UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 3

RECORD OF DECISION

VALMONT TCE SUPERFUND SITE
Luzerne County, Pennsylvania

CERCLIS ID PAD982363970

January 2011

CONTENTS

Appendices

LIST OF ACRONYMS

1,1,1-TCA	1,1,1-trichloroethane
1,1-DCA	1,1-dichloroethane
1,2-DCE	1,2-dichloroethylene
ARARs	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
CANDO	Community-Area Development Organization, Inc
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
COC	chemical (or contaminant) of concern
COPC	contaminant of potential concern
CSM	conceptual site model
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ESI	Expanded Site Inspection
FS	Feasibility Study
GAC	granular activated carbon
GETS	Groundwater Extraction and Treatment System
gpm	gallons per minute
HCWA	Hazleton City Water Authority
HSCA	Hazardous Site Cleanup Act
HQ	Hazard Quotient
IC	institutional control
ICR	incremental cancer risk
ISCO	in-situ chemical oxidation
K	potassium
$KMnO_4$	potassium permanganate
MCL	Maximum Contaminant Level
$Mn0_4^-$	permanganate
MnO_2	manganese dioxide
MSC	medium specific concentration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	operation and maintenance
ORP	oxidation reduction potential
OSC	On-Scene Coordinator
PA/SI	Preliminary Assessment and Site Inspection
PADEP	Pennsylvania Department of Environmental Protection
PADOH	Pennsylvania Department of Health
PCE	Tetrachloroethylene
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate

LIST OF ACRONYMS

ppb	parts per billion
ppm	parts per million
psi	pounds per square inch
RA	Remedial Action
RAO	Remedial Action Objective
RBC	Risk Based Concentration
RfD	reference dose
RG	Remediation Goal
RI	Remedial Investigation
RME	relative maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SLERA	screening level ecological risk assessment
SVE	soil vapor extraction
TAG	Technical Assistance Grant
TCE	trichloroethylene
UECA	Uniform Environmental Covenant Act
ug/kg	microgram per kilogram
ug/l	microgram per liter
USGS	U.S. Geological Survey
UST	underground storage tank
VI	vapor intrusion
VOC	volatile organic compound
VRAP	Valmont Residents Against Pollution

Part 1
The Declaration

PART 1: THE DECLARATION

1.0 Site Name and Location

The Valmont TCE Superfund Site (Site) is located in Hazle Township and the borough of West Hazleton, Luzerne County, Pennsylvania. The historical use of chlorinated solvents at a manufacturing facility at the Site resulted in contamination of soil and groundwater. The National Superfund Database Identification Number is PAD982363970.

2.0 Statement of Basis and Purpose

This decision document presents the "Selected Remedy" for the Site. This is the final remedy for the Site. The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 U.S.C. § 9601 et seq,, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300, as amended.

This decision is based on the Administrative Record for the Site, which has been developed in accordance with Section 113(k) of CERCLA, 42 U.S.C. § 9613(k). This Administrative Record file is available for review online at http://www.epa.gov/arweb/, at the U.S. Environmental Protection Agency (EPA) Region III Records Center in Philadelphia, Pennsylvania, and at the Hazleton Area Public Library in Hazleton, Pennsylvania. The Administrative Record Index (Appendix A) identifies each of the items comprising the Administrative Record upon which the selection of the Remedial Actions is based.

The Commonwealth of Pennsylvania concurs with the Selected Remedy.

3.0 Assessment of the Site

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

4.0 Description of the Selected Remedy

Site contamination will be addressed as one operable unit. The Site-specific media have been divided into two categories to address the chlorinated solvent contamination remaining in groundwater and sub-basement slab soil vapor. The categories are:

Groundwater

The groundwater plume is defined as the area of groundwater contaminated with Site-related volatile organic compounds (VOCs). Contamination at the Site is predominantly chlorinated solvents. The primary contaminant present in groundwater is trichloroethylene (TCE).

The groundwater plume measures approximately 2,000 feet by 500 feet, to an approximate depth of 110 feet.

Chromium (total) has been detected above its MCL (100 ug/l) in only one Site-related well, at a concentration of 105 ug/l (December 2009). Since it is the only metal detected at a concentration above an MCL, is found in only one on-Site well and with no apparent pattern or source, EPA does not believe it is Site related and is not proposing an active remedy for metals. Monitoring of chromium will continue as part of annual monitoring activities.

Indoor Air

Indoor air is defined as the ambient air within residential structures in the neighborhood bordered by Twin Oaks Road, Deer Run Road, and Fawn Drive. Sub-slab soil vapor and/or indoor air was previously shown to have Site-related contaminants present, including TCE, 1,1,1-trichloroethane (TCA), and 1,1-dichloroethylene (DCE).

The components of the Selected Remedy are described in detail in Section 20 of this ROD. Briefly, the major components of the Selected Remedy are:

1. Groundwater

   Contaminated groundwater at the Site shall be restored to the performance standards provided in Section 20 of this ROD. In-situ treatment of the entire groundwater plume will be done by conducting batch injections of a chemical oxidant, such as potassium permanganate or sodium permanganate, into the bedrock in the vicinity of the former Chromatex Inc. upholstery manufacturing plant (Plant). Injections will initially be a slurry of chemical oxidant into new injection wells, followed by periodic injections of either a slurry or more dilute solution of chemical oxidant.

   Performance monitoring will be conducted during the treatment period. Long-term groundwater monitoring for VOCs and inorganic compounds will be conducted until cleanup criteria have been met.

   Institutional controls (ICs) will be necessary to restrict the potable use of groundwater within the contaminated plume until groundwater cleanup goals are met. Use restrictions selected in this ROD could be implemented with a variety of tools, including local ordinances, orders issued by the Commonwealth of Pennsylvania or environmental covenants. IC's will also include requirements that the Plant property owner not interfere with the action, or the integrity of equipment for the duration of the remedial action.

2. Indoor Air

   Operation and maintenance (O&M) of the existing sub-slab depressurization systems that have been installed in 16 residential structures in the neighborhood adjacent the Plant area will be continued until the performance standards for sub-slab soil vapor are met. This will include annual system inspections, and monitoring at least once every five years until the

cleanup goals are met. The performance standards for indoor air are provided in Section 20 of this ROD.

5.0 Performance Standards

5.1 Groundwater

1. The following MCLs for the groundwater contaminants of concern (COCs) shall be attained throughout the entire plume:

Maximum Contaminant Levels (MCLs) for Contaminants of Concern in Groundwater	
TCE	5 ug/l
cis-1,2-DCE	70 ug/l
1,1,1-TCA	200 ug/l
Vinyl chloride	2 ug/l

2. Once the above performance standards for groundwater are met for three years, a risk assessment shall be conducted that evaluates the cumulative risk presented by residual Site-related compounds, including any remaining VOCs and/or chemical oxidation breakdown products.

3. The remedial action for groundwater will continue until the MCLs are achieved, as specified above, and the cumulative risk presented by all remaining Site-related compounds, and/or chemical oxidation breakdown products, is below a 10^{-4} cancer risk level, and the noncancer HI is equal to or less than 1.

5.2 Indoor Air

1. The operation of the sub-slab depressurization systems will continue until the following performance standards for sub-slab soil vapor have been achieved for four consecutive quarters:

Performance Standards for Contaminants of Concern in Sub-slab Soil Vapor	
TCE	12 ug/m^3
1,1-DCE	1,050 ug/m^3
1,1,1-TCA	26,500 ug/m^3

2. Once the above performance standards for sub-slab soil vapor are met, a risk assessment shall be conducted that evaluates the cumulative risk presented by residual Site-related compounds, including any remaining VOCs and/or chemical oxidation breakdown products.

3. O&M of the sub-slab depressurization systems will then continue until the performance standards for the COCs in sub-slab soil vapor are met, as described above, and the cumulative risk presented by all remaining Site-related compounds and/or chemical oxidation breakdown products present in sub-slab soil vapor is below a 10^{-6} cancer risk level, and the noncancer hazard index (HI) is equal to or less than 1.

5.3 Institutional Controls

1. Groundwater within the plume boundaries shall not be used for drinking water until the groundwater attains the standards set forth within Section 20.3.1 of this ROD. The plume boundaries are defined as the approximate area bounded by Deer Run Road to the north, the southern boundary of the Plant property to the south, Jaycee Drive to the west, and the eastern Plant boundary and Fawn Drive to the east. This area includes the residential streets of Twin Oaks Road, Bent Pine Trail, and Fawn Drive.

2. The remedial action, or the integrity of equipment, shall not be interfered with for the duration of the remedial action.

6.0 Statutory Determinations

The Selected Remedy meets the mandates of CERCLA § 121 and the regulatory requirements of the NCP. This remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate requirements (ARARs) to the remedial action, is cost-effective, and utilizes permanent solutions to the maximum extent practicable.

The Selected Remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e. reduce the toxicity, mobility, or volume of hazardous substances through treatment). EPA has determined that the majority of VOC contamination at the Site is contained in the fractured bedrock matrix porosity in the Plant area. This is considered source material that is acting as a reservoir and continuing to contaminate groundwater at it flows through the fractures. The Selected Remedy will address this principal threat waste, as well as the VOC-contaminated groundwater throughout the entire plume using active treatment.

ICs that restrict the potable use of groundwater within the plume area will be necessary until groundwater cleanup goals are met. A statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. Five year reviews will be conducted at least every five years after the date of the initiation of the remedial action and continue until hazardous substances no longer remain present above levels that allow for unlimited use and unrestricted exposure.

7.0 ROD Data Certification Checklist

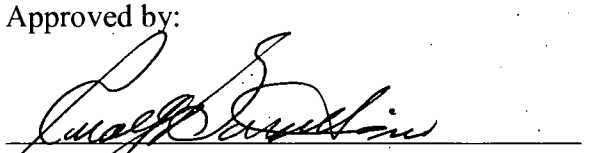
The following information is included in the Decision Summary (Part 2) of this ROD, while additional information can be found in the Administrative Record file for the Site:

- Chemicals of concern (COCs) and their respective concentrations;
- Baseline risk represented by the COCs;
- Cleanup levels established for COCs and the basis for these levels;
- How source materials constituting principal threats are addressed;
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD;
- Potential land and groundwater use that will be available at the Site as a result of the Selected Remedy;
- Estimated capital, annual O&M, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected; and
- Key factors that led to selecting the remedy.

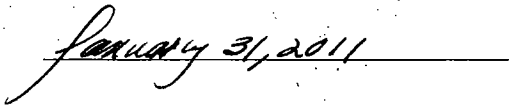
8.0 Authorizing Signature

This ROD documents the Selected Remedy for contaminated groundwater and indoor air at the Site and is based on the Administrative Record for the Site. EPA selected this remedy with the concurrence of the Pennsylvania Department of Environmental Protection (PADEP). The Director of the Hazardous Sites Cleanup Division for EPA Region 3 has approved and signed this ROD.

Approved by: Date:



Ronald J. Borsellino, Director
Hazardous Site Cleanup Division



Part 2
The Decision Summary

PART 2: THE DECISION SUMMARY

9.0 Site Name, Location, and Description

The Site is located in Hazle Township and borough of West Hazleton, Luzerne County, Pennsylvania (Figure 1). The Site is bounded to the north by Deer Run Road, to the south by an adjacent facility in the Valmont Industrial Park, to the west by Jaycee Drive, and to the east by a wooded property and Fawn Drive. The geographic coordinates of the approximate center of the Site are 40.968932 degrees north latitude, and 76.014885 degrees west longitude. The Site is located in a mixed industrial and residential area. A map of the Site is provided in Figure 2.

The National Superfund Database Identification Number for the Site is PAD982363970. This is a fund-lead site, with EPA being the lead agency for the remedial activities, and PADEP the support agency. Potentially responsible parties have been identified, but to date all removal activities have been conducted by either EPA or PADEP.

The Site currently consists of one known source area (the Plant), a former upholstery manufacturing plant at 423 Jaycee Drive within the Valmont Industrial Park, and contaminated groundwater attributable to the Plant in the nearby residential neighborhood. The Plant building is owned by Chromatex, Inc. (Chromatex). Chromatex vacated the building in 2001 after having operated an upholstery manufacturing and coating business from 1979 to 1993. The building is currently leased by Chromatex to Karchner Logistics, Inc., who uses the building as a warehouse to store non-hazardous materials. Chromatex used fluorocarbon stain repellants, including Scotchgard™ and Dupont Teflon, that contained TCE. It is the use of these TCE containing products that led to the subsequent VOC contamination at the Site.

10.0 Site History and Enforcement Activities

This section of the ROD provides the history of the Site and a discussion of EPA and PADEP investigations and response activities. The "Proposed Rule" proposing the Site to the National Priorities List (NPL) was published in the *Federal Register* on June 14, 2001. The "Final Rule" adding the Site to the NPL was published in the *Federal Register* on September 13, 2001.

10.1 History of Activities That Led to Contamination

The first developer of the property at 423 Jaycee Drive was the Greater Hazleton Community-Area Development Organization, Inc. (CANDO). The building shell was constructed at the Site in 1963. In 1966, Wallace Metal Products, Inc., a coffin manufacturer, purchased the property. In 1972, Wallace transferred the property back to CANDO, which subsequently sold it to Nutmeg Corporation. Nutmeg began manufacturing knitted fabrics at the facility. Futura Fabrics Corporation, a successor to Nutmeg, continued manufacturing fabrics through 1978.

In July 1978, the Valmont Group purchased the property from CANDO after Futura had transferred it back to CANDO. The Valmont Group leased the property to Chromatex. In the same year Chromatex began upholstery fabric manufacturing operations at the Plant. In 1991, the property's title was transferred outright to Chromatex. In 1993, Chromatex sold the

manufacturing process and equipment to CULP, Inc. Chromatex vacated the building in March 2001. The building is currently leased from Chromatex by Karchner Logistics, Inc.

As described in the Remedial Investigation (RI) report, Chromatex used both water-based and solvent-based adhesives as part of the process to apply stain repellents to fabrics and to manufacture latex-backed throw rugs. Yarns were received and knitted into unfinished upholstery fabrics of various styles. The unfinished goods were then processed by applying a styrene butadiene rubber or acrylic fabric compound on the back to stabilize the fabric and were dried in one of two steam ovens. A fluorocarbon stain repellent was applied in a third oven to some fabrics. The fluorocarbon used solvent TCE as a carrier. The carrier was recovered in a carbon adsorption/steam stripping system to be reused. These adhesives and the stain repellent were commonly known under the trademark names of Scotchgard™ and Dupont Teflon™.

The northeast side of the Plant contained a truck loading area and a catchment basin that collected chemicals that were spilled during storage tank pumping. An asphalt parking lot is now adjacent to the northern side of the Plant.

A 10,000-gallon emergency overflow underground storage tank (UST) was formerly located at the northwestern corner of the Plant. This tank was used for collecting chemicals in the event of a spill or leak.

The TCE used in the fabric coating operation was piped directly from the delivery trailer to one of two 5,000-gallon storage tanks located inside the Plant. From the tank, TCE was pumped through an overhead pipe to a 55-gallon mixing drum containing Scotchgard™ chemicals. This mixture was pumped to the application machine where it was sprayed onto fabrics. Vapors from the machine were recovered by dual activated carbon units which were part of a solvent/vapor adsorption recovery system. Recycling of the solvents was done by introducing steam into the recovery system to vaporize solvents captured by the carbon units. Any solvents and vapors were then condensed from the steam and separated. The exhaust from the recovery system was piped through the roof of the Plant and emitted into the atmosphere. The treated water was piped to the local sewer system, while the reclaimed TCE was sent to the collector and then back to one of the 5,000 gallon storage tanks. The reclaimed TCE could not be used as solvent-based adhesive since it lacked the necessary additives. The use of TCE for the stain repellent process was discontinued in June 1988, when Chromatex switched to a water-based latex adhesive process only.

10.2 History of Previous Environmental Investigations and Removal Actions

10.2.1 Previous Environmental Investigations

Groundwater contamination at the Site was discovered in October 1987 by the Pennsylvania Department of Environmental Resources (now PADEP) when conducting groundwater sampling in response to a spill of xylene at an adjacent facility. Samples collected from four private drinking water wells in the nearby neighborhood revealed the presence of elevated concentrations of chlorinated solvents in each of the wells. The presence of these solvents was unrelated to the xylene spill. Following the discovery, PADEP contacted EPA for assistance.

EPA conducted further sampling that indicated the presence of TCE in 23 residential wells adjacent to the Plant. TCE was found in the residential wells at concentrations as high as 1.4 parts per million (ppm). TCE was found in the Plant production well, located on the west side of the Plant building, at a concentration of 2.2 ppm. Under an EPA removal action, bottled water and carbon filters were provided to the affected homes. Later, public water supply lines were extended into the neighborhood to supply clean drinking water to the residents.

As part of its 1987 investigation, EPA collected soil gas samples from depths of 3 to 5 feet around the Plant. TCE was detected in the soil gas at concentrations ranging from 0.1 to 12.5 parts per billion (ppb). The highest concentration was found along the east side of the Plant. EPA also conducted an analysis of the gas that had accumulated at the top of the emergency overflow UST located in the northern section of the Plant property. This UST served as a collection point for the floor drains within the Plant, and was not associated or connected with the solvent recovery system. The gas sample revealed a concentration of TCE within the UST at 1,100 ppm. This UST was drained of wastewater and sludge in November 1987. Chromatex reported that the analysis of the wastewater revealed 14 ppm of TCE and lower levels of other VOCs. The tank was cleaned prior to being closed.

