern	# of Results (# of Detections)	Range of Detections	# of Results (# of Detections)	Range of Detections	# of Results (# of Detections)	Range of Detections
		2011		2012		2013	
VOCs	Benzene	2 (1)	0.65 - 0.65	4 (4)	0.71 - 7.7	14 (11)	0.64 - 21
	Ethylbenzene	2 (0)	ND - ND	4 (1)	37 – 40	14 (6)	0.88 - 170
	Toluene	2 (0)	ND - ND	4 (2)	0.6 – 690	14 (6)	3.4 - 3,700
	Total Xylenes	2 (0)	ND - ND	4 (1)	110 – 120	14 (7)	1.5 - 630
	Chlorobenzene	2 (1)	6.2 - 6.2	4 (4)	4.6 – 20	14 (12)	2.2 - 160
	1,2-Dichlorobenzene	2 (1)	3.3 - 3.3	4 (4)	1.9 - 6.3	14 (9)	0.96 - 44
	1,3-Dichlorobenzene	2 (1)	1.2 - 1.2	4 (4)	1.2 - 3.8	14 (8)	0.88 - 27
	1,4-Dichlorobenzene	2 (1)	10 - 10	4 (4)	7.8 – 25	14 (11)	1.9 - 230
SVOCs	2,4-Dimethylphenol	2 (0)	ND - ND	4 (1)	2 - 2.5	7 (1)	8.2 - 8.2
	2-Methylphenol	2 (0)	ND - ND	4 (0)	ND – ND	7 (1)	13 - 13
	4-Methylphenol	2 (0)	ND - ND	4 (1)	2.7 - 2.7	7 (2)	9.2 - 13
	1,4-Dioxane	2 (1)	20 - 20	4 (4)	6.9 – 17	7 (1)	15 - 15
		2014		2015		2016	
VOCs	Benzene	13 (10)	0.62 - 15	18 (10)	0.55 - 3.6	8 (3)	0.66 - 3.3
	Ethylbenzene	13 (7)	7.1 - 130	18 (7)	0.91 – 52	8 (2)	8.6 - 15
	Toluene	13 (7)	19 - 2,700	18 (6)	0.56 – 790	8 (2)	0.53 - 290
	Total Xylenes	13 (8)	1 - 500	18 (6)	0.94 – 170	8 (1)	46 - 47
	Chlorobenzene	13 (12)	2 - 92	18 (16)	1 – 31	8 (4)	2.5 - 9.8
	1,2-Dichlorobenzene	13 (10)	1 - 32	18 (12)	0.93 – 11	8 (3)	3.7 - 6.3
	1,3-Dichlorobenzene	13 (10)	1 - 22	18 (12)	1 – 16	8 (3)	1.8 - 11
	1,4-Dichlorobenzene	13 (12)	0.85 - 160	18 (14)	2.1 – 54	8 (6)	0.86 - 32
SVOCs	2,4-Dimethylphenol	7 (2)	1.8 - 6.4	8 (1)	ND - 0.59	8 (0)	ND - ND
	2-Methylphenol	7 (2)	0.71 - 7.6	8 (1)	16 – 16	8 (2)	0.58 - 6.2
	4-Methylphenol	7 (2)	0.5 - 12	8 (1)	18 – 18	8 (2)	0.36 - 1.8
	1,4-Dioxane	7 (6)	1.6 - 26	8 (6)	1.5 – 39	8 (5)	1.3 - 22

Analytical data are in ug/L and are from groundwater samples collected from source-area transect monitoring wells (EX-1, MW-1A, MW-1B, MW-1C, MW-10, MW-11, MW-20A, and MW-20B) between July 2011 and July 2016.

Summary

The highest concentrations of VOCs and SVOCs are found in the shallow groundwater near the source area, but in the downgradient wells the contamination is found deeper in the intermediate zone of the aquifer. The data collected during the past five years do not show a consistent trend in groundwater concentrations. While the Delaware river constitutes the downgradient boundary of the plume, as noted above VOCs and SVOCs have not been detected in river monitoring locations since 2009.

Site Inspection

An inspection of the site was conducted on November 9, 2015. In attendance were EPA RPM Mark Granger and EPA hydrogeologist Kathryn Flynn. Pat Bisky of Groundwater Treatment & Technology, Inc. (the O&M contractor for the PRP Group) was also present. The purpose of the inspection was to assess the protectiveness of the remedy. The cap, treatment systems, fencing, vents, roadways, wetlands, monitoring wells, and other closure-related facilities were all in good repair at the time of the inspection.