During the cleaning of the emergency overflow UST, Chromatex reported that the piping associated with the UST was clogged with latex material. The lines to and from the UST were inspected by EPA and PADEP. It was determined that the feed line to the UST was broken. Soil and waste samples from near the broken line revealed that concentrations of TCE were present in the latex material and in the soil samples. The highest TCE concentration reported for the soil sample collected beneath the broken line was 1,800 milligrams per kilogram (mg/kg [roughly equivalent to ppm]).

In March through May of 1988, Chromatex performed a groundwater contamination study as one of the requirements of an Adminstrative Consent Order signed by EPA on March 2, 1988. Chromatex installed and sampled 12 monitoring wells at and near the Plant. TCE was detected at a concentration of 17 ppm in a monitoring well located on the east side of the Plant. Elevated contaminant levels were also detected in other wells. Additional VOCs detected included 1,1,1-TCA (13 ppm), 1,2-DCE (1 ppm), tetrachloroethylene (PCE, 35 parts per billion [ppb]), as well as relatively low concentrations of additional VOCs. The report summarizing the results of the investigation was completed in June 1988.

EPA conducted a Preliminary Assessment and Site inspection (PA/SI) of the Plant in 1989 and 1990, respectively. No samples were collected during these investigations. EPA collected soil and groundwater samples at the Site in September 1993, as part of an Expanded Site Inspection (ESI). 1,1,1-TCA, 1,1-DCA (dichloroethane), and 1,2-DCE were detected in a sample from beneath a roof drain spout. TCE was found at 22 ppb in the sample from the nearby drainage ditch. Groundwater samples from residential wells contained TCE ranging up to 592 ppb as well as lower levels of other VOCs. Monitoring well samples revealed TCE levels near the Plant up to 17 ppm, as well as high concentrations of 1,1,1-TCA (5.5 ppm) and 1,2-DCE (1 ppm), along with lower concentrations of additional VOCs.

EPA completed a hazard ranking of the Site in May 2001 and placed the Site on the NPL in September 2001. The NPL is the list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories.

To determine the complete nature and extent of contamination at the Site, EPA conducted the RI. RI activities were conducted from March 2001 to July 2004, and the RI report was issued in July 2004.

10.2.2 EPA Removal Actions

As noted in the previous section, EPA conducted an initial removal action in 1987 to provide bottled water and carbon filtration devices to residents that had wells contaminated with Site-related VOCs. Later that year, public water supply lines were extended into the neighborhood to supply clean drinking water to the residents.

Based on the results of indoor air samples collected as part of the RI during 2001, EPA conducted a removal action to address contaminated indoor air. Eight homes were supplied with temporary air filtration units and three additional homes were provided with custom-made sump covers between 2003 and 2004. The homes that were selected for air filtration units or custom sump covers were found to have Site-related contaminants present in indoor air that resulted in an incremental cancer risk (ICR) greater than $1x10^{-4}$ and/or a Hazard Index (HI) greater than 1, based on a reasonable maximum exposure (RME).

EPA determined a non time-critical removal action was necessary to address contaminated soils at the Site. In August 2003, EPA completed an Engineering Evaluation/Cost Analysis (EE/CA) that evaluated several alternatives that could be used to mitigate potential exposures to the contaminated soils. EPA ultimately selected a removal action to provide for the excavation and off-Site disposal of VOC contaminated soil (outside the Plant building), and soil vapor extraction (SVE) from inside the Plant building.

In August 2004, EPA completed a soil removal action at the Site where more than 18,000 tons of VOC-contaminated soil (down to the cleanup level of 5 ppb for TCE) was excavated and taken off-Site for disposal. The soil excavations were conducted on the Plant property outside the Plant building, as shown in Figure 3. The SVE system was designed and constructed in 2006 to address contaminated soil beneath the Plant floor. The SVE system operated from March 2007 through October 2009, during which time the system recovered 234 pounds of TCE from the contaminated soil beneath the slab of the building. Soil samples collected by EPA in January, February, and April 2010 indicate that operation of the SVE system has successfully achieved the removal action level of 5 micrograms per kilogram (ug/kg [roughly equivalent to ppb]) for TCE in soil beneath the Plant, and the system has been shut off. The removal action for contaminated soil eliminated potential health risks from direct contact exposure to VOC-contaminated soil, as identified in the EE/CA for Contaminated Soils. The clean-up goal of the removal action meets EPA's risk-based concentration for direct contact, and also PADEP's soil-to-groundwater clean-up goal. In addition, the soil removal eliminated a continuing source of TCE contamination to groundwater. A complete description of the SVE system and the

confirmation soil sampling can be found in the On-Scene Coordinator (OSC) Report dated July 2010.

In 2006, EPA removed the temporary air filtration systems from the homes and replaced them with more energy efficient and less intrusive sub-slab depressurization systems.

In April 2006, the Agency for Toxic Substances and Disease Registry (ATSDR) and the Pennsylvania Department of Health (PADOH) completed a public health assessment for the Site. The purpose of the public health assessment was to evaluate on- and off-Site contamination, human exposure pathways, public health concerns, and associated public health implications. At the time the health assessment was being conducted, EPA had provided public water to the affected residents, and had either mitigated or was in the process of mitigating indoor air vapors in the affected residences. The conclusion of the public health assessment was that current and future exposures to contaminants from the plume of contaminated groundwater in residential indoor air were not likely to cause adverse health effects in residents.

EPA completed an EE/CA for contaminated groundwater in May 2006. At that time, EPA was evaluating whether a non-time-critical removal action was appropriate for contaminated groundwater attributable to the Site. The EE/CA incorporated groundwater data from the RI, and evaluated multiple alternatives for the cleanup. EPA then initiated pilot studies to evaluate the effectiveness of chemical oxidation. EPA later determined that a remedial action, rather than a non time-critical removal action, would be a more effective way to manage the cleanup of contaminated groundwater. The remedial action is the subject of this ROD.

In support of a non time-critical removal action, EPA completed an EE/CA for contaminated indoor air in April 2007. While the Indoor Air EE/CA considered information from the 2004 RI Report, additional sub-slab soil vapor samples were also collected from homes that were identified as being potentially impacted by Site-related vapor intrusion. The houses that were selected for sampling were those that were directly above the shallow groundwater plume of TCE. Sub-slab samples were collected from a total of 27 homes. A default attenuation factor of 0.1 was used to evaluate sub-slab data, meaning a hypothetical TCE concentration of 10 ug/m^3 detected in a sub-slab sample was assumed to translate to an indoor air concentration of 1 ug/m^3. Based on the 2006 sub-slab data and associated human health risk assessment, an unacceptable risk from potential indoor air contamination, due to groundwater contamination, existed at nine homes, in addition to the eight homes that were previously addressed. For those nine homes, Site-related contaminants present in the sub-slab were found to potentially present an indoor air cancer risk greater than $1x10^{-4}$ and/or a non-cancer HI greater than 1, assuming a default attenuation factor of 0.1. Construction of the depressurization systems was recommended as the best alternative for mitigating Site-related subslab vapors. In a Special Bulletin dated March 8, 2007, EPA initiated a removal action to install depressurization systems in the newly identified homes. The depressurization systems were installed in eight of the nine homes in April/May 2007. Shallow groundwater was encountered beneath the basement slab of the ninth home, and EPA was unable to install a depressurization system. EPA subsequently conducted indoor air sampling inside the home, and found no Site-related contamination present. A total of 16 homes currently have depressurization systems, as described above.

10.3 History of Enforcement Activities

On October 30, 1991, the United States filed a complaint against Site owners and operators, Chromatex, Inc., The Valmont Group, and its individual partners, pursuant to Section 107 (a) of the CERCLA, 42 U.S.C. § 9607(a), as amended, seeking response costs incurred by the United States in connection with the Site. On October 27, 1993, the Court granted a Motion for Summary Judgment filed by the United States, finding Defendants liable for the United States' Past and Future Site Response Costs. The Court entered a Final Judgment against Defendants on February 9, 1994. Pursuant to the Final Judgment, in 1997 the United States sought payment from Defendants of Past Response Costs. Defendants paid a total of $823,216.65 to the United States in Past Response Costs. EPA has billed Defendants for subsequent response costs incurred in connection with the Site and is seeking payment of these costs by Defendants pursuant to the Final Judgment.

11.0 Community Participation

This section of the ROD describes EPA's community involvement activities. EPA has hosted a number of public meetings to engage the local community, distributed fact sheets to update the community on EPA's activities, and provided a technical assistance grant to a local community group. These community participation activities meet the public participation requirements in CERCLA § 121 and the NCP Section § 300.430(f)(3).

11.1 Community Meetings

EPA and PADEP have conducted a number of community meetings during the course of remedial and response activities at the Site. Availability sessions were held a number of times to provide an opportunity for the community to speak to EPA in a relatively informal setting and learn about activities being conducted. Meetings were also held to provide updates on the progress of the Feasibility Study (FS) and EE/CAs that were conducted.

11.2 Community Involvement with the Proposed Plan

The public comment period for the Proposed Plan was from August 23 to September 30, 2010. In addition, a public meeting was held on September 16, 2010, at the West Hazleton Community Building, in West Hazleton, Pennsylvania, to present the Proposed Plan to community members. Representatives from EPA answered questions about EPA's Preferred Alternative for the Site. Oral comments were documented during the meeting. This transcript is included in the Administrative Record for the Site. EPA's response to comments received during the public comment period is included in the Responsiveness Summary in this ROD.

Information provided by EPA in the Proposed Plan is based largely on the findings of the RI Report (2004) and the final Feasibility Study (FS) Report (2010). Both of these documents, along with the other documents that EPA relied upon to prepare this ROD, are available in the Administrative Record for the Site.

11.3 Technical Assistance Grant

Technical Assistance Grants (TAGs) provide money for activities that help communities participate in the decision making process at Superfund sites. Initial grants up to $50,000 are available to qualified community groups so they can contract with independent technical advisors to help the community understand technical information about the site.

A $50,000 TAG was provided to "Valmont Residents Against Pollution" (VRAP), a local community group that formed to participate in decisions made at the Site. The grant money allowed VRAP to contract the services of an environmental consultant. VRAP maintained the TAG from February 2003 through December 2006. The TAG was officially closed out in November 2007.

11.4 Fact Sheets

Numerous fact sheets have been prepared during the course of EPA's removal and remedial activities at the Site. Most recently, a fact sheet was distributed to the local community summarizing the contents of the Proposed Plan and EPA's Preferred Remedy. These fact sheets have been placed in the Administrative Record for the Site.

11.5 Local Site Repository

The purpose of the local site repository is to provide the public a location near the community to review and copy background and current information about the Site.

The repository is located near the Site at:

Hazleton Area Public Library
55 N. Church Street
Hazleton, PA 18201
Hours: Monday - Thursday 8:30 am to 9pm
Friday - Saturday 8:30 am to 5pm
Sunday closed

12.0 Scope and Role of Response Action

The Selected Remedy is the final remedy for the Site. The overall strategy of the Selected Remedy presented in this ROD is to address the contaminated groundwater at the Site, and ensure the continued mitigation of vapor intrusion into homes in the neighborhood. All other impacted media (indoor air, soil) have been addressed by earlier removal actions. Ingestion of water from within the groundwater plume area poses a potential risk to human health because contaminant concentrations exceed EPA's acceptable risk range and concentrations of contaminants are greater than the MCLs for drinking water. The Selected Remedy will restore the entire plume of contaminated groundwater to its future beneficial use in a timely and efficient manner. The Selected Remedy also provides for the maintenance and periodic monitoring of the

sub-slab depressurization systems previously installed by EPA in the residential area, as well as ICs to restrict the potable use of groundwater within the contaminated plume.

13.0 Site Characteristics

This section of the ROD provides an overview of the Site's geology and hydrogeology; the sampling strategy used during the RI; and the nature and extent of contamination. Information regarding the nature and extent of contamination can be found in the RI report, and information about the current groundwater contaminant concentrations can be found in the FS report.

13.1 Overview of the Site

The Site is located in northeast Pennsylvania in an area with a rich history of anthracite coal mining. The Site itself is generally flat and slopes to the north. The region surrounding the Site is made up of rolling hills to mountainous terrain. The Site covers approximately 25 acres across both the Plant area and adjacent neighborhood. Most of the Plant area is covered with an impermeable surface, including the asphalt parking lot on the north side of the Plant building, and the Plant building itself.

The municipal water supply in the area is provided by the Hazleton City Water Authority Department (HCWA), who obtains potable water from a number of supply wells in the area. There are five municipal water supply wells located within a 1 mile radius of the Site.

The nearest surface water body is Black Creek, which is located over 1,200 feet north of the Site. Black Creek is classified as a cold-water fishery. There are no identified wetlands in the vicinity of the Site. During the RI, groundwater at the Site was not found to be discharging to Black Creek.

13.2 Geology and Hydrogeology

The contamination remaining at the Site is limited to groundwater. The removal actions conducted by EPA in the past eliminated other contaminated media. More detailed information regarding the Site geology and hydrogeology can be found in the RI Report.

13.2.1 Geology

The Site is located in the Appalachian Mountain Section of the Valley and Ridge Physiographic Province. The Appalachian Mountain Section consists of broadly folded Paleozoic sedimentary rocks that range in age from Ordovician to Pennsylvanian. Pennsylvanian-age Pottsville Group and the Mississippian age Mauch Chunk formations directly underlie the Site. The average depth to competent bedrock is about 14 feet below ground surface (bgs).

The Pottsville Group is a terrestrially deposited, fluvially influenced complex composed primarily of gray conglomerate, conglomeritic sandstone, siltstone, sandstone, and some thin beds of anthracite coal. The Mauch Chunk Formation underlies the Pottsville formation beneath the Site at a depth of less than 300 feet. The Mauch Chunk Formation is composed of an

interbedded brownish-gray to grayish-red siltstone, claystone, and brownish-gray to pale red poorly cemented, fine grain sandstone.

The subsurface geology at the Site was interpreted during RI activities from the geologic information obtained from subsurface borings and the subsequent geophysical logging of many of the boreholes. The local bedrock geology consists mainly of fine-to-coarse grained sandstones, conglomeritic sandstones, and conglomerate. Minor shale, slate and coal layers were also observed. The color of the rocks varied from brown, red-brown to light/dark gray and black. Fractures were encountered at varying depths in the well borings.

13.2.2 Hydrogeology

The occurrence and migration of groundwater beneath the Site is primarily controlled by open bedrock fractures. Fractures are found both at lithologic contacts (bedding plane fractures) and within lithologic units (cross-bedding fractures). Fractures tend to be more common near the contacts between finer-grained rocks, such as siltstone, shale, and sandstone beds. The predominant orientation of bedding planes based on strike distribution was east-northeast and west-northwest. The volume of water within the fracture porosity is orders of magnitude less than the relatively less mobile volume of water in the matrix porosity (rock pores). The storage capacity of the matrix porosity is significant because this is where the bulk of the contaminant mass is located at the Site.

The bedrock aquifer is the primary source of drinking water in the area. Groundwater can also be found in localized, perched conditions in the overburden, depending on recent precipitation events. Depth to water at the Site ranges from 10 feet (near the groundwater divide in the Plant area) to approximately 30 feet below ground surface. Groundwater at the Site is generally flowing in two distinct directions because a groundwater divide runs through the Plant building. North of the divide, groundwater is generally flowing toward the north/northeast, into the residential neighborhood. South of the divide, groundwater is generally flowing toward the south/southwest.

13.3 Sampling Strategy

Sampling activities were completed as part of the RI to address the following elements:

- Characterize the nature and extent of contamination attributable to the Site, including an evaluation of groundwater, soil, and indoor air.
- Better understand the physical parameters affecting contaminant fate and transport.
- Provide a comprehensive assessment of the current and potential human health and environmental risks associated with the Site.
- Use the RI data to evaluate potential environmental response clean-up options (i.e., removal actions and remedial actions) and to support the FS.

RI field activities were performed at the Site from May 2001 through November 2003. This work included:

- Indoor air sampling and analysis within the nearby residential neighborhood. A total of 89 indoor air samples were collected.
- Surface water, sediment sampling, and sewer stormwater.
- Sampling of basement sump and floor drain water for seven residences.
- Four soil gas surveys to identify VOCs at the Plant property and within the neighborhood.
- Soil sampling within the vicinity of the Plant, including the neighborhood. Nearly 200 surface and subsurface soil samples were collected.
- Installation and sampling of 33 new monitoring wells and 13 former residential wells.
- Ecological characterization of the study area.

The RI groundwater investigation was conducted in two separate phases, as follows:

Phase I groundwater investigation was performed from June to December 2002. Phase I included drilling and installing 23 new monitoring wells and reconstructing 13 existing wells with well screens and risers. Under agreement with EPA, the U.S. Geological Survey (USGS) conducted borehole geophysical logging for the new wells; existing wells previously drilled by Chromatex, and selected residential wells. One comprehensive round of groundwater sampling was done in October and November 2002, while one round of water-level measurements took place in December 2002.

Phase II groundwater investigation was conducted from April to July 2003. The work involved drilling and/or installing 10 new monitoring wells. USGS again performed geophysical logging of the open boreholes. One comprehensive round of groundwater sampling was conducted and three rounds of water level measurements were done in June and July 2003.

Additional data that were evaluated for the FS included data generated during the 2009 In-situ Chemical Oxidation (ISCO) Pilot Study.

13.4 Conceptual Site Model

Since the release of the 2004 RI, the conceptual site model (CSM) has been modified. A CSM provides a convenient format to present an overall understanding of the site. A CSM may be developed at the start of a project and refined and updated throughout the life of the site activities.

EPA conducted non time-critical removal activities to address contaminated soil present in the Plant area by excavating contaminated soil and constructing and operating a soil vapor extraction system inside the Plant building. A total of 18,000 tons of TCE contaminated soil was removed, along with nearly 235 pounds of TCE captured in the soil vapor extraction system. Soil contaminated with VOCs is no longer part of the CSM.

Groundwater in the Plant area is the primary source of contamination. During the 2009 ISCO Pilot Study that was conducted to support the FS, EPA determined that a significant portion of contamination is present in the bedrock matrix porosity. As less contaminated, or clean, groundwater moves through the fractures in the bedrock, it comes into contact with the highly contaminated groundwater within the pore space of the bedrock and it becomes contaminated.

This groundwater then moves away from the Plant area and generally begins to decrease in VOC concentrations because of natural processes, such as dilution, dispersion, absorption, and abiotic and biological degradation. At the water table, which is the point of contact between the saturated and unsaturated zones, TCE vapors come out of the water because of the gas's relatively high partial pressure. These TCE vapors rise to the ground surface, and have accumulated underneath the basement slabs of some homes in the residential neighborhood. In some cases, TCE vapors were found inside the homes, signifying vapor intrusion.

In August 2010, it was estimated that the current volume of groundwater contaminated with TCE at concentrations above the MCL of 5 ug/l is 9.9 million gallons. The calculations used to estimate this volume can be found in Appendix B of the FS.

Figure 4 provides an illustration of the CSM.

13.5 Nature and Extent of Contamination

This section of the ROD discusses the nature and extent of contamination found at the Site.

13.5.1 Indoor Air and Sub-slab Soil Vapor

Residential Air

During the RI, EPA collected 89 indoor air samples from homes in the neighborhood north of the Chromatex property to evaluate VOC vapors migrating from contaminated groundwater into indoor air. Four rounds of indoor air sampling were conducted from May 2001 to November 2003. TCE was detected in the indoor air samples from 10 homes out of 42 homes sampled, at least once, while TCA was found in the air of 17 homes. Only five houses had both TCE and TCA detected in indoor air. Eight of the 42 homes sampled during the RI were found to have unacceptable levels of Site-related vapors present due to vapor intrusion, and were provided with air filtration units, and later sub-slab depressurization units, as described in Section 10.2.2 of this ROD. Three additional homes were provided with custom sump covers to prevent vapors from entering the basement.

During March and April 2006, as part of the EE/CA for Contaminated Indoor Air, EPA collected vapor samples from beneath the basements (sub-slab vapor) of homes in the residential neighborhood located above the contaminated groundwater. The houses that were selected for sampling were those that were directly above the shallow groundwater plume of TCE. The eight homes that had already received air filtration units, which were later upgraded to sub-slab depressurization units, were not included in these sampling events. Sub-slab samples were collected from a total of 27 homes. The samples were analyzed for VOCs. Elevated concentrations of TCE were detected in the sub-slab vapor samples collected from beneath the homes of nine residences. The EE/CA for Contaminated Indoor Air was finalized in April 2007. Based on the elevated concentrations of TCE detected in the sub-slab soil vapor samples and the risk posed by the potential for vapor intrusion into indoor air, EPA installed sub-slab depressurization systems in eight homes, as part of a removal action. As described in Section 10.2.2, shallow groundwater was encountered beneath the basement slab of the ninth home that

prevented installation of a sub-slab depressurization unit. Indoor air samples were collected from this home, and no Site-related vapors were detected. To evaluate the effectiveness of the sub-slab depressurization systems, EPA performed smoke tests, verified the pressure differential between the basement and beneath the slab, and measured concentrations of naturally occurring radon gas.

1,3-Butadiene, which is a VOC, was detected in indoor air samples collected during the RI and in low concentrations in sub-slab soil vapor samples collected during the EE/CA for Contaminated Indoor Air. This compound is widely present in man-made rubber and plastics, and was possibly used at the Site as a constituent of styrene-butadiene rubber backing that was at one time applied to the backing of fabrics. 1,3-Butadiene is not expected to dissolve into water because it quickly evaporates, so its presence in indoor air and sub-slab samples was further evaluated to determine whether or not it is a Site-related contaminant. This analysis can be found in Appendix G of the 2007 EE/CA for Contaminated Indoor Air, and is summarized in the following paragraphs.

The locations where 1,3-butadiene were detected in residential sub-slab soil vapor samples were mapped, and there appeared to be no discernable pattern. The locations were also compared to locations where Site-related TCE was detected in sub-slab soil vapor samples, and there appeared to be no strong correlation between TCE and 1,3-butadiene. 1,3-Butadiene, while detected in approximately half of the sub-slab sampling locations, was also detected at several locations outside of the inferred plume of TCE-contaminated groundwater plume. The compound was only in the indoor air of 6 out of 63 homes that were sampled during the RI. Of the six homes where it was detected in indoor air, 1,3-butadiene was also detected in sub-slab samples in only two of the homes. However, a comparison of the sub-slab concentrations to the indoor air concentrations did not indicate vapor intrusion because the sub-slab concentrations were very low. It is likely the indoor air concentrations were indicative of detections of 1,3-butadiene from a household source.

In the 2007 EE/CA for Contaminated Indoor Air, 1,3-butadiene sub-slab concentrations were included in the risk assessment because of its presence in a number of indoor air samples. The incremental cancer risks (ICRs) that were calculated for various residences did not approach actionable levels, and ranged from $6x10^{-7}$ to $2.5x10^{-6}$. The non-cancer Hazard Quotient (HQ) for 1,3-butadiene was calculated to be 0.05.

Based on the evaluation presented in Appendix G of the 2007 EE/CA for Contaminated Indoor Air, EPA has determined that the presence of 1,3-butadiene in sub-slab and indoor air samples collected in the residential neighborhood is unlikely to be Site-related, and has not included it as a COC in this ROD. However, 1,3-butadiene will be included as one of the constituents monitored for when conducting sub-slab and/or indoor air monitoring as part of the Selected Remedy described in this ROD.

Plant Building Air

During the ISCO Pilot Study described below, EPA collected indoor air samples from within the Plant building in January 2010 to evaluate the potential for vapor intrusion. No VOC concentrations above unacceptable human health risks were detected in the indoor air samples. The results are summarized in the 2010 FS.

13.5.2 Soil

During the RI, multiple rounds of surface and subsurface soil sampling were conducted to investigate potential source areas of contamination, and to evaluate the potential risk to human health and the environment. Both historical information and previous investigations indicated that at least three suspected areas of soil contamination were present at the Plant, with concentrations of TCE as high as 1,800 ppm. The highest concentration was found in soils near the emergency overflow UST. Samples were collected from throughout the Plant area, as well as in the residential neighborhood. The RI report presents more detailed information with regard to findings of the soil sampling events.

Four general areas of soil contamination were identified, as shown in Figure 3. These areas (or zones) included:

- Zone A: A small area south of the Plant beneath an asphalt roadway.
- Zone B: An area inside the Plant near the former front office, near the northwest corner of the building where chemicals were stored in aboveground tanks.
- Zone C: A larger area beneath the parking lot to the north of the Plant, adjacent to the residential area.
- Zone D: A small area along the eastern side of the Plant near the former drum storage area. Only a trace level of DCE was detected in the surface soil samples collected from this area.

Based on the RI soil sampling results, EPA determined that a non time-critical removal action was appropriate for VOC contaminated soils at a portion of the Site, as described in Section 10.2.2 of this ROD. The cleanup goal for TCE-contaminated soil was 5 ppb.

13.5.3 Groundwater

Two rounds of groundwater sampling conducted during the RI confirmed the presence of significant VOC contamination in the groundwater. The plume of VOC contaminated groundwater measured approximately 2,000 feet by 500 feet, to an approximate depth of 110 feet. Groundwater flows both to the north of the Plant and to the south of the Plant (a groundwater divide runs through the Plant area). Figure 5 shows the direction of shallow bedrock groundwater flow, and Figure 6 shows the direction of deeper groundwater flow at the Site. Figures 7 and 8 show the area of shallow and deeper groundwater TCE contamination, respectively, as of June 2009. The area of contamination has remained relatively constant, indicating that the plume is under static conditions and is neither expanding nor contracting.

TCE levels in shallow groundwater (generally less than 60 feet bgs), were found to be as high as 8.8 ppm in the Plant area. TCE levels in deep groundwater (generally greater than 60 feet bgs) were found to be as high as 1.4 ppm in the Plant area. Groundwater contamination was found to be much higher north of the groundwater divide than south of the divide. In addition to TCE, the following VOCs were detected: PCE, TCA, vinyl chloride, and DCE. Currently, TCE, TCA, and DCE are detected at concentrations exceeding their respective MCLs. Vinyl chloride, though not currently detected above its MCL at the Site, remains one of the significant risk drivers at the Site, as will be discussed in the risk section of this ROD.

As noted earlier, TCE was historically detected in the Plant production well at concentrations as high as 2.2 ppm. Prior to being connected to a municipal water supply, the Plant production well was used to withdraw an estimated 5,500 gallons of water per day. This well was a large open borehole well that produced up to 34 gallons of water per minute. It was open from 10 to 370 feet bgs. Contamination at depth does not appear to be representative of the depth of contamination across the remainder of the Site. Rather, contamination at this depth is attributed to cross-contamination caused by the open borehole that was open to shallow zones that contained high concentrations of contaminated water. Pumping of this well influenced the vertical migration of contamination, pulling contamination from the shallower, more unconfined portions of the Pottsville Formation to the deeper water-bearing zones. In addition, when the production well was taken out of service, the downward gradient within the well may have caused shallow contamination to migrate down the open borehole to deeper water bearing zones.

The production well was converted from an open borehole to a monitoring well (MW-22D) and screened from 294 – 304 feet bgs during the RI. The TCE concentration in monitoring well MW-22D has steadily decreased over time because cross contamination between the shallow contaminated zones and deep water bearing zones within the borehole has been eliminated; the April 2010 TCE concentration from this well was 220 ppb.

To evaluate the potential for deep groundwater contamination in other areas of the Site, EPA advanced a boring in the center line of the plume in the residential area to a depth of 250 feet bgs. During drilling, few water bearing zones were encountered, and those that were encountered were found at depths shallower than 150 feet bgs. The shallower water bearing zones were sampled and TCE was found to be present at concentrations of 120 ppb, similar to concentrations observed in surrounding wells. Therefore, since the depth of water-bearing zones and concentration of TCE found in the deep neighborhood well was similar to what has been found in surrounding wells, and the water bearing zones were limited to depths no greater than 150 feet bgs, contamination deeper than 150 feet bgs is unlikely.

The RI Report identified several metals as contaminants of potential concern, including chromium. Chromium was detected in three wells above its MCL. Only one of the wells is located within the VOC plume. The other two wells are located outside the VOC plume. A recent analysis of the spatial distribution (meaning what their concentrations are throughout the plume area) of these metals and how they relate to the VOC plume shows no pattern of distribution. Additionally, chromium is only detected in elevated concentrations in deeper wells, not the shallower wells on-Site. Since chromium, the only metal detected at a concentration above an MCL, is found in only one on-Site well and with no apparent pattern or source, EPA

does not believe it is Site related and is not proposing an active remedy for metals. Monitoring for metals will continue as part of the response actions presented in this ROD.

In June 2008, in preparation for the ISCO Pilot study (see below), EPA conducted a baseline round of groundwater samples from all Site monitoring wells. While the relative concentrations of VOCs were somewhat less than found during the RI sampling, the distribution in the Plant area and neighborhood was similar.

During the RI, and more recently in April 2010, EPA evaluated whether or not perfluorinated compounds are present in the groundwater at the Site. Perfluorinated compounds are a group of synthetic chemicals that do not occur naturally in the environment. These compounds, which include perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS), have been used in the Scotchgard™ manufacturing process. PFOA and PFOS do not have MCLs; however, EPA issued a provisional health advisory in 2009 concerning these chemicals in drinking water. EPA defines provisional health advisories as "reasonable, health-based hazard concentrations above which action should be taken to reduce exposure to unregulated contaminants in drinking water." The 2009 provisional health advisory levels for PFOA and PFOS are 0.4 micrograms per liter (ug/l) and 0.2 ug/l, respectively. The health advisory levels are based on a child drinking 1 liter of water per day, and that the water provides a relative source contribution of only 20 percent of the child's exposure to PFOA or PFOS. It is unclear how closely the assumptions for the health advisories apply to the Site, particularly with respect to the 20% relative source contribution.

The April 2010 groundwater sample results indicated the presence of PFOA and PFOS in Plant area wells at concentrations from non-detect to 1.9 ug/l (in one well located on the Plant property [MW-10a]) and 1.7 ug/l (also in the same well on the Plant property), respectively. The presence of these compounds does not appear to be widespread throughout the TCE-plume area; however, these compounds will be included in the groundwater monitoring program for the Site to ensure they are not adversely impacting the aquifer. Multiple rounds of comprehensive sampling for these compounds will also be conducted during the design phase of the remedial action.

13.6 Potential Routes of Contaminant Migration

The migration of contaminants at the Site is currently occurring via several mechanisms, including back diffusion of contamination out of rock matrix porosity in the Plant area, the migration of dissolved contamination from the Plant area to the remainder of the plume in the aquifer, and the volatilization of VOCs from the aquifer as soil gas and the subsequent migration of soil gas towards the ground surface.

The Plant area is the historical source of contamination at the Site. Contaminants migrated downwards through the overburden soil as rainwater and shallow overburden groundwater migrated down through the soil and into the bedrock and bedrock aquifer. All contaminated soil has been removed from the Site during previous EPA removal actions. However, the upper portion of bedrock in the Plant area (upper 40 feet) has been shown to contain concentrations of TCE as high as 26 ppm and this continues to act as a source for the remaining groundwater contamination at the Site (2010 Treatability Study Report).

13.6.1 Matrix Diffusion in the Plant Area

Matrix diffusion is defined as the exchange of contaminant mass, through molecular diffusion, between the fluid in fractures and the fluid in the rock matrix. In the case of this Site, the solute mass of concern is the VOC contamination. The flow velocity of water in the rock matrix (the matrix porosity, or primary porosity) is orders of magnitude slower than the flow of water in the fractures (the secondary porosity). This can translate to significantly slower contaminant transport throughout the aquifer and is therefore an important process to understand for remediation of groundwater contamination.

During the ISCO Pilot Study, a rock core was cut during drilling of an injection well. Samples were then taken from the rock core every 1.5 feet and submitted to a laboratory for VOC analysis. The purpose of this sampling was to document the concentrations of TCE in the matrix porosity, to help locate injection zones, and to better determine the amount of oxidant required for the Pilot Study injections. The sample results indicated significant TCE concentrations in the uppermost 40 feet of the matrix porosity, and lower concentrations from deeper samples. The elevated TCE concentrations, which were as high as 26 ppm, were found in the rock matrix surrounding visible fractures in the rock.

13.6.2 Migration of Dissolved Contamination

Groundwater at the Site moves primarily through the fractures in the rock, or secondary porosity. Dissolved VOC contaminants move in the direction of groundwater flow at the Site. Large-scale, far-reaching bedding plane fractures provide the preferential pathway for groundwater flow, as well as small-scale vertical joints and localized large-scale open fault planes.

Contaminated groundwater moves through the Plant area to the north of the groundwater divide and then through the residential neighborhood. TCE concentrations in the Plant area are currently shown to be around 2,000 to 3,000 ppb and then decrease in the neighborhood to 100 ppb (down to 5 ppb at the far northern edge of the plume near Deer Run Road). This portion of the VOC plume is approximately 1,500 feet in length and 500 feet in width. The plume to the south of the groundwater divide extends approximately 500 feet to the south.

13.6.3 Soil Vapor and Vapor Intrusion

VOCs that are dissolved in the groundwater can volatize into the vapor phase. TCE can readily volatize at the water table because of its relatively high partial pressure. These TCE vapors can then migrate towards the ground surface. While the direction of vapor movement can be difficult to predict, soil vapor investigations conducted at the Site have shown that TCE (and other VOCs) have accumulated underneath the basement slabs of residential structures in the neighborhood. VOC vapors that accumulate underneath basement slabs can then migrate through preferential pathways that include cracks in the basement slab or walls and enter the residential structure. This occurrence is referred to as vapor intrusion, and has been documented to have occurred at Site by collecting indoor samples.