V. TECHNICAL ASSESSMENT

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

The 1994 ROD called for, among other things, the construction of storm-water management improvements; excavation and disposal of contaminated materials from the drum trenches and septage lagoons; installation of a Part 360 cap; and groundwater extraction and treatment. The OU1 drum-trench excavations removed the targeted contaminated materials from the vadose zone and therefore OU1 is not addressed in this FYR. Contamination remaining below the vadose zone in the landfill drum-trench area is addressed as OU4. The purpose of capping of the landfill was to minimize the infiltration of rainfall and snowmelt into the landfill, thereby reducing the potential for contaminants leaching from the landfill into the groundwater and negatively impacting groundwater and surface-water quality. Capping was also intended to prevent direct contact exposure to contaminants. The landfill-cap and storm-water-management aspects of the remedy have been successfully completed, have been appropriately maintained, and are functioning as intended.

The 1994 ROD and 2010 ROD/ROD amendment identified a restoration goal for the aquifer downgradient of the landfill. This included MNA of the downgradient plume and AS/SVE and ISCO to address the source area beneath the former drum-disposal area, The AS/SVE and MNA remedy selected in the 2010 ROD/ROD amendment is currently being implemented and is functioning as intended. The groundwater monitoring data from OU3 and OU4 collected over the last five years indicate the highest concentrations of VOCs and SVOCs are found in the shallow groundwater near the source area, but in the downgradient wells the contamination is found deeper in the intermediate zone of the aquifer. While the data collected during the past five years do not show a consistent trend in groundwater concentrations, data from the AS/SVE system show that the source-area remedy continues to remove mass: 7,200 pounds (lbs) of VOCs have been

documented to have been removed since AS/SVE startup (*i.e.*, November 2014 through June 2016) and the system is currenly removing approximately 170 lbs of VOCs per month. In addition, samples collected from the public drinking-water supply well located closest to the site and from monitoring wells located between this drinking-water well and the landfill plume continue to show that site-related contamination is not affecting or threatening the public drinking-water supply.

The off-site ICs in the form of local ordinances have been put in place that restrict the withdrawal of groundwater downgradient from the landfill for any purpose and prohibit the installation of private wells. On-property ICs to protect the integrity of the landfill cap are also in place.

QUESTION B: *Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*

The exposure assumptions and toxicity values that were used to estimate cancer risks and noncancer hazards in the risk assessment supporting the 1994 and 2010 ROD/ROD amendments for human health followed the *Risk Assessment Guidance for Superfund* used by EPA. The process that was used in the human-health risk assessment is still valid. While there are no completed exposure pathways at the site, continued evaluation of groundwater downgradient of the landfill will be performed until groundwater cleanup levels are attained.

Source Area: As noted in the HHRA, the greatest potential future carcinogenic risk and noncarcinogenic hazard attributable to the site are associated with the ingestion of groundwater. The specific RAOs identified in the 1994 ROD include restoring the aquifer as a potential source of drinking water by reducing contaminant levels downgradient of the landfill to the federal and state MCLs, reducing or eliminating the potential for migration of contaminants downgradient of the landfill, reducing or eliminating site-related contaminant loads on the Delaware River, and reducing or eliminating site-related contaminant seeps along the eastern bank of the Delaware River. The 2010 ROD/ROD amendment added an RAO to reduce or eliminate the potential for saturated source areas to release contaminants to groundwater. The selected remedies were necessary to achieve the RAOs. All of the RAOs remain valid. While the RAO of restoring the aquifer as a potential source of drinking water by achieving groundwater standards has not yet been reached, it does not affect the protectiveness of the remedy, since the surrounding areas utilize public water. It is anticipated that groundwater standards will be achieved in the future. With respect to cleanup levels, the 1994 ROD and 2010 ROD/ROD amendment selected state and federal MCLs as groundwater cleanup goals. While some of these values may have changed since the time of the RODs, they remain valid. Though groundwater concentrations continue to exceed MCLs, the remedial measures detailed in the 2010 ROD/ROD amendment are expected to provide for restoration of the downgradient aquifer to drinking-water standards in the future.