13.7 Potential Routes of Human Exposure

Potential exposure pathways identified for the Site are exposure to groundwater and exposure to vapor intrusion. Human exposure to contaminated groundwater could occur through ingestion, dermal contact, and inhalation by breathing VOC vapors during showering. It should be noted that residents have been provided with a municipal water supply since 1987. Additional potential routes of human exposure to contaminated groundwater include car washing, lawn watering, and filling of swimming pools; a number of residents may use their wells for these purposes. Additional potential human exposure pathways are the inhalation of VOC vapors during excavation and vapor intrusion into residential structures.

13.8 In-situ Chemical Oxidation Pilot Study

EPA conducted the ISCO Pilot Study between 2008 and 2010. The objectives of the ISCO Pilot Study were to: a) evaluate the effectiveness of in-situ chemical oxidation (ISCO) as a stand alone remedy; b) determine if a high volume of potassium permanganate ($KMnO_4$) slurry could be injected into the fractured bedrock; and c) determine the radial influence of chemical oxidation around the injection wells and throughout the plume area. EPA wanted to evaluate the potential to inject a slurry of $KMnO_4$ because doing so would create an excess of chemical oxidant in the rock fractures, which would continue to react with the contaminated groundwater over time.

ISCO involves the injection of an oxidizing agent to a contaminated groundwater zone to react with and degrade VOCs to less toxic or benign compounds. When $KMn0_4$ dissolves in water, the potassium (K) separates from the permanganate ($Mn0_4^-$). The resulting MnO_4 ions oxidize compounds like TCE and result in breakdown products that include manganese dioxide, carbon dioxide, chloride, hydrogen, and potassium. The manganese dioxide solid is slowly reduced to a manganese solid and water.

The study included the installation of six vertical injection wells and four additional monitoring wells, the collection of rock core for contaminant matrix diffusion analysis, injecting 26,000 pounds of $KMnO_4$ slurry, and pre and post injection monitoring. During the Pilot Study, the $KMnO_4$ slurry was injected under relatively low pressure to facilitate delivery of $KMn0_4$ through the fractures.[1] This process involved injecting high volumes of fluid under pressure into the aquifer. This procedure dilates, or opens, existing bedrock fractures, flushes fine grained material from the fractures, and allows greater volumes of slurry to flow through the fractures. The injection encountered pressure ranges between 200 to 300 pounds per square inch (psi); in comparison a typical electrical pressure washer generates 1,600 psi. The injections were performed at different depths, ranging from 18 feet to 92 feet deep. The purpose of injecting slurry of KMn04 into the bedrock fractures was to increase the residence time of KMn04 within the fractures. This increased residence time allows the $Mn0_4^-$ to continue to react with VOCs as they diffuse out of the bedrock matrix porosity and into the fracture porosity (secondary

[1] This procedure falls within a broad definition of hydraulic fracturing and will be used at this Site to deliver the $KMnO_4$to the shallow bedrock aquifer. The technique will be used under relatively low pressure, injected into vertical wells at shallow depths, and include monitoring. The baseline and long-term monitoring will be conducted to ensure public health is protected. The result will be remedial restoration of a currently contaminated aquifer.

porosity) network. This method of treatment maximizes the area of influence and the treatment time period.

The results of the ISCO Pilot Study demonstrated:

a) $KMnO_4$ could effectively reduce contaminants concentrations to remedial action goals;
b) A $KMnO_4$ slurry could be injected into the fractured bedrock and that the residence time of $KMnO_4$ in the aquifer was in excess of six months, thereby maximizing its impact on contaminants within the matrix porosity; and
c) Significant destruction of VOCs in the source area and throughout the entire plume.

After the ISCO injection, a thirty percent decrease in contaminant concentrations was observed at the leading edge of the plume, in the residential area. Decreasing contaminant concentrations throughout the plume were also accompanied by increases in oxidation reduction potential (ORP). Increases in ORP indicate that decreases in contaminant concentrations were due to contaminant destruction, rather than dilution. The radius of influence of $KMnO_4$ slurry injection, determined by the visual observation of $KMnO_4$ is in excess of 160 feet. Figures 7 and 8 illustrate the plume of TCE contamination in shallow and deeper groundwater before the ISCO injection, respectively. Figures 9 and 10 illustrate the plume of TCE contamination in shallow and deeper groundwater after the ISCO injection, respectively, as of April 2010.

Recent data indicates the maximum TCE concentration in the neighborhood is approximately 170 ppb, while the maximum concentration in the Plant area is 4,900 ppb.

14.0 Current and Potential Future Land and Resource Uses

Land

Land use at the Site currently includes mixed residential homes and industrial properties. The Plant building is part of the Valmont Industrial Park, and is being used as a warehouse to store nonhazardous goods. There is a large parking lot to the north of the Plant building that is used for parking and offloading of tractor trailers. The parking lot is also used as a space for commercial driver license training. The adjacent residential neighborhood is for the most part fully developed.

It is unlikely that the future land use will change from its current uses.

Resources

Groundwater at the Site is currently not used for drinking. Municipal water is provided at the Site. However, there are no local ordinances currently in place to prevent its potable use, or to prevent drilling of wells.

The future use of groundwater at the Site is as a potential drinking water source.

15.0 Summary of Site Risks

This section summarizes the results of the human health risk assessment and the ecological risk assessments that were performed during the RI, and updated for the FS. These baseline risk assessments (before any cleanup) provide the basis for taking a response action and indicate the exposure pathway(s) that need to be addressed by the remedial action. The potential risks related to the no-action scenario are also described. As part of the RI, the current and future risks posed to human and ecological receptors by the contamination at the Site were evaluated. The risk assessment performed during the RI and FS evaluated the potential for health risks, based on current and potential future conditions, to people exposed to Site contamination, such as the risk of developing cancer, and risk of non-cancer health impacts (such as adverse impacts to organs). The screening level ecological risk assessments (SLERAs) evaluated facility and off-facility conditions with respect to potential risks to ecological receptors.

HOW IS HUMAN HEALTH RISK CALCULATED?

A Superfund human health risk assessment estimates the baseline risk. This is an estimate of the likelihood of developing cancer or non-cancer health effects if no cleanup action were taken at a site. To estimate baseline risk at a Superfund site, EPA undertakes a four-step process:

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers
Step 4: Characterize Site Risk

In Step 1, EPA looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparison between site-specific concentrations and concentrations reported in past studies helps EPA to determine which concentrations are most likely to pose the greatest threat to human health.

In Step 2, EPA considers the different ways that people might be exposed to contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, EPA calculates a "reasonable maximum exposure" scenario, which portrays the highest level of exposure that could reasonably be expected to occur.

In Step 3, EPA uses the information from Step 2 combined with information on the toxicity of each chemical to assess potential risks. EPA considers two types of risk: cancer and non-cancer risk. The likelihood of any kind of cancer resulting from a Superfund site is generally expressed as an upper bound probability; for example, a "1 in 10,000 chance." In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, EPA calculates a "hazard index." The key concept here is that a "threshold level" (measured usually as a hazard index of less than 1) exists below which non-cancer health effects are no longer predicted.

In Step 4, EPA determines whether site risks are great enough to cause health problems for people at or near the Superfund site. The results of the three previous steps are combined, evaluated, and summarized. EPA adds up the potential risks from the individual contaminants and exposure pathways and calculates a total site risk. Generally, cancer risks between 10^{-4} and 10^{-6}, and a non-cancer hazard index of 1 or less are considered acceptable for EPA Superfund sites.

15.1 Summary of Human Health Risk Assessment

The baseline human health risk assessment followed a four-step process which included the following:

a) Identification of contaminants of concern
b) Exposure assessment
c) Toxicity assessment
d) Risk characterization

EPA typically takes a remedial action at a site when the ICR for people exposed to site contaminants exceeds one in ten thousand ($1x10^{-4}$). For health effects other than cancer, EPA compares the estimated chemical dose from the site to a dose that is not expected to cause health effects (the acceptable dose is determined from scientific experiments or models). EPA's goal for these non-cancer exposures is that the dose from a site should not exceed the acceptable dose; otherwise, EPA will typically take action at that site.

As part of the RI/FS, EPA conducted a baseline risk assessment (based on the contamination present before taking a response action) to determine the current and future effects of contaminants on human health and the environment. The current uses of the area surrounding the Site include a commercial business in the Plant area, and residential usage in the adjacent neighborhood. Therefore, these uses are the reasonably anticipated future uses for the Site itself. In addition, the potential future use of groundwater will be as a drinking water source once safe cleanup levels have been achieved. Hence, the risk assessment focused on health effects for both children and adults, in a residential setting, that could result from future direct contact with contaminated groundwater and indoor air, and future construction workers that may come into contact with contaminated groundwater (2004 RI Report).

The RI Report includes the baseline risk assessment that is summarized below. The FS, dated July 2010, includes an updated risk assessment for groundwater that is based on groundwater data collected during the ISCO Pilot Study baseline sampling event. Three exposure pathways were considered: future construction worker; future residential child; and future residential adult.

15.1.1 Identification of Contaminants of Concern

Contaminants of potential concern (COPCs) at the Site in various media (i.e., soil, groundwater, surface water, and air) are identified, based on factors such as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation. EPA performs statistical analysis of the samples collected from given media in order determine above parameters. The COPCs are then screened against risk-based screening criteria to identify COCs. Any COPCs which exceed Risk Based Concentrations (RBCs) are identified as a COCs to be carried through the risk assessment.

Once COCs are identified, EPA's risk assessment identifies which COCs are the primary risk drivers on the basis of the relative maximum exposure (RME) scenario for the entire contaminated media. In the case of this Site, TCE and vinyl chloride are the contaminants that present the greatest potential risk to human health.

COCs are also identified by comparing their concentration to ARARs. For groundwater, examples of ARARs at the Site are Federal MCLs. Those COCs that have average concentrations exceeding the ARARs are retained. It is possible to have contaminants present that are over MCLs but that do not contribute significant risk; these are retained as COCs because they exceed a specific ARAR.

The contaminants of concern at the Site are limited to VOCs, and specifically, are chlorinated solvents. TCE is the most common groundwater contaminant, and is pervasive enough that the extent of the groundwater plume can largely be defined by the occurrence of TCE. Concentrations of TCE in groundwater ranged from 23,500 ug/l in the Plant area to less than 5 ug/l at the farthest edge of the plume in the neighborhood. The other VOCs detected are primarily degradation products of TCE.

The following section presents a summary of the evaluation and the compounds that are COCs at the Site.

Groundwater

The aquifer underlying the Site is considered to be part of a drinking water source for the surrounding area. There are several public water supply wells within 1 mile of the Site. While there are no residents currently using private wells for potable use, restoration of groundwater is one of the remedial action objectives at the Site.

COCs at the Site were selected by evaluating their contributing risk to human health and comparing their relative concentrations to Federal MCLs and PADEP Act 2 medium specific concentrations (MSCs). The following contaminants are the primary COCS because of the risk they pose to human health:

- TCE
- Vinyl chloride

Additionally, the following contaminants were selected as COCs because they are present in groundwater at the Site at concentrations above MCLs:

- TCE
- cis-1,2-DCE
- 1,1,1-TCA

Indoor Air

Vapor intrusion into homes in the residential neighborhood adjacent to the Plant area has been mitigated during previous EPA non time-critical removal actions. As discussed earlier in this ROD, 16 sub-slab depressurization systems and custom sump covers were installed in those residences where vapor intrusion of Site-related VOC contamination was shown to either be occurring or have the potential to occur, based on sub-slab soil gas sample results. The continuing operation and maintenance of these systems is a component of the Selected Remedy described in this ROD.

During the RI and subsequent sampling done to support the Indoor Air EE/CA, EPA identified TCE, 1,1-DCE, and 1,1,1-TCA as the primary COCs for vapor intrusion because of the concentrations present either in indoor air or beneath the basement slabs. Therefore, for the Selected Remedy, the following Site-related contaminants have been selected as COCs for indoor air:

- TCE
- 1,1-DCE
- 1,1,1-TCA

15.1.2 Exposure Assessment

The objectives of the exposure assessment are to evaluate potential current and future human exposures to the COCs in the media of concern. As described in the Conceptual Site Model section above, the primary medium of concern at the Site is groundwater. EPA initially addressed the immediate threat from potable use of contaminated groundwater at the Site by providing a municipal water supply. However, the NCP requires that contaminated groundwater be restored to its beneficial use so that it can be used as a source of drinking water in the future. Therefore, EPA has evaluated the risk posed by groundwater to both future adults and children, as well as the risks posed to construction workers that may come into contact with it. Contaminated soil has been addressed in previous EPA non time-critical removal actions, and is no longer a medium of concern. The potential for vapor intrusion into residences in the neighborhood has also been evaluated as a possible route of exposure to Site-related contamination. While this has been mitigated by the installation of the sub-slab depressurization systems and custom sump covers, their continued O&M is necessary to ensure protection.

Exposure pathways and routes identified for the Site, which are driving the remedial activities specified in this ROD, are based on the following:

- Groundwater Exposure Pathway – Exposure to COCs in groundwater was evaluated through ingestion, inhalation, and dermal exposure routes for the future onsite resident adult, child, and construction worker.
- Indoor Air Exposure Pathway – Exposure to COCs in indoor air, via vapor intrusion, through inhalation for current and future residential adults and children.

15.1.3 Toxicity Assessment

Toxicity assessment is accomplished by hazard identification and assessing dose-response. Hazard identification is the process of determining whether exposure to a chemical is associated with a particular adverse health effect and characterizes the inherent toxicity of a compound. A dose-response assessment correlates the magnitude of the intake of a particular compound with the probability of toxic effects. Toxicity values are then derived that can be used to estimate the potential for adverse effects from the potential exposure to the chemical.

When performing risk assessments, EPA evaluates carcinogenic and noncarcinogenic effects of various chemicals present at a site. Slope factors are applicable for estimating the lifetime probability of human receptors developing cancer as a result of exposure to known or potential carcinogens. The reference dose (RfD) is developed by EPA for chronic and/or subchronic human exposure to hazardous chemicals and is based solely on the noncarcinogenic effects of chemical substances.

The carcinogenic and noncarcinogenic toxicity data for the COCs through the oral, dermal, and inhalation exposure routes are provided in Appendix C.

15.1.4 Risk Characterization

Groundwater Risks

The human health risk assessment used a conservative approach to evaluate risk levels under various exposure scenarios. In particular, the consumption of contaminated groundwater assumed a 30-year period of exposure, which may not reflect local residents' past or current risk. None of the nearest residents have relied on private wells for drinking water since 1987. Therefore, there is no current risk from groundwater ingestion since all residents rely on public water for potable use. It should be noted that some residents do continue to use their private wells for uses such as lawn and garden watering, car washing, and possibly to fill their swimming pools. During the RI, EPA evaluated the exposures from these activities and with the exception of filling swimming pools, determined that residents can safely continue these activities. There were no data available on filling swimming pools at the time the risks were evaluated.

The following is a summary of future potential risk which assumes that residents are using the groundwater for their water supply. The primary risk-based COCs selected for the groundwater plume are TCE and vinyl chloride. TCE is the principle Site contaminant, and the primary risk driver with respect to groundwater.

Future Construction Worker: For the groundwater plume, the estimated RME non-cancer hazard index (HI) for the future construction worker was 2.92, primarily based on dermal absorption. The estimated ICR for the future construction worker exposed to contaminated groundwater was 1.9×10^{-5}.

Future Residential Child: The estimated RME non-cancer HI for the future residential child was 586. This non-cancer risk was primarily based on exposures through ingestion and to a lesser extent dermal absorption. TCE was the primary risk driver. The RME cancer risk for the future residential child exposed to the contaminated groundwater was 7.6×10^{-3}.

Future Residential Adult: For the future residential adult exposed to the groundwater plume, the estimated HI was 189, while the RME cancer risk was 1.6×10^{-2}. The cancer risk for the future lifetime resident was 2.3×10^{-2}. Based on the assumptions made during the risk assessment, both the non-cancer and cancer target risk ranges are exceeded.

These hazard levels and risks indicate that there is significant potential risk to children and adults from direct exposure with contaminated groundwater.

Indoor Air Risks

The sub-slab and indoor air samples collected from residences in the vicinity of the Site were used to evaluate human health risks because of concerns that contaminated groundwater could possibly degrade indoor air quality via vapor intrusion. HIs were calculated for the current residential child and adult, while cancer risks were estimated for the lifetime resident. The risk was calculated based on the presence of TCE, and for selected residences, 1,1,1-TCA, 1,1-DCE, and 1,3-butadiene inside the homes. While TCE and other chlorinated hydrocarbons were detected in the indoor air of several homes, the results were not consistent across the entire residential neighborhood. In most homes, the TCE concentrations were not associated with a carcinogenic risk greater than 1×10^{-4} or a non-cancer HI greater than 1. TCE cancer risks exceeded 1×10^{-4} in certain rounds of air samples collected at eight residences during the RI. During the EE/CA for Contaminated Indoor Air, Site-related contaminants present in the sub-slab of nine additional homes were found to potentially present an indoor air ICR greater than 1×10^{-4} and/or a HI greater than 1, assuming a default attenuation factor of 0.1.

Based on indoor air and sub-slab vapor sampling, EPA identified an unacceptable risk present in seventeen homes. EPA conducted removal actions to mitigate the risk to these residents, as previously discussed.

15.2 Ecological Risks

A screening level ecological risk assessment (SLERA) was completed for the Site as part of the RI. This assessment identified potential contaminants of ecological concern using published toxicity data and conservative assumptions regarding exposure and ecological effects. However, the evaluation concluded that none of the CPOCs identified by the ERA were ecological contaminants of concern requiring further investigation or study.

15.3 Basis for Remedial Action

In summary, the baseline human health risk assessment conducted for the Site demonstrated that unacceptable risks are present because of the contaminated groundwater originating from the Plant area. The contaminated groundwater has also created a risk in the form of vapors that may enter the residential homes. Through a series of removal actions conducted at the Site, EPA has mitigated these risks by providing a public water supply and providing sub-slab depressurization systems. However, it is EPA's objective, as stated in the NCP, to provide for the beneficial future use of groundwater. In short, it is EPA's objective to restore groundwater so that is can be used for drinking water at some point in the future. Therefore, it is EPA's current judgment that the Selected Remedy is necessary to protect human health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

16.0 Remedial Action Objectives

The Remedial Action Objectives (RAOs) provide general descriptions of what the cleanup is designed to accomplish. They are established on the basis of the nature and extent of contamination at a site, the resources that are currently and potentially threatened, and the potential for human and environmental exposure. These objectives typically address both a contaminant level and an exposure route, because protectiveness may be achieved by reducing exposure (such as the installation of a water line) as well as by reducing actual contaminant levels in the media of concern.

The media of concern at the Site are groundwater and indoor air. As previously stated, soil clean-up goals at the Site were met and direct exposure through vapor intrusion into residential structures was mitigated under several removal actions undertaken by EPA. While vapor intrusion into residential structures has already been mitigated at the Site, indoor air will remain a media of concern as long as VOC contamination remains in the groundwater.

The specific criteria for establishing RAOs can be found in the NCP § 300.430(e)(2)(i).

16.1 Remedial Action Objectives for Groundwater

RAOs, remediation goals, and the cleanup strategies developed for the Site assume that the current and future uses of the Site remain a combination of industrial and residential properties, and that groundwater will be used as a source of drinking water in the future. The RAOs for groundwater at the Site are:

- Minimize any potential further migration of contaminated groundwater from the Site;
- Protect human health from exposure to chemical constituent concentrations above MCLs or Applicable or Relevant and Appropriate Requirements (ARARs); and
- Restore groundwater throughout the Site to beneficial use as a drinking water source.

16.2 Remedial Action Objectives for Indoor Air

The following RAOs have been developed for the indoor air media at the Site:

- Protect human health from exposure to vapor intrusion through the continued O&M of the existing sub-slab depressurization systems in the neighborhood adjacent to the Plant area until sub-slab vapors meet the performance standards and no longer present unacceptable risk to human health; and
- Monitor the VI pathway, as necessary, to ensure the residents remain protected.

16.3 Basis and Rationale for Remedial Action Objectives

The basis for the RAOs for groundwater and indoor air is to clean up the Site to residential standards, which is one of the current and anticipated future land uses for the Site. The COCs in groundwater are above MCLs or are present at concentrations that potentially present unacceptable risk, and have migrated beneath residential properties. The migration of contaminated groundwater has caused vapor intrusion to occur at a number of residences. Although no one in the neighborhood is currently using the groundwater as a drinking water source, the future use of groundwater in the area is potentially as a drinking water source. The NCP requires EPA to take action at sites where contaminants exceed MCLs unless it is technically impracticable.

The remedial action will restore groundwater to drinking water standards and remove the vapor intrusion risk to residents in the neighborhood. The Selected Remedy will restore groundwater to the MCLs, reduce the cumulative risk presented by all remaining Site-related compounds to below a 10^{-4} cancer risk level, and reduce the noncancer risk to a HI of 1 or less. The performance standards for groundwater are provided in Section 20.3.1 of this ROD. The Selected Remedy will reduce the concentrations of COCs for indoor air to levels at or below the performance standards listed in Section 20.3.2 of this ROD, will reduce the cancer risk to a 10^{-6} risk level or less, and reduce to noncancer risk to a HI of 1 or less.

17.0 Description of Alternatives

The Superfund Law (CERCLA) requires that any remedy selected to address contamination at a hazardous waste site must be protective of human health and welfare and the environment, cost-effective, in compliance with regulatory and statutory provisions that are ARARs, and consistent with the NCP to the extent practicable. The FS prepared by EPA contractor Tetra Tech NUS (July 2010) evaluated four alternatives for the final cleanup at the Site.

17.1 Common Elements of Each Remedial Component

This section of the ROD describes those components that are common to each of the remedial alternatives except the No Action Alternative.

Institutional Controls

Three of the alternatives require ICs to restrict the potable use of groundwater until the contamination is remediated, through the use of restrictions including local ordinances, orders issued by the Commonwealth of Pennsylvania or environmental covenants.

Groundwater Monitoring

Groundwater monitoring is required by all of the alternatives except the No Action Alternative. Groundwater samples will be collected to monitor contaminant levels throughout the Site. The groundwater monitoring data will be used to evaluate the effectiveness of the remedy. Monitoring will include analyses for VOCs and metals. Additional monitoring requirements specific to each the alternatives are discussed with each alternative.

Operation and Maintenance of Sub-slab Depressurization Systems

Operation and maintenance of the sub-slab depressurization systems is required by three of the alternatives. The 16 existing sub-slab depressurization systems will be maintained until vapors resulting from the contaminated groundwater are no longer present beneath basement slabs in concentrations above the performance standards and no longer present an unacceptable risk to human health.

Five Year Reviews

Five year reviews are an element common to all four of the alternatives. Five year reviews are required on all Superfund sites when there is waste is left in place. In the case of this Site, five year reviews will be conducted every five years until the final groundwater and indoor air performance standards are met.

17.2 Alternative 1 – No Action

Estimated Capital Cost: $0
Estimated Annual Cost: $48,000 (for each Five Year Review)
Estimated Present Worth Cost: $103,500
Estimated Time to Completion: 30 years (for cost estimating purposes)

This alternative is developed and retained as a baseline scenario to compare with the other alternatives, as required by CERCLA. The only activity that would occur under the no-action alternative is a review of Site conditions and risks every five years. Under this alternative, groundwater would not be restored and the potential for exposure to contaminated groundwater through the use as a potable water source would still remain.

Five-Year Reviews - Every five years, the groundwater and sub-slab monitoring data would be reviewed to assess the status of the Site source areas and their condition, status of groundwater contamination, changes in potential risks, and whether imminent hazards are posed by Site contaminants in all media. Site use and development would also be monitored.

17.3 Alternative 2 - Limited Actions

Estimated Capital Cost: $26,300
Estimated Annual Cost: $15,400 to $77,700 (includes $48,000 for each Five Year Review)
Estimated Present Worth Cost: $416,000
Estimated Time to Completion: 30 years (for cost estimating purposes)

Limited actions, including institutional controls, are actions that do not involve engineering actions or treatments to reduce potential health threats or remediate the groundwater plume attributable to the Site. Under this Alternative 2, no active remediation or treatment of contaminated groundwater would be conducted to reduce or prevent potential human exposure.

Institutional Controls – ICs would be implemented to restrict the potable use of groundwater until the contamination is naturally attenuated. Use restrictions selected in this ROD could be implemented with a variety of tools, including local ordinances, orders issued by the Commonwealth of Pennsylvania or environmental covenants.

Monitoring - Groundwater throughout the contaminant plume would be sampled and analyzed on a periodic basis to monitor contaminant levels and distribution in groundwater beneath and downgradient of the Site. The data would be used to evaluate the migration of contaminants and quality of impacted private and commercial wells. Monitoring would not limit exposure to contaminants; however, it could limit potential future exposure by serving as an early warning mechanism. Monitoring will include analyses for VOCs and metals.

Sub-slab Depressurization Systems - Operation and maintenance of the 16 existing sub-slab depressurization systems would continue until vapors resulting from the contaminated groundwater are no longer present beneath basement slabs in concentrations that could potentially result in levels in indoor air above EPA's level of acceptable risk.

Five-Year Reviews - Every five years, the groundwater and sub-slab monitoring data would be reviewed to assess the status of the Site source areas and their condition, status of groundwater contamination, changes in potential risks, and whether imminent hazards are posed by Site contaminants in all media. Site use and development would also be monitored.

While this alternative would be considered a protective remedy because institutional controls would prevent the potable use of contaminated groundwater, it would not meet all of the RAOs. Specifically, it would not restore groundwater to drinking water standards.

17.4 Alternative 3 - Groundwater Extraction, Treatment, and Discharge

Estimated Capital Cost: $888,000
Estimated Annual Cost: $14,900 to $171,800 (includes $48,000 for each Five Year Review)
Estimated Present Worth Cost: $2,100,000
Estimated Time to Completion: 20 years

For this alternative, contaminated groundwater would be pumped, treated, and discharged to the sanitary sewer adjacent to the Site. A pre-design investigation would be necessary to support implementation of the selected Remedial Action (RA). Groundwater would be captured from the entire plume using a network of extraction wells and the captured groundwater would be treated above ground in a treatment system. The intent of the extraction well network design would be to capture and actively restore the entire plume with elevated VOC groundwater concentrations (i.e., TCE and other COCs with concentrations greater than MCLs and/or greater than risk based concentrations) and other contaminants at levels exceeding groundwater final performance standards. The design of the Groundwater Extraction and Treatment System (GETS) would maximize the effectiveness of the groundwater remedy and minimize potential impacts to the residential area, through the installation of extraction wells, groundwater conveyance piping, and associated utilities along roadways to extent practicable. The treatment train of the groundwater influent prior to discharge would depend on effluent (discharge) requirements. The GHJSA establishes requirements for discharging effluent to the sanitary sewer.

Pre-Design Investigation - If necessary, a pre-design investigation, including geophysical and hydrogeologic work, would be conducted to support implementation of this alternative. If necessary, the pre-design hydrogeologic investigation would include the installation of new wells, a pumping test, and the sampling of existing and new wells, to further evaluate the impact of the Site on local groundwater quality, to further assess the potential vertical and lateral migration of any Site-related contaminants, and to obtain additional information to design an efficient extraction well network.

Groundwater Extraction - For Alternative 3, the goal of the extraction well system would be to attain an estimated pumping rate of at least 12 to 14 gallons per minute (gpm). For conceptual purposes, a total of seven extraction wells are proposed. Six of these wells (E-1 through E-6) were installed during the ISCO Pilot Study; therefore, one new extraction well would be needed. Additional fieldwork will be required to determine the actual conditions before any definitive design is prepared (e.g., number and placement of wells, discharge rates, well depths, and well screen intervals). This information would be gathered during pre-design investigations as described above.

Groundwater Treatment - A single groundwater treatment plant would be located near the southeast corner of the Plant. Water would be pumped from each extraction well to a common feed tank that provides mixing, nominal aeration, and a steady source of water to the treatment plant feed pump.

If necessary, coagulation and flocculation treatment processes would be used for pre-treatment to enhance the removal of suspended solids and iron in order to meet discharge limit requirements. The water would then pass through a tray-type air stripper where VOCs would be stripped out by air. The stripper effluent would then be pumped to the discharge point.

The off-gas from the air stripper would pass through granular activated carbon (GAC) to capture VOCs prior to discharge to the atmosphere. The GAC would be periodically disposed of off-Site.

Groundwater Discharge – Treated groundwater effluent would be discharged to the GHJSA sanitary sewer. The effluent would be discharged through a buried 4-inch pipe. To monitor the efficiency of the treatment system, sampling of the effluent would be conducted.

Sub-slab Depressurization Systems - Operation and maintenance of the 16 existing sub-slab depressurization systems would continue until vapors resulting from the contaminated groundwater are no longer present beneath basement slabs in concentrations that could potentially result in levels in indoor air above EPA's level of acceptable risk.

Institutional Controls – ICs would be implemented to restrict the potable use of groundwater until the contamination is remediated. Use restrictions selected in this ROD could be implemented with a variety of tools, including local ordinances, orders issued by the Commonwealth of Pennsylvania or environmental covenants. IC's would also include requirements that the Plant property owner not interfere with the action, or the integrity of equipment for the duration of the remedial action.

Long-Term Monitoring - Groundwater would be extracted and treated until final performance standards are met. The total time required to meet this goal is uncertain; however, operation of the system for 20 years has been used for estimating purposes. Selected monitoring wells would be sampled until residual concentrations in the groundwater meet cleanup levels. In the first year, samples would be collected quarterly, in the subsequent two years sampling would be semiannually, and in the remaining years, sampling would be annually. The samples would be analyzed for selected VOCs and metals.

Five-Year Reviews - Every five years, site reviews would be conducted to evaluate the protectiveness of the Selected Remedy and the effectiveness of achieving cleanup goals. The monitoring results would be evaluated to determine the progress of groundwater extraction and treatment and its effectiveness in the achievement of cleanup goals. If EPA determined that achievement of cleanup goals is technically impracticable with the implemented remedy, EPA would conduct a reevaluation of remedial technologies and/or institutional controls. Site use and development would also be monitored. Five year reviews would be conducted until all Site-related cleanup goals are met.

This alternative provides a remedy that would be protective to human health and welfare and the environment, and upon completion would meet the RAOs described in Section 16.

17.5 Alternative 4 - In-Situ Chemical Oxidation

Estimated Capital Cost: $593,600
Estimated Annual Cost: $16,500 to $64,500 (includes $48,000 every five years)
Estimated Present Worth Cost: $821,700
Estimated Time to Completion: 5 years

Alternative 4 is EPA's Preferred Alternative. For Alternative 4, in-situ chemical oxidation (ISCO) treatment of VOC-contaminated groundwater attributable to the Site would be implemented. The volume of VOC-contaminated groundwater to be addressed is estimated to be

9.9 million gallons. The system would include vertical injection wells for the addition of an oxidizer to the aquifer to destroy VOC contaminants. A series of injections would be completed over time. Alternative 4 estimates that additional injection wells would be needed, in addition to six existing injection wells installed during the ISCO Pilot Study.

Pre-Design Investigation - Approximately three new injection wells would be installed to complement the six existing injection wells. It is anticipated that the three new injection wells would be drilled to an approximate depth of 150 feet bgs. Each new borehole would be geophysically logged using both traditional and source tool methods as employed during the ISCO Pilot Study. If necessary, packer testing would be performed to measure VOC concentrations at significant water-producing zones. The combination of the borehole geophysical logs and packer test results would help determine the targeted intervals for injecting the oxidant solution. Additional rock coring and matrix analysis may also be done. The injection well network would then consist of nine wells to reduce VOC-contaminated groundwater concentrations within the plume.

Groundwater Treatment - The new wells would be injected with concentrated oxidant slurry. The type of oxidant mixture to be used would take into consideration various factors such as the formation's permanganate demand, porosity, pore volume, and hydraulic characteristics.

Subsequent injections in all injection wells will be either oxidant slurries or solution as explained below. The selection of slurry or solution injections will be based on the results of previous injections.

The oxidant would be delivered to the Site in drums or super sacks. An appropriate method would be selected to mix and inject the oxidant solution. Appropriate plans would be developed to address health and safety concerns during the injections, including provisions for dust control, respiratory protection, physical hazards, and spill response for both solids and liquids.

Injection of Oxidant Solution - As part of Alternative 4, it is estimated that multiple injections of oxidant slurry or solution would periodically occur for up to 5 years. For cost purposes, four additional injection events would take place. Costs presented in this ROD are based on injections of $KMnO_4$. It is estimated that the frequency of these events would be annually for 2 years, followed by two injection events spaced 1 to 2 years apart (or an average of every 18 months). The scope of each event would be determined after evaluating the monitoring results for the previous event.

It is estimated that about 5,000 gallons of oxidant would be used for each injection well. It is assumed for estimating purposes that four injection events, with one injection zone per well will be required. The actual number of gallons to be injected and the dosage required would be determined for each well based on monitoring results to facilitate destruction of remaining VOC concentrations in groundwater.

Groundwater Monitoring - After the oxidant slurry is injected into the new injection wells, groundwater performance monitoring would be conducted to evaluate the performance of the injections. It is expected that up to 16 wells would be sampled on a monthly basis for four

months. Existing open borehole wells (e.g., MW-18) may be reconstructed as required to support the monitoring program. The frequency and scope of monitoring would be determined based on the results of the previous injection event.

Following the injection events, a long term groundwater monitoring program would be carried out to evaluate the overall progress of meeting the final performance standards. Monitoring will include analyses for VOCs and metals and continue until final performance standards are met. The number and location of monitoring wells included in the long term groundwater monitoring plan shall be determined by EPA, in consultation with PADEP.

Sub-slab Depressurization Systems - Operation and maintenance of the 16 existing sub-slab depressurization systems would continue until vapors resulting from the contaminated groundwater are no longer present beneath basement slabs in concentrations that could potentially result in levels in indoor air above EPA's level of acceptable risk.

Institutional Controls – ICs would be implemented to restrict the potable use of groundwater until the contamination is remediated. Use restrictions selected in this ROD could be implemented with a variety of tools, including local ordinances, orders issued by the Commonwealth of Pennsylvania or environmental covenants. IC's would also include requirements that the Plant property owner not interfere with the action, or the integrity of equipment for the duration of the remedial action.