Surface Water: No cleanup levels were selected for surface water in either of the decision documents. Nevertheless, VOCs and SVOCs have not been detected in surface water from the river since 2009. Continued monitoring will be performed to evaluate site-related contaminant concentrations over time and to ensure that RAOs are being addressed.

Soil: Since soils did not pose an unacceptable risk to human health in the 1994 risk assessment, no cleanup levels were selected for this media.

Vapor Intrusion: Soil-vapor intrusion (SVI) is evaluated when soils and/or groundwater are known or suspected to contain VOCs. EPA sampled three of the six homes between the landfill and the Delaware River for SVI risk over two data collection efforts (2007 and 2009). Ambient, sub-slab, and indoor air samples were collected and analyzed. It was concluded that a complete SVI pathway does not exist in any of the homes that were sampled. According to the 2013 and 2014 Annual Environmental Monitoring Reports (please refer to ***Appendix B - Reference List)***, while total VOC concentrations remain above standards in groundwater downgradient of the landfill, they have not increased since the last FYR when it was determined that the SVI pathway was not a concern. It is anticipated that as the source area continues to be remediated, the soil vapors will continue to decrease in concentration. Currently, the SVI pathway remains incomplete at the site.

Ecological Risk: From an ecological perspective, it appears that the remedy is functioning as intended for ecological receptors. Although the ecological risk-assessment screening and toxicity values used to support the 1994 ROD may not necessarily reflect the current values, the excavated-soil and the landfill-cap components of the remedy have eliminated the potential risk from soil contaminants to terrestrial receptors. Further, the surface-water contaminant concentrations during the review period do not indicate a significant potential risk to ecological receptors. Consequently, the ecological exposure assumptions remain appropriate and, thus, the remedy remains protective of ecological resources.

In summary, the land use assumptions, exposure assumptions and pathways, cleanup levels, and RAOs considered in the decision documents remain valid. Although specific parameters may have changed since the time that the risk assessment was completed, the process that was used remains valid.

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

Based on the evaluation of the potential human exposures at the site, there is no new information that could call into question the protectiveness of the remedies. There have been no physical changes to the site that would adversely affect the protectiveness of the remedy and none are anticipated in the next five years.

VI. ISSUES/RECOMMENDATIONS

Table 5: Issues/Recommendations

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None of the OUs were determined to have issues or recommendations identified in the FYR.