Five-Year Reviews - Every five years, site reviews would be conducted to evaluate the protectiveness of the Selected Remedy and the effectiveness of achieving cleanup goals. The monitoring results would be evaluated to determine the progress of chemical oxidation treatments and their effectiveness in achievement of cleanup goals. If EPA determined that achievement of cleanup goals is technically impracticable with the implemented remedy, EPA would conduct a reevaluation of remedial technologies and/or institutional controls. Site use and development would also be monitored. Five year reviews would be conducted until all Site-related cleanup goals are met.

This alternative provides a remedy that would be protective to human health and welfare and the environment, and upon completion would meet the RAOs described in Section 16.

17.6 Expected Outcomes of Each Alternative

Implementation of any of the alternatives considered for the Site, other than the No Action Alternative, is expected to reduce the human health risk over time at the Site. However, only the Groundwater Extraction, Treatment and Discharge Alternative and the In-Situ Chemical Oxidation Alternative achieve the RAOs of restoring the groundwater to drinking water standards and residual cumulative ICRs within EPA's acceptable risk range of $1x10^{-6}$ to $1x10^{-4}$ and a HI less than 1. The time required to achieve these RAOs varies from 5 years to 20 years depending on the alternative used. Restoration of groundwater to drinking water standards is also expected to achieve the indoor air RAO of the elimination of sub-slab vapors that present a risk to human health. Implementation of any of the alternatives, with the exception of the No

Action Alternative, will achieve the indoor air RAO of the continued O&M of the sub-slab systems.

The outcome of the remedy is not expected to change the land and groundwater use at the Site because it will likely continue to be residential and industrial. Implementation of the Selected Remedy will reduce potential risk to human health and restore the groundwater to drinking water standards, which will allow it to be used as a drinking water source in the future.

18.0 Comparative Analysis of Alternatives

The alternatives discussed above were compared with the nine criteria set forth in the NCP at 40 C.F.R § 300.430(e)(9)(iii) in order to select a remedy for the Site. These nine criteria are categorized according to three groups: threshold criteria; primary balancing criteria; and modifying criteria. These evaluation criteria relate directly to the requirements in Section 121 of CERCLA, 42 U.S.C § 9621, which determine the overall feasibility and acceptability of the remedy.

Threshold criteria must be satisfied in order for a remedy to be eligible for selection. Primary balancing criteria are used to weigh major trade-offs among remedies. State and community acceptance are modifying criteria formally taken into consideration after public comment is received on the Proposed Plan. A summary of each of the criteria is presented below, followed by a summary of the relative performance of the alternatives with respect to each of the nine criteria. These summaries provide the basis for determining which alternative provides the "best balance" of trade-offs with respect to the nine criteria. The "Comparative Analysis of Alternatives" can be found in the FS.

Threshold Criteria:

1. Overall Protection of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

4. Compliance with ARARs evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the Site, or whether a waiver is justified.

Primary Balancing Criteria:

5. Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

6. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

7. Short-term Effectiveness considers the risks that might be posed to the community during implementation of the alternative; the potential impacts on workers during the remedial action and the effectiveness and reliability of protective measures; potential environmental impacts of the remedial action; and the length of time to until protection is achieved.

8. Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

9. Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

Modifying Criteria:

10. State/Support Agency Acceptance considers whether the State agrees with EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.

11. Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

DETAILED ANALYSIS OF THE PROPOSED REMEDIAL ALTERNATIVES

1. Overall Protection of Human Health and the Environment

Alternative 1 would not be protective of human health and the environment since no actions would be taken to prevent exposure to contaminated groundwater or ensure the continued prevention of vapor intrusion. No risk reduction is anticipated under the "no action" alternative.

Alternative 2 is protective of human health via the groundwater ingestion pathway, over the short term, through the implementation of ICs. Contaminant concentrations in groundwater would still exceed MCLs and risk-based levels. Overall carcinogenic and noncarcinogenic risks through exposure to VOCs in indoor air through the vapor intrusion pathway would be significantly reduced or eliminated by the current sub-slab systems.

Alternatives 3 and 4 are protective of human health because contaminants would be either be removed from groundwater over time, or destroyed, and carcinogenic and noncarcinogenic risks would eventually be reduced to acceptable levels. Alternatives 3 and 4 would constitute permanent solutions. As a result of the treatment times, Alternatives 3 and 4 would require ICs to prohibit the use of groundwater as a drinking water supply to be protective in the short term. However, Alternative 4 would require ICs for the shortest period of time compared to the other alternatives since the entire VOC-contaminated plume would be remediated over a projected period of 5 years, compared to an estimated period of 20 years for Alternative 3.

2. Compliance with ARARs

Alternatives 1 and 2 would not comply with ARARs and/or final performance standards. No action specific ARARs apply to these alternatives since no construction would take place and contaminant concentrations would not be reduced.

Alternative 3 would eventually meet the ARARs pertaining to the groundwater COCs, including MCLs and/or final performance standards. Alternatives 3 and 4 would meet their respective ARARs from Federal and State laws. The ARARs that EPA anticipates being relevant to the alternatives presented in this ROD are provided in Appendix D, and are also included in the FS.

3. Long-Term Effectiveness and Permanence

Alternative 1 would have no long-term effectiveness and permanence because contaminated groundwater would remain and therefore could not be used as a drinking water supply. Alternative 2 would provide some long-term effectiveness and permanence compared to Alternative 1, but only as long as ICs remain in place. Contaminated groundwater would also remain with Alternative 2.

Alternatives 3 and 4 would both provide similar levels of long-term permanence and effectiveness since both alternatives would eventually eliminate contaminants from the groundwater to levels below the final performance standards. The time for remediation is expected to be significantly shorter for Alternative 4 compared to Alternative 3. Alternative 3 would provide for long-term effectiveness by reducing those portions of the groundwater plume with elevated concentrations of VOCs. The extraction well network would remove elevated contaminant levels while allowing lower VOC levels to be reduced through dissipation and dilution. Alternative 4 would provide for long-term effectiveness by using ISCO to treat the entire plume to eliminate VOCs in groundwater.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 1 and 2 would not reduce the toxicity, mobility, or volume of contaminants through treatment. Additionally, alternatives 1 and 2 would not satisfy the statutory preference for treatment since remedial activities would not be performed. Alternatives 3 and 4 would reduce and eventually eliminate unacceptable contaminant concentrations through treatment, destruction, or both.

Alternative 3 would provide for a permanent reduction in toxicity through the capture and removal of contaminated groundwater. Alternative 3 does not directly address the process of matrix diffusion that continues to occur at the Site. Rather, the continued pumping of the extraction wells would remove groundwater that continues to become contaminated with VOCs as they continue to diffuse back from the matrix porosity. As a result of the continued pumping, the VOC concentrations would eventually decrease to the point that the cleanup goals would be met.

Alternative 4 would provide for destruction of VOC contaminants by oxidation. The oxidation, or destruction, of VOCs would be permanent. Alternative 4 is designed to address the matrix diffusion at the Site, as demonstrated during the ISCO Pilot Study. The slurry of oxidant injected into the bedrock fractures will remain present and continue to react with VOCs for an extended period of time. The volume of VOC-contaminated groundwater would eventually be eliminated and the end products of the chemical oxidation process would not adversely affect human health. Physical destruction of the VOCs would diminish their toxic characteristics, and the potential for the VOCs to migrate downgradient.

5. Short-Term Effectiveness

Since no active response actions would be implemented under Alternative 1, no additional short-term impacts would be anticipated for this option. Alternative 2 would cause minor short-term impacts related to groundwater sampling. Contractor vehicles would be in the residential area a few days per year. Proper health and safety procedures and PPE would protect workers during the collection of long-term monitoring samples.

Alternative 3 would pose the most short-term impacts to the community because of the possible disruptions caused by roadway excavation, pipeline installation, extraction well installation, and materials delivery for the treatment plant. Proper health and safety procedures and PPE would protect workers during the construction and collection of long-term monitoring samples. Alternative 3 would take a relatively long time to implement because of the extent of construction involved. It is estimated that final performance standards will be met within 20 years.

Alternative 4 would pose short-term impacts in the Plant area because of the possible disruptions caused by injection well installation and chemical injections. Proper chemical storage, health and safety procedures, and PPE would protect workers during the construction, chemical injections, and collection of long-term monitoring samples. Alternative 4 would take a relatively short time to implement, and it is estimated that final performance standards will be met within 5 years.

6. Implementability

Since no response activities would occur, Alternative 1 is simplest to implement. The ICs under each of the alternatives are feasible to implement, and the monitoring program under Alternative 2 is technically feasible.

Both Alternative 3 and Alternative 4 are readily implementable, though Alternative 3 may take longer to implement because extraction wells may need to be installed in the neighborhood. All injection wells for Alternative 4 will be on the Plant property. Groundwater pump and treat is a proven technology, and there are many contractors that are experienced in the installation and operation of these systems. ISCO, while a newer technology, was demonstrated during the ISCO Pilot Study to be a viable technology at the Site.

For all alternatives, regulatory and technical personnel are available to perform the 5-year reviews effectively, and companies are available to perform the monitoring under all alternatives except Alternative 1.

7. Costs

Alternative 1 would cost the least to implement since there would be no active remediation and only 5-year reviews would be performed. Alternative 2 would be the next lowest cost because there is no treatment of contaminated groundwater. Alternative 3 and 4 have higher costs because of the extent of the treatment systems. Alternative 3 has a present net worth cost $1,278,000 greater than Alternative 4. Compared to Alternative 3, Alternative 4 has lower capital costs and lower long-term O&M costs. The estimated costs of each alternative are summarized below:

Estimated Costs of Remedial Alternatives

Alternative	Capital Cost	Annual Cost*	Present Worth
1 – No Action	Not applicable	$48,000 (Five Year Reviews)	$103,500
2 – Limited Actions	$26,300	$15,400 - $77,700	$416,000
3 – Groundwater Extraction, Treatment, and Discharge	$888,000	$14,900 - $171,800	$2,100, 000
4 - ISCO	**$593,600**	**$16,500 – $64,500**	**$821,700**

*Annual cost ranges for each alternative reflect different annual costs associated with that alternative on a given year (ie year 1 sampling costs may be greater than year 10 sampling costs)

8. State Acceptance

PADEP agrees with EPA's recommendations for the Selected Remedy.

9. Community Acceptance

EPA conducted a public meeting for the Proposed Plan on September 16, 2010. EPA's Preferred Remedy, Alternative 4 – ISCO, was presented to the attendees. EPA's Preferred Remedy was well received by those in attendance. Questions or concerns that were raised during the public meeting are provided in the Section 3 of this ROD, the Responsiveness Summary. Additional comments that were submitted during the public comment period are also provided in the Responsiveness Summary.

19.0 Preference for Treatment as a Principal Element

The Selected Remedy will meet the statutory preference for treatment as a principal element, since it treats the principal threat waste at the Site. The VOCs that are present in the matrix porosity are acting as a continuous reservoir of contamination. Treatment will be accomplished

through the injection of chemical oxidants directly into the bedrock fractures, which will actively destroy the contaminants in groundwater.

20.0 Selected Remedy: Description and Performance Standards for Each Component of the Remedy

The Selected Remedy will be implemented in phases over an estimated period of five years to achieve the cleanup goals for the Site. This implementation will include a series of ISCO injections and the concurrent O&M of the existing sub-slab depressurization systems in the neighborhood. ICs will be implemented to ensure groundwater within the contaminated plume is not used as potable water until RAOs are met.

20.1 Summary of the Rationale for the Selected Remedy

This section provides EPA's rationale for the primary elements of the Selected Remedy.

20.1.1 Groundwater

In-situ Chemical Oxidation

EPA chose ISCO treatment for the plume of contaminated groundwater because of the demonstrated success of rapidly destroying VOCs and reducing their concentrations throughout the entire plume during the ISCO Pilot Study. The Selected Remedy is designed to treat the principal threat at the Site as well as the remaining portion of the groundwater plume. ISCO will be more effective in eliminating the COCs in a relatively short amount of time compared to groundwater extraction, treatment, and discharge, and will cost less than half the amount of money. EPA and PADEP believe the Selected Remedy will be protective of human health and the environment, complies with ARARs, is cost effective, and utilizes permanent solutions to the maximum extent practicable.

Institutional Controls

EPA chose the development of ICs to ensure the protection of human health until Site RAOs are met. No one is currently drinking contaminated water since all of the affected homes are connected to a public water supply. ICs will be implemented to restrict the potable use of groundwater until the contamination is remediated. Use restrictions selected in this ROD could be implemented with a variety of tools, including local ordinances, orders issued by the Commonwealth of Pennsylvania or environmental covenants. IC's will also include requirements that the Plant property owner not interfere with the action, or the integrity of equipment for the duration of the remedial action.

20.1.2 Indoor Air

Operation and Maintenance of the Existing Sub-slab Depressurization Systems

EPA chose to continue the O&M of the existing sub-slab depressurization systems installed as part of past removal actions in the neighborhood to ensure the continued protection of human health from potential vapor intrusion of Site-related contaminants. It is expected that the potential risk for vapor intrusion will remain at the Site until the COCs are removed from the groundwater.

20.2 Description of the Selected Remedy

Following is a description of each component of the Selected Remedy – In-situ Chemical Oxidation. Although EPA does not expect significant changes to this remedy, it may change somewhat as a result of the construction process. Any changes to the remedy described in this ROD would be documented using a technical memorandum in the Administrative Record, an Explanation of Significant Differences, or a ROD Amendment, as appropriate and consistent with the applicable regulations.

20.2.1 Groundwater

The Selected Remedy will address elevated VOC concentrations present within the plume until they are at or below their respective MCLs, as provided in Section 20.3.1. The approximate dimensions of the plume with TCE concentrations greater than its MCL of 5 µg/L are 500 feet in width, 2,000 feet in length, and 110 feet in depth, based on the monitoring results from the June 2008 sampling event. The volume of VOC-contaminated groundwater to be addressed is an estimated 9.9 million gallons. If necessary, additional wells for monitoring the treatment process would be installed in and around the treatment area. Based on results of the ISCO Pilot Study, it is estimated that approximately three additional injection wells, in conjunction with the existing six injection wells installed during the ISCO Pilot Study, will be required to address the entire plume.

ISCO treatment within the most contaminated portion of the plume in the Plant area will significantly reduce and will eliminate mass flux of VOC contaminants into downgradient portions of the plume located northeast and southwest of the Plant building. Injections of a massive dose of oxidants in the source area (the Plant) will also induce oxidant flux into the downgradient portions of plume, thus destroying the remaining VOC concentrations. The current contaminant flux into the downgradient area will be replaced by remediated groundwater with excess reactive oxidant present. These processes were effectively demonstrated during the ISCO Pilot Study and are summarized in the June 2010 Treatability Pilot Study Report.

Pre-Design Investigation

Approximately three new injection wells would be installed to complement the six existing injection wells. It is anticipated that the three new injection wells would be drilled to an approximate depth of 150 feet bgs. Each new borehole would be geophysically logged using

both traditional and source tool methods as employed during the ISCO Pilot Study. If necessary, packer testing would be performed to measure VOC concentrations at significant water-producing zones. The combination of the borehole geophysical logs and packer test results would help determine the targeted intervals for injecting the oxidant solution. Additional rock coring and matrix analysis may also be done. The injection well network would then consist of nine wells to reduce VOC-contaminated groundwater concentrations within the plume. Baseline sampling of all Site-related monitoring wells will also be completed. Samples will be analyzed for VOCs, metals, and perfluorinated compounds.

Injection Wells

It is estimated that approximately nine injection wells will be needed to reduce and destroy VOC concentrations throughout the groundwater plume, as shown in Figure 11. Approximately seven injection wells will be used for the portion of the plume north of the groundwater, and approximately two wells will be used south of the divide. The wells will generally be spaced no more than 180 feet apart, and will be located to focus on both shallow and deeper groundwater with concentrations of TCE greater than 200 to 500 µg/L. The new injection wells will be drilled to an approximate depth of 150 feet bgs.

Groundwater Treatment

ISCO Injections

The general procedure for the pressurized injections of the new injection wells will be consistent with the ISCO Pilot Study. After well development and sampling, the new injection wells will be injected under pressure using an oxidant slurry. Existing Site wells will be used to generate the volume of water needed for the solution; this water will be temporarily stored in large frac tanks or water trailers.

Targeted zones or intervals in each new well will be injected with an oxidant slurry under pressure. The pressurized injections will enhance the permeability of the targeted interval by flushing fine grain materials and dilating the fracture aperture. This will also force the slurry further into the fracture matrix. An oxidant slurry or solution will also be injected into the existing injection wells.

As part of the Selected Remedy, multiple injections of either a slurry or solution of oxidant will periodically occur as needed for up to five years following the initial round of injections. If necessary, the injection wells will be redeveloped, surged, and pumped to remove any precipitated manganese oxide in the well, and to improve the capability (yield) of these wells to accept the oxidant solution. For cost estimating purposes, it was assumed that a total of about 40,000 gallons of water and 13,000 lbs of $KMnO_4$ will ultimately be injected during these follow-up injections. The scope of each injection event will be determined after the results from the previous injection event are fully evaluated.