VII. PROTECTIVENESS STATEMENT

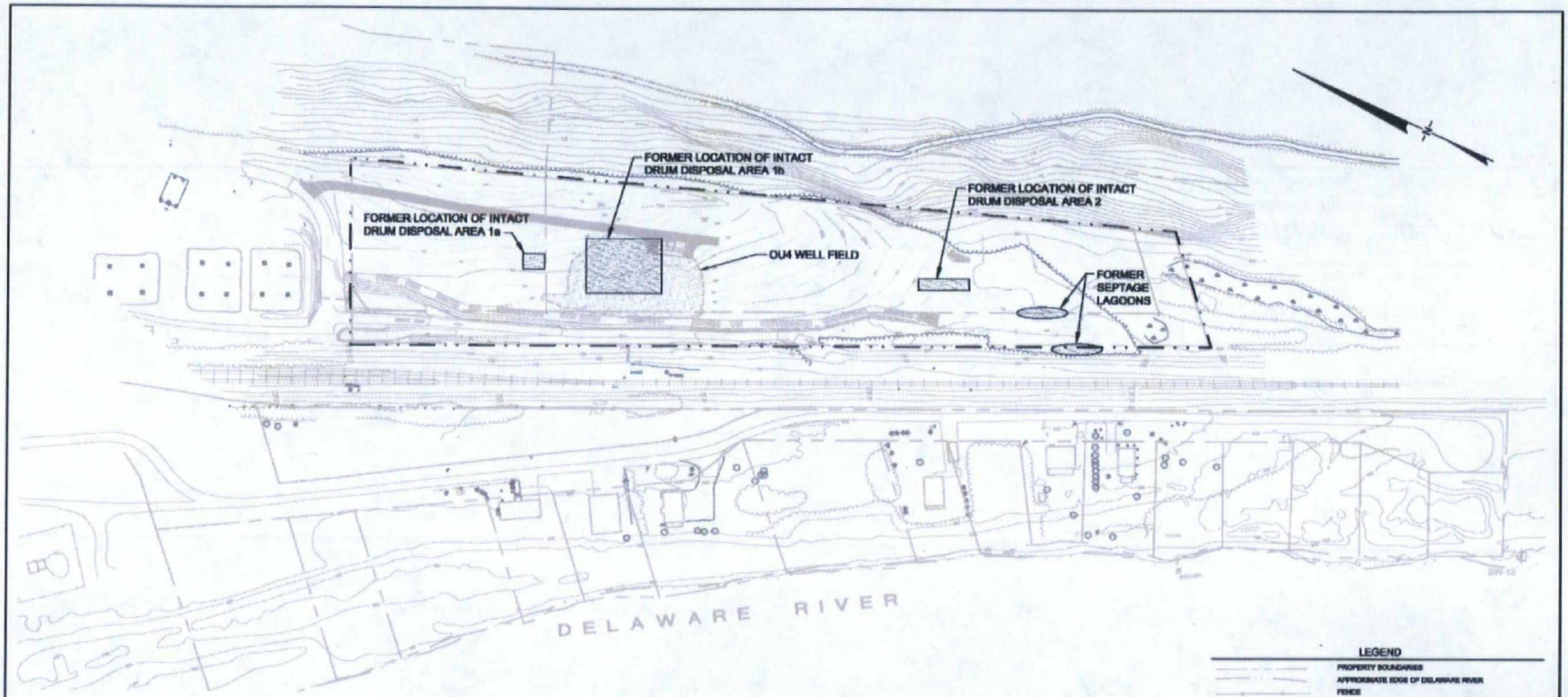
Table 6: Protectiveness Statements

Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
OU2 (Cap)	**Protective**
Protectiveness Statement:	
The **remedy at OU2** is protective of human health and the environment.	
Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
OU3 (Downgradient Groundwater)	**Protective**
Protectiveness Statement:	
The **remedy at OU3** is protective of human health and the environment.	
Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
OU4 (Source Area)	**Protective**
Protectiveness Statement:	
The **remedy at OU4** is protective of human health and the environment.	
Sitewide Protectiveness Statement	
Protectiveness Determination:	
Protective	
Protectiveness Statement:	
The **sitewide remedy** is protective of human health and the environment.	

VIII. NEXT REVIEW

The next FYR report for the Cortese Landfill Superfund site is required five years from the completion date of this review.

APPENDIX A – FIGURES



LEGEND

- PROPERTY BOUNDARIES
- APPROXIMATE EDGE OF DELAWARE RIVER
- FENCE
- LANDFILL COVER ELEVATION CONTOUR
- PRE-EXISTING TOPOGRAPHY ELEVATION CONTOUR
- SITE BOUNDARY

150 75 0 150

SCALE: 1" = 150'

NOTES:

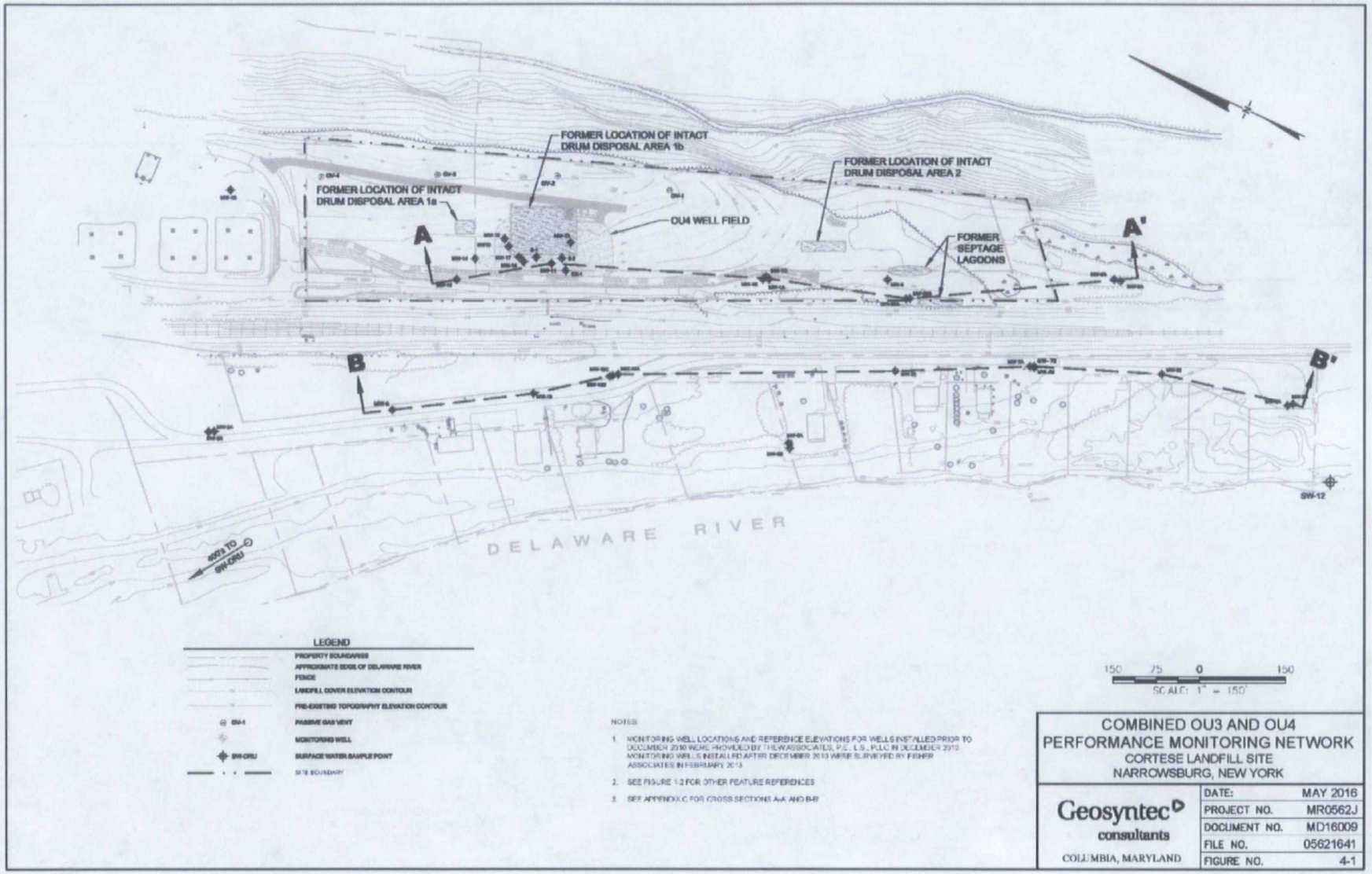
1. ALL COORDINATES SHOWN ON THIS MAP REFLECT THE NORTH AMERICAN DATUM 1983 (NAD 83) AS DERIVED USING "THE NATIONAL GEODETIC SURVEY SHIFT OF N 05°05'25" AND E A DISTANCE OF 426,245.03' AS APPLIED TO THE NATIONAL GEODETIC SURVEY DATUM OF 1927 (NAD 27). ALL ELEVATIONS SHOWN ON THIS MAP REFLECT THE NORTH AMERICAN VERTICAL DATUM OF 1988, AS DERIVED USING THE NATIONAL GEODETIC SURVEY SHIFT OF -6.547' AS APPLIED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.
2. TOPOGRAPHY AND SURFACE FEATURES EAST OF DELAWARE DRIVE WERE ORIGINALLY PREPARED BY FIELD METHODS BY DAVID POPLI P.E., L.S. PC CONSULTING ENGINEERS & SURVEYORS, ROCHESTER, NEW YORK, MARCH 1995. TOPOGRAPHY CHANGES SINCE MARCH 1995 PREPARED BY ENVIRONMENTAL RESEARCH, INC. ON DECEMBER 12, 1996. PROPERTY LINES EAST OF DELAWARE DRIVE WERE DETERMINED FROM A SURVEY MAP ENTITLED "CORTESE LAND FILL SITE" DATED MAY 7, 1985 PREPARED BY GARY PACKER, P.L.S. AND TAX MAP, TOWN OF TUSTEN, SULLIVAN COUNTY, NY., DATED 11/09/92. LANDFILL PROPERTY BOUNDARY TAKEN FROM BASE, ME PROPERTY BOUNDARY CONTROL, CORTESE LANDFILL SITE, TOWN OF TUSTEN, SULLIVAN COUNTY, NY, MAY 7, 1985, BY GARY PARKER, P.L.S. TOPOGRAPHY AND SURFACE FEATURES WEST OF DELAWARE DRIVE WERE DIGITIZED FROM AN ELECTRONICALLY SCANNED FILE OF THE TOPOGRAPHIC BASE MAP PREPARED BY ROBINSON AERIAL SURVEYS, INC. BY PHOTOGRAMMETRIC METHODS FROM PHOTOGRAPH TAKEN APRIL 18, 1985.
3. REFERENCE DRAWING DEVELOPED FROM FIGURE 2, "SITE PLAN" OF THE SOURCE CHARACTERIZATION REPORT BY GOLDER ASSOCIATES, INC. DATED 30 JANUARY 2006.