Groundwater Monitoring

Post-injection performance monitoring will be conducted to evaluate the performance of the oxidant injections. Periodic sampling and analysis will be conducted to evaluate changes in VOC concentrations, oxidation reduction potential (ORP), dissolved metals, chloride, total organic carbon, and physical parameters. This monitoring will include evaluating the presence and concentrations of chemical oxidation breakdown products to ensure the oxidant injections are not negatively impacting the aquifer. Post-injection performance monitoring data will be evaluated to determine the frequency of injections, any necessary modifications to the dosage of oxidants used to facilitate destruction of the VOCs, and modifications to the injection well system. Wells indicating the presence of permanganate will be removed from the injection program.

The monitoring program will also be designed to ensure that insoluble manganese dioxide (MnO_2) solids, or elevated dissolved manganese groundwater concentrations, do not significantly affect the injection wells and other nearby wells within the treatment area. As with all oxidants, some metals may be mobilized within the treatment area due to changes in oxidation state, pH, or both. This potential concern was not observed during the 2009 ISCO Pilot Study, but will be monitored for.

Following the injection events, a long term groundwater monitoring program will be carried out to evaluate the overall progress of meeting the final performance standards. Long term groundwater monitoring will be conducted until the successful achievement of the performance standards for three years, and will include sampling for VOCs, metals (including chromium), and chemical oxidation breakdown products. The number and location of monitoring wells included in the long term groundwater monitoring plan shall be determined by EPA, in consultation with PADEP.

20.2.2 Indoor Air

The overall cleanup goal is to reduce concentrations of Site-related sub-slab vapors to levels below the sub-slab vapor performance standards, as provided in Section 20.3.2. As part of the Selected Remedy, the long term O&M of homes with sub-slab depressurization systems or sump covers will be conducted until sub-slab vapors meet the performance standards and no longer present an unacceptable risk to human health. This will include annual inspections to verify the systems are working properly, and sub-slab soil vapor sampling at least every five years or until the performance standards are met. Additional monitoring in support of Five Year Reviews may be conducted in the residential neighborhood to ensure the remedy remains protective of human health.

Sub-slab soil vapor sampling will be conducted to determine whether or not the performance standards have been met for sub-slab soil vapor. Before the sub-slab samples are collected, the sub-slab depressurization systems will be temporarily shut off for a long enough period of time to allow conditions beneath the basement slab to reach equilibrium. The systems will continue to be run until the performance standards are met for the COCs, and there is no longer unacceptable risk posed by Site-related sub-slab vapors.

20.2.3 Institutional Controls

ICs will restrict the potable use of groundwater until the contamination is remediated. Use restrictions selected in this ROD could be implemented with a variety of tools, including local ordinances, orders issued by the Commonwealth of Pennsylvania or environmental covenants. IC's will also include requirements that the Plant property owner not interfere with the action, or the integrity of equipment for the duration of the remedial action.

20.2.4 Five Year Reviews

Every five years, site reviews will be conducted to evaluate the protectiveness of the Selected Remedy and the effectiveness of achieving cleanup goals. The monitoring results will be evaluated to determine the progress of chemical oxidation treatments and their effectiveness in achievement of cleanup goals. If EPA determines that achievement of cleanup goals is technically impracticable with the implemented remedy, EPA may require a reevaluation of remedial technologies and/or institutional controls. Five year reviews will be conducted until all Site-related cleanup goals are met.

20.3 Performance Standards

20.3.1 Groundwater

1. The following MCLs for the groundwater COCs shall be attained throughout the entire plume:

Maximum Contaminant Levels (MCLs) for Contaminants of Concern in Groundwater	
TCE	5 ug/l
cis-1,2-DCE	70 ug/l
1,1,1-TCA	200 ug/l
Vinyl chloride	2 ug/l

2. Once the above performance standards for groundwater are met for three years, a risk assessment shall be conducted that evaluates the cumulative risk presented by residual Site-related compounds, including any remaining VOCs and/or chemical oxidation breakdown products.

3. The remedial action for groundwater will continue until the MCLs are achieved, as specified above, and the cumulative risk presented by all remaining Site-related compounds, and/or chemical oxidation breakdown products, is below a 10^{-4} cancer risk level, and the noncancer HI is equal to or less than 1.

20.3.2 Indoor Air

1. Operation of the sub-slab depressurization systems will continue until the following performance standards for sub-slab soil vapor have been achieved for four consecutive quarters:

Performance Standards for Contaminants of Concern in Sub-slab Soil Vapor	
TCE	12 ug/m^3
1,1-DCE	1,050 ug/m^3
1,1,1-TCA	26,500 ug/m^3

2. Once the above performance standards for sub-slab soil vapor are met, a risk assessment shall be conducted that evaluates the cumulative risk presented by residual Site-related compounds, including any remaining VOCs and/or chemical oxidation breakdown products.

3. O&M of the sub-slab depressurization systems will then continue until the performance standards for the COCs in sub-slab soil vapor are met, as described above, and the cumulative risk presented by all remaining Site-related compounds, and/or chemical oxidation breakdown products, present in sub-slab soil vapor is below a 10^{-6} cancer risk level, and the noncancer HI is equal to or less than 1.

20.3.3 Institutional Controls

1. Groundwater within the plume boundaries shall not be used for drinking water until the groundwater attains the standards set forth within Section 20.3.1 of this ROD. The plume boundaries are defined as the approximate area bounded by Deer Run Road to the north, the southern boundary of the Plant property to the south, Jaycee Drive to the west, and the eastern Plant boundary and Fawn Drive to the east. This area includes the residential streets of Twin Oaks Road, Bent Pine Trail, and Fawn Drive.

2. The remedial action, or the integrity of equipment, shall not be interfered with for the duration of the remedial action.

20.3.4 Determination of Performance Standards

Groundwater

The performance standards for the COCs in groundwater and have been developed to meet ARARs, as well as risk-based goals, in accordance with the NCP. Since each of the four COCs have MCLs, the MCL for each compound has been selected as the performance standard. The cumulative risk of all of the COCs at concentrations equivalent to the MCLs equates to a total cancer risk of $1x10^{-4}$ and a non-cancer HI less than 1. Achieving the performance standards for three years will demonstrate that contaminant rebound is not occurring. Evaluating the

cumulative risk presented by any remaining Site-related compounds once MCLs are achieved, and continuing the remedial action until the cumulative risk presented by any remaining Site-related compounds is at or below the 10^{-4} risk level and a noncancer HI equal to or less than 1, will ensure the remedy remains protective.

Indoor Air

ARARs were not available, so the performance standards for indoor air, and therefore sub-slab soil vapor, were developed to meet risk-based goals and the 10^{-6} risk level point of departure, in accordance with the NCP. The sub-slab soil vapor performance standards have been established using current exposure and toxicity factors, and correspond to a cumulative indoor air cancer risk level of 10^{-6}, and a target noncancer HI of 1, assuming a default attenuation factor between the basement sub-slab and indoor air of 0.1. Successful achievement of the performance standards over the course of four quarters will allow for seasonal variation and differences that are typical of monitoring the sub-slab environment. Evaluating the cumulative risk presented by any remaining Site-related compounds once the performance standards are achieved, and continuing the remedial action until the cumulative risk presented by any remaining Site-related compounds is at or below the 10^{-6} risk level and a noncancer HI equal to or less than 1, will ensure the remedy remains protective.

The performance standards set forth in this section, 20.3, are protective of human health. Once these performance standards are achieved, the Site will be available for unrestricted use.

20.4 Cost Estimate for the Selected Remedy

Appendix E includes details of the estimated costs to construct and implement the Selected Remedy. The estimated total cost to construct and implement the Selected Remedy is $821,700. The information in this cost estimate is based on the best available information regarding the anticipated scope of the remedial action.

Some changes to cost are expected to occur during implementation of the remedy. Major changes may be documented in the form of a technical memorandum in the Administrative Record, an ESD, or a ROD amendment. This cost estimate is expected to be within +50 to -30 percent of the actual project cost.

20.5 Expected Outcomes of the Selected Remedy

Following are the expected outcomes of the Selected Remedy in terms of resulting land and groundwater uses, the cleanup levels and the risk reduction achieved as a response of the response action, and the anticipated community impacts.

20.5.1 Available Land Uses

The remedy will not alter the current land use at the Site, which includes mixed industrial and residential use. Land at the Site will continue to be able to be used for residential and industrial uses when the final performance standards are met.

20.5.2 Available Groundwater Uses

The remedy will be protective of groundwater because active treatment of the plume will reduce the concentrations of the COCs to below the MCLs, below a residual cumulative ICR of $1x10^{-4}$, and a target-organ-specific, Site-related HI of 1 or less. Once the final performance standards are met, the groundwater at the Site can be used for drinking water. The planned implementation of the ICs will help restrict the use of groundwater until cleanup goals are met. The active remediation at the Site will prevent the further migration of contaminants in the groundwater.

21.0 Statutory Determinations

Under CERCLA § 121 and the NCP § 300.430(f)(5)(ii), EPA must select remedies that are protective of human health and the environment, comply with ARARs, are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery to the maximum extent possible. There is also a preference for remedies that use treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element. The following sections discuss how the Selected Remedy meets these statutory requirements.

21.1 Protection of Human Health and the Environment

The Selected Remedy will be protective of human health and the environment. Active treatment of the principal threat waste in the groundwater in the Plant area, and active treatment of contaminated groundwater throughout the remainder of the plume is expected to restore groundwater to drinking water standards. Active treatment of contaminated groundwater is also expected to reduce or eliminate the potential for vapor intrusion of Site-related contaminants. O&M of the existing sub-slab depressurization systems will ensure protection against inhalation of Site-related vapors until the cleanup goals are met. Implementation of ICs restricting the potable use of groundwater within the contaminated plume until cleanup goals are met will ensure the remedy remains protective.

21.2 Compliance with Applicable or Relevant and Appropriate Requirements

The NCP § 300.430(f)(5)(ii)(B) and (C) require that a ROD describe Federal and State ARARs that the Selected Remedy will attain or provide a justification for any waivers. ARARs include substantive provisions of any promulgated Federal or more stringent State environmental standards if they exists, requirements, criteria, or limitations that are determined to be legally ARARs for a CERCLA site or action. Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, or contaminant; remedial action; location; or other circumstance at a CERCLA site. Relevant and appropriate requirements that, while not legally applicable to circumstances at a particular CERCLA site, address problems or situations similar to those encountered at the site that their use is considered relevant and appropriate.

The ARARs that will be met during implementation of the Selected Remedy are in Appendix D of this ROD.

21.3 Cost Effectiveness

Cost effectiveness is determined by evaluating the remedy's long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; and short-term effectiveness. If the overall cost of the remedy is proportional to its overall effectiveness, then it is considered to be cost effective. The Selected Remedy satisfies the criteria listed above because it offers a permanent solution through the destruction of contaminants in the groundwater, and is less than half the cost of another protective remedy that was evaluated. Therefore, the Selected Remedy is cost effective.

21.4 Utilization of Permanent Solutions to the Maximum Extent Practicable

EPA has determined the Selected Remedy represents the maximum extent to which permanent solutions and treatment are practicable at the Site. When compared to the other protective alternative that was evaluated, EPA has determined the Selected Remedy provides the best balance of tradeoffs in terms of the five balancing criteria, as well as the preference for treatment as a principal element, and State and community acceptance.

The Selected Remedy will meet the statutory preference for treatment as a principal element since it treats the principle threat waste at the Site. This is done through the injection of chemical oxidants into the bedrock fractures, which will actively destroy the COCs.

21.5 Five Year Review Requirements

CERCLA § 121(c) and the NCP § 300.430(f)(4)(ii) provide the statutory and legal bases for conducting Five Year Reviews. Since the Selected Remedy is expected to take at least 5 years to achieve the cleanup goals for groundwater, it will result in hazardous substances remaining onsite in groundwater above levels that allow for unrestricted use and exposure. A statutory review will be conducted within 5 years after initiation of the remedial action to ensure the remedy is, or will be, protective of human health and the environment.

22.0 Documentation of Significant Changes from Preferred Alternative of Proposed Plan

EPA has revised the estimated costs of the Selected Remedy and the other remedial alternatives since issuing the Proposed Plan. The revised costs are shown in the table below:

Alternative	Capital Cost	Annual Cost	Present Worth
1 – No Action	Not applicable	$48,000 every 5 years	$103,500
2 – Limited Actions	$26,300	$15,400 - $77,700	$416,000
3 – Groundwater Extraction, Treatment, and Discharge	$888,000	$14,900 - $171,800	$2,100, 000
4 - ISCO	**$593,600**	**$16,500 – $64,500**	**$821,700**

The Proposed Plan was released for public comment on August 23, 2010. The public comment period for the Proposed Plan was held from August 23 to September 30, 2010. EPA held a public meeting on September 16, 2010 to present the preferred alternative in the Proposed Plan. EPA has reviewed and responded to verbal and written comments submitted during the public comment period in Part 3 of the ROD, the Responsiveness Summary.

23.0 State Role

PADEP, on behalf of the Commonwealth of Pennsylvania, has reviewed the remedial alternatives presented in the ROD and has indicated its concurrence with the Selected Remedy. PADEP has also reviewed the list of ARARs to determine if the Selected Remedy is in compliance with appropriate State environmental laws and regulations.

Part 3
Responsiveness Summary

PART 3: THE RESPONSIVENESS SUMMARY

24.0 Overview of Responsiveness Summary

This section summarizes the questions and comment received during the Proposed Plan public comment period for this ROD for the Valmont TCE Site. The Proposed Plan was released for public comment on August 23, 2010. The public comment period was from August 23 to September 30, 2010. A public meeting was held at the West Hazleton Community Building on the evening of September 16, 2010.

The transcript for the public meeting is provided in the Administrative Record for the Site.

24.1 Stakeholder Comments

COMMENT #1:
A local citizen asked during the public meeting if households that have basement sumps that were previously found to contain TCE in the water will be reevaluated in the future.

RESPONSE TO COMMENT #1:
Yes. During investigative activities leading up to this ROD, a number of homes were found to have TCE present in the water in their basement sumps. During previous EPA removal actions, these sumps were outfitted with custom sump covers. These sumps will continue to monitored, and the effectiveness of the sump covers, as part of the O&M activities for the sub-slab depressurization systems as part of the Selected Remedy for the Site. This monitoring will continue until Site-related remediation goals are met for groundwater, and Site-related contaminants are no longer found to be present in basement sump water and/or sub-slab soil gas at concentrations that may result in an unacceptable risk to human health.

COMMENT #2:
A local citizen asked during the public meeting if the results of the [ISCO] Pilot Study were evaluated for seasonal variations.

RESPONSE TO COMMENT #2:
No, the groundwater results were not evaluated for seasonal variations because contaminant concentrations in groundwater will remain fairly consistent between different seasons. The purpose of the ISCO Pilot Study was to determine an effective delivery method, evaluate if a slurry form of oxidant could be injected, and determine the area of influence associated with the injections. The injections spanned from August through October 2009, and multiple post injection monitoring events were conducted up to April 2010. While the post injection monitoring did span multiple seasons, the focus on the data review was not to evaluate seasonal variation.

COMMENT #3:
A local citizen asked during the public meeting what the average concentration of TCE is in public water supplies throughout the nation.

RESPONSE TO COMMENT #3:
EPA was unable to determine the average concentration of TCE in public water supplies across the nation. However, every six years, EPA's Safe Drinking Water program reviews occurrence data of certain chemicals in public water systems, including TCE. The most recent completed review, covering the period 1998-2005, is summarized in the 2009 EPA Report 815-B-09-006 ("The Analysis of Regulated Contaminant Occurrence Data from Public Water Systems in Support of the Second Six-Year Review of National Primary Drinking Water Regulations").

This document contains TCE data reported by 45 states, representing 50,432 water systems serving 226,907,686 people. Overall, reported TCE concentrations ranged from 0.001 to 159 ug/L. Twenty-five public water systems, which represent 0.05% of the total number of public water systems included in the study, had a mean concentration of TCE greater than the MCL of 5 ug/l. The vast majority of public water systems had an average concentration of TCE less than the MCL.

COMMENT #4:
A local citizen asked during the public meeting why new extractions wells were necessary in the neighborhood, given the number of monitoring wells that are currently in the neighborhood.

RESPONSE TO COMMENT #4:
For the Selected Remedy, Alternative 4 – ISCO, no new monitoring or injection wells are planned for construction in the neighborhood. The new injection and monitoring wells that are planned will be constructed on the Plant property. EPA anticipates that the existing six injection wells located on the Plant property, in addition to the new injection wells that are planned for the Plant property, will be sufficient to deliver oxidant into the groundwater that will destroy Site-related contaminants throughout the entire groundwater plume.

For Alternative 3 - Groundwater Pumping, Treatment, and Discharge, EPA estimated that two additional extraction wells would be required in the neighborhood for the purpose of capturing the entire groundwater plume. These wells, in addition to the extraction wells that would have been located on the Plant property, would have been plumbed to the treatment facility that would have been located on the Plant property. Alternative 3 was not selected as the remedy in this ROD.

COMMENT #5:
A local citizen asked during the public meeting for clarification of the language "the estimated RME non-cancer HI for a future residential child was 586" as it appeared in the Proposed Plan, and how it compares to national data.