SITE PLAN

CORTESE LANDFILL SITE
NARROWSBURG, NEW YORK

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	MAY 2016
PROJECT NO.	MR0562J
DOCUMENT NO.	MD16009
FILE NO.	05621612
FIGURE NO.	1-2



NOTES:

1. MONITORING WELL LOCATIONS AND REFERENCE ELEVATIONS FOR WELLS INSTALLED PRIOR TO DECEMBER 2010 WERE PROVIDED BY TH&W ASSOCIATES, P.C., L.S., PLLC IN DECEMBER 2010. MONITORING WELLS INSTALLED AFTER DECEMBER 2010 WERE SURVEYED BY FISHER ASSOCIATES IN FEBRUARY 2013.
2. SEE FIGURE 1-2 FOR OTHER FEATURE REFERENCES.
3. SEE APPENDIX C FOR CROSS SECTIONS A-A' AND B-B'.

COMBINED OU3 AND OU4 PERFORMANCE MONITORING NETWORK

CORTESE LANDFILL SITE
NARROWSBURG, NEW YORK

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	MAY 2016
PROJECT NO.	MR0562J
DOCUMENT NO.	MD16009
FILE NO.	05621641
FIGURE NO.	4-1

APPENDIX B – REFERENCE LIST

2011 Annual Environmental Monitoring Report, Remedial Work Element I, Cortese Landfill Site, Narrowsburg, New York, Geosyntec, April 2012.

2012 Annual Environmental Monitoring Report Remedial Work Element I, Cortese Landfill Site, Narrowsburg, New York, Geosyntec, March 2013.

2013 Annual Environmental Monitoring Report Remedial Work Element I, Cortese Landfill Site, Narrowsburg, New York, Geosyntec, February 2014.

2014 Annual Environmental Monitoring Report Remedial Work Element I, Cortese Landfill Site, Narrowsburg, New York, Geosyntec, March 2015.

2015 Annual Environmental Monitoring Report Remedial Work Element I, Cortese Landfill Site, Narrowsburg, New York, Geosyntec, May 2016.

Consent Decree for Remedial Design/Remedial Action, Cortese Landfill Site, U.S. vs. Allied Signal et al., Civil Action 96-CV-1513, USEPA, August 1995.

Consent Decree Amendment, Cortese Landfill Site, U.S. vs. Allied Signal et al., Civil Action 96-CV-1513, USEPA, September 2012.

Explanation of Significant Differences, Cortese Landfill Superfund Site, Town of Tusten, Sullivan County, New York, USEPA, September 2013.

Five-Year Review Report, Cortese Landfill Superfund Site, Sullivan County, Town of Tusten, New York, USEPA, July 2011.

Interim Source Area Remedial Action Report Operable Unit 4 Source Areas, Cortese Landfill Site, Narrowsburg, New York, Gesoyntec, December 2013.

Monitored Natural Attenuation Remedial Design, Operable Unit 3 Downgradient Groundwater, Cortese Landfill Site, Narrowsburg, New York, Geosyntec, May 2013.

Operation and Maintenance Plan, Remedial Work Element I, Cortese Landfill Site, Narrowsburg, New York, Golder, March 1997.

Operation, Maintenance, and Monitoring Plan, Operable Unit 4 Source Areas, Cortese Landfill Site, Narrowsburg, New York, Geosyntec, October 2013.

Quality Assurance Project Plan, OU3 and OU4 O&M, Cortese Landfill Site, Narrowsburg, New York, Geosyntec, May 2013.

Record of Decision, Cortese Landfill Site, Narrowsburg, Sullivan County, New York, USEPA, September 1994.

Record of Decision/Amendment to the Record of Decision, Cortese Landfill Superfund Site, Town of Tusten, Sullivan County, New York, USEPA, October 2010.

Revised Phase III Remedial Investigation Report, Cortese Landfill Site, Narrowsburg, New York, Golder, January 1994.