RESPONSE TO COMMENT #5:
RME stands for "reasonable maximum exposure." The RME estimate represents an exposure that is higher than average, but still could reasonably be expected to occur. (It uses a combination of high-exposure and average assumptions. Therefore, while an RME risk is usually considered higher than average exposure, it is not a worst-case scenario.) Non-cancer HI is the noncancer Hazard Index, which is the number used to evaluate the potential for health effects

other than cancer. EPA considers an HI of 1 or less to be acceptable. When the HI is greater than 1, toxic effects will not necessarily occur, but can no longer be ruled out.
Therefore, the statement "the estimated RME non-cancer HI for a future residential child was 586" means that if a child were to use water containing the TCE concentrations found in the wells at this site, that child's chronic exposure would be 586 times the acceptable risk level.

COMMENT #6:
A local citizen asked during the public meeting about the risks of a child in the neighborhood that grew up drinking the contaminated water for 10 or 12 years of his life, and if there could be impacts that show up later in life.

RESPONSE TO COMMENT #6:
While EPA's focus is to determine what current and future risks may be present because of contamination at a site, the Agency enlisted the support of the Pennsylvania Department of Health (PADOH) to evaluate historical risks. A representative of PADOH was present at the public meeting and provided answers to this question; below is a summary of PADOH's response:

PADOH completed a Public Health Assessment for the Site, and evaluating past exposure to contamination from the Site was part of the assessment. In the Public Health Assessment, PADOH included an estimate of what the worst-case scenario in terms of exposure may have been. Based on the worst-case scenario exposure to contaminated groundwater, PADOH determined it was possible a child could have had some adverse health effects. In terms of forecasting adverse health effects that may develop in the future, PADOH evaluates studies that are based largely on occupation exposure levels that are much higher than those that found at this Site, and it is therefore difficult to determine future effects from the relatively lower concentrations that are found at the Site.

COMMENT #7
A staff person from Pennsylvania State Representative Todd Eachus's office asked during the public meeting if EPA has evaluated using a combination of ISCO and groundwater extraction and treatment.

RESPONSE TO COMMENT #7:
Yes. In the Engineering Evaluation/Cost Analysis (EE/CA) for Contaminated Groundwater (May 2006), EPA considered various alternatives to restoring contaminated groundwater, including two alternatives that evaluated utilizing a combination of groundwater extraction and treatment, and enhancing the treatment with ISCO. However, following completion of the ISCO Pilot Study, EPA determined implementing ISCO alone would be a viable remedial alternative to treat the entire plume of groundwater contamination, and would not require the capital and operating costs associated with groundwater extraction and treatment.

COMMENT #8:
A staff person from Congressman Paul Kanjorski's office asked during the public meeting if ISCO has been used as a remediation technology at other sites where the groundwater is contaminated.

RESPONSE TO COMMENT #8:
Yes, ISCO has been used at other sites to successfully address groundwater contaminated with VOCs. Once chemical oxidants come into contact with VOCs, the VOCs are destroyed, which is well documented. One of the main challenges is delivery, or getting the chemical oxidant distributed throughout the contaminated media. The innovative process developed during the ISCO Pilot Study at the Site was the pressurized injection of a slurry, rather than a dilute solution, of chemical oxidants. This technique has not been widely used at sites where the contaminated groundwater is in fractured bedrock. The technique was determined to be effective during the ISCO Pilot Study and allowed the concentrated oxidant slurry to be distributed throughout the fracture network and come into contact with the contaminated groundwater. The residence time of the oxidant slurry was documented during the ISCO Pilot Study to be at least 6 months.

COMMENT #9
EPA received a letter dated September 30, 2010 from a law firm representing the potentially responsible parties for the Site. The comments are summarized below:

COMMENT #9(a)
There is insufficient basis for remedial action under the NCP because there is no current risk to human health or the environment, and EPA's expectation of restoring groundwater so that it can be used for drinking water in the future is not a sufficient reason to conduct a remedial action at the Site.

RESPONSE TO COMMENT #9(a)
EPA believes that restoring the groundwater at the Site is a sufficient reason for conducting a remedial action, and is in accordance with the NCP and Agency practice. EPA has determined that multiple criteria are met at the Site that make it eligible for remedial action. There are currently concentrations of TCE, 1,1,1-TCA, and (cis)1,2-DCE in groundwater at the Site that are above MCLs. Current concentrations of these compounds, as well as vinyl chloride, present levels of potential future risk above EPA's acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$. The bedrock aquifer immediately underlying the Site has historically been used as a source of drinking water, and there are multiple municipal supply wells that are within 1 mile of the Site that are still currently used. As stated in EPA guidance ('Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration', OSWER Directive 9283.1-33),

"a CERCLA remedial action generally is appropriate in various circumstances, including: a regulatory standard that helps define protectiveness (e.g. a federal or state MCL or nonzero MCLG for current or potential drinking water aquifers) is exceeded; when the estimated risk calculated in a risk assessment exceeds a noncarcinogenic level for an adverse health effect or the upper end of the of the NCP risk range for "cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use; the noncarcinogenic hazard index is greater than one (using reasonable maximum exposure assumptions for either the current or reasonably anticipated future land use); or the site contaminants cause adverse environmental

impacts. It is important to note that all conditions do not need to be present for action and the conditions may be independent of each other."

COMMENT #9(b)
The evaluation of alternatives in the Proposed Plan is in error because of the reliance on "future potential risk." The commenter also stated that Five Year Reviews under Alternative 1, No Action, would be sufficient to alert the Agency to changes in use and allow the Agency to consider remedial action. The commenter further stated the identification of ARARs was performed without regard and inconsistent with the NCP.

RESPONSE TO COMMENT #9(b)
EPA conducted a baseline risk assessment in accordance with the NCP to evaluate risks to human health. Baseline risk assessments are done during the Remedial Investigation at a site to determine whether the contaminants of concern identified at the site pose a current or potential risk to human health and the environment in the absence of any remedial action. 40 CFR 300.430 (d)(2)(v) and (vi) task the lead agency with assessing actual and potential exposure pathways and exposure routes; 40 CFR 300.430 (d)(4) states that "the lead agency shall conduct a site-specific baseline risk assessment to characterize the current and potential threats" and that the results of the assessment will help establish acceptable exposure levels for use in developing remedial alternatives; and 40 CFR 300.430 (e)(2)(i) specifies that remedial action objectives include potential exposure pathways.

The baseline risk assessment conducted for the Valmont TCE Site assumed a potential route of exposure to contaminated groundwater through the groundwater ingestion pathway. Based on the levels of contamination present in the groundwater, unacceptable levels of potential risk are present at the Site in the event the groundwater is used for drinking water.

While conducting Five Year Reviews would alert the Agency to changes in use, EPA determined that Alternative 1, No Action, would not be a sufficiently protective remedy. EPA also determined that remediation of Site groundwater was possible by completing the 2009 ISCO Pilot Study and therefore the expectation to restore the aquifer so that it can be used for drinking water in the future is valid.

EPA believes the identification of ARARs was conducted in accordance with the NCP.

COMMENT #9(c)
The final comment in the letter was that the Feasibility Study did not establish contaminants and media of concern, potential exposure pathways, and remediation goals.

RESPONSE TO COMMENT #9(c)
The FS was completed in July 2010, and is part of the Administrative Record for the Site. The Revised FS established TCE and vinyl chloride as contaminants of concern based on the potential risk posed by their concentrations in groundwater, and established preliminary remediation goals for those compounds. As presented in this ROD, 1,1,1-

TCA and (cis)1,2-DCE are also included as contaminants of concern in groundwater because they are currently present in groundwater in concentrations above their respective MCLs. The Selected Remedy, which was presented as EPA's Preferred Alternative in the Proposed Plan, will reduce the concentrations of the contaminants of concern in groundwater to levels that will restore groundwater to beneficial use. The Selected Remedy will also ensure the continued mitigation of vapors from Site-related contaminants in residences that have historically been affected by vapor intrusion.

APPENDIX A – Administrative Record Index

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VALMONT TCE

REMEDIAL ADMINISTRATIVE RECORD FILE * **

INDEX OF DOCUMENTS

I. SITE IDENTIFICATION

1. Report: Extent of Groundwater Contamination Study, prepared by International Exploration, Inc., 1/89. P. 100001-100126.

2. Report: Hazard Ranking System (HRS), prepared by U.S. EPA, 3/01. An undated cover sheet is attached. P. 100127-100144.

3. Report: HRS Documentation Record, prepared by U.S. EPA, 5/01. A June, 2001, U.S. EPA Fact Sheet is attached. P. 100145-100184.

4. Letter to Mr. Steve Miano, U.S. EPA, from Mr. Steven Engelmeyer, Hangley, Connolly, Epstein, Chico, Foxman and Ewing, re: Extent of contamination study, 12/4/87. P. 100185-100188.

5. Letter to Mr. Steve Miano, U.S. EPA, from Mr. Steven Engelmeyer, Hangley, Connolly, Epstein, Chico, Foxman and Ewing, re: Soil samples, 12/17/87. P. 100189-100190.

6. Letter to Mr. Steven Engelmeyer, Hangley, Connolly, Epstein, Chico, Foxman and Ewing, from Mr. Richard Dulcey, U.S. EPA, re: Soil samples, 1/19/88. P. 100191-100192.

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* Administrative Record File available 8/6/02, 10/18/02, 2/4/03, 3/21/03, 9/13/06, 8/23/10, 10/5/10, **and //.**

** Marked documents can be referenced in the Valmont TCE Removal Administrative Record Files.

7. Report: Revised Work Plan for Phase I Extent of Contamination Ground Water Study at Chromatex, Inc., West Hazleton, PA, prepared by International Exploration, Inc., 2/88. P. 100193-100340.

8. Letter to Mr. Richard Dulcey, U.S. EPA, from Mr. John Walker, International Exploration, Inc., re: Extent of contamination study, 3/21/88. P. 100341-100343.

9. Memorandum to file, from Mr. Dale Williams, PADEP, re: Chromatex, Inc. meeting minutes, 4/29/88. P. 100344-100346.

10. Letter to Mr. Shawn Gogola, Chromatex, Inc., from Mr. Jaydeb Pai, PADEP, re: Trichloroethylene testing, 5/11/88. P. 100347-100348.

11. Record of telephone conversation to Mr. John Walker, INTEX, by Mr. Richard Dulcey, U.S. EPA, re: TCE recovery system, 5/17/88. P. 100349-100349.

12. Volatile Organics Analysis Data Sheet, 5/18/88. P. 100350-100354. A cover letter to Mr. Richard Dulcey, U.S. EPA, from Mr. John Walker, International Exploration, Inc., is attached.

13. Report: Chromatex Plant #2 Extent of Groundwater Contamination Study - Phase I, prepared by International Exploration, Inc., 6/88. P. 100355-100421. A cover letter to Mr. Bill Marion, Chromatex, Inc., from Mr. John Walker, International Exploration, Inc., is attached.

14. Letter to Mr. Jaydeb Pai, PADEP, from Mr. Shawn Gogola, Chromatex, Inc., re: Response to 5/11/88 letter regarding intent to conduct tests, 6/2/88. P. 100422-100424.

15. Report: Volatile Organics Analysis (VOA) Report, prepared by U.S. EPA, 6/9/88. P. 100425-100436. A cover memorandum to Mr. Richard Dulcey, U.S. EPA, from Mr. Daniel Donnelly, U.S. EPA, is attached.

16. Letter to Mr. Jaydeb Pai, PADEP, from Mr. Shawn Gogola, Chromatex, Inc., re: Solvent to aqueous based fabric protection application, 6/22/88. P. 100437-100439. A Material Safety Data Sheet is attached.

17. Letter to Mr. John Walker, INTEX, from Mr. Richard Dulcey, U.S. EPA, re: Disposal procedures, 6/23/88. P. 100440-100440.

18. Letter to Mr. Michael Kelchak, Hazleton Sewer Authority, from Mr. Daniel Segal, Chromatex, Inc., re: Release of trichloroethylene into sewer system, 6/23/88. P. 100441-100442.

19. Report: Organic Data Validation Report, prepared by Weston, 6/24/88. P. 100443-100469.

20. Report: Odor Emissions Study for Chromatex, Inc., Valmont Industrial Park, West Hazleton, PA, prepared by Recon System, Inc., 6/30/88. P. 100470-100491.

21. Report: Organic Data Validation Report, prepared by Weston, 7/7/88. P. 100492-100535. A cover memorandum to Mr. Richard Dulcey, U.S. EPA, from Ms. Diana Baldi, U.S. EPA, is attached.

22. Report: Organic Data Validation Report, prepared by Weston, 7/8/88. P. 100536-100579. A cover memorandum to Mr. Richard Dulcey, U.S. EPA, from Ms. Diana Baldi, U.S. EPA, is attached.

23. Report: Preliminary Assessment Report, prepared by NUS Corp., 8/18/88. P. 100580-100618.

24. Report: Chromatex Plant #2 Extent of Groundwater Contamination Study - Phase I, prepared by International Exploration, Inc., 10/88. P. 100619-100650.

25. Tank Closure/Post Closure Plan, Chromatex Plant #2, 11/88. P. 100651-100685. A cover letter to Mr. David Lameraux, Bureau of Waste Management, from Mr. Joseph Jacobsen, International Exploration, Inc., is attached.

26. Memorandum to Mr. David Lamereaux, Pennsylvania Department of Environmental Resources (PADER), from Mr. Theodore Geary, PADER, re: Closure of underground hazardous waste storage tank, 2/1/89. P. 100686-100690.

27. SBR Latex Sludge Analysis, 7/5/89. P. 100691-100709. A cover letter to Mr. Scott Detwiler, PADER, from Mr. Shawn Gogola, Chromatex, Inc., is attached.

28. Letter to Mr. Gregory Ham, U.S. EPA, from Mr. Keith Hambley, NUS Corp., re: Final Work Plan, 5/9/91. P. 100710-100712.

29. Report: Final Work Plan, prepared by NUS Corp., 5/9/91. P. 100713-100994.

30. Journal article entitled, "Case Studies in Environmental Medicine - Trichloroethylene Toxicity," ATSDR Environmental Medicine, 1/92. P. 100995-101015.

31. Excerpt from the ATSDR Public Health Assessment Manual, Determining Public Health Implications, 3/92. P. 101016-101027.

32. Report: Volatile Organic Analysis Report, prepared by Lockheed Environmental Systems & Technologies Co., 10/19/93. P. 101028-101260. A cover memorandum to Mr. Frederick Dreisch, Lockheed Environmental Systems & Technologies Co., from Ms. Sue Raupuk, Lockheed Environmental Systems & Technologies Co., is attached.

33. Report: Final Expanded Site Inspection Report, prepared ++ by Halliburton NUS Corp., 1/95. P. 101261-101446.

34. Report: Laboratory Sampling Report, prepared by PADEP, 6/30/98. P. 101447-101472.

35. Packet of habitat assessment field data sheets and field sampling data, 7/8/98. P. 101473-101591.

36. Method TO-14a, Determination of the Volatile Organic Compounds (VOCs) In Ambient Air Using Specially Prepared Canisters with Subsequent Analysis by Gas Chromatography, excerpt from the Compendium of Methods for Toxic Organic Air Pollutants, 1/99. P. 101592-101595.

++ Document has been redacted to protect the privacy of individuals. The redaction is evident from the face of the document.

37. Method TO-15, Determination of Volatile Organic Compounds in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry, excerpt from the Compendium of Methods for Toxic Organic Air Pollutants, 1/99. P. 101596-101604.

38. Memorandum to Ms. Kate Crowley, PADEP, from Mr. Kupsky, PADEP, re: Stream investigations, 1/29/99. P. 101605-101641.

39. Electronic memorandum from Mr. Kevin Wood, U.S. EPA, re: Old site information to be used for Hazardous Ranking System, 11/26/99. P. 101642-101642.

40. Excerpt from untitled article on trichloroethylene, 5/8/01. P. 101643-101669.

41. Monitoring well & residential well groundwater sampling data, 5/14/01. P. 101670-101673.

42. Report: Preliminary Assessment and Site Inspection Report (PA/SI), prepared by Tetra Tech EM, Inc., 2/5/02. P. 101674-101709.

43. Report: Valmont TCE Site Investigation Report, West Hazleton, Luzerne County, Pennsylvania, prepared by Roy F. Weston, Inc., 4/02. P. 101710-101858.

44. Report: Valmont TCE Site Investigation Report, Volume 3, West Hazleton, Luzerne County, Pennsylvania, prepared by Roy F. Weston, Inc., 4/02. P. 101859-102270.

II. REMEDIAL RESPONSE PLANNING

1. Report: Aerial Photographic Analysis and Fracture Trace of Valmont TCE Site, prepared by U.S. EPA, 4/02. P. 200001-200041.

2. Report: Site Specific Plan & Remedial Investigation/Feasibility Study, Valmont TCE Site, Hazle Township, Luzerne County, Pennsylvania, prepared by Tetra Tech NUS, Inc., 5/02. P. 200042-200472.

3. Memorandum to Mr. David Evans, U.S. EPA, from Mr. James McCreary, U.S. EPA, re: Review of RCRA data management system, 11/3/00. P. 200472A-200472A.

4. Report: Field Sampling Plan, prepared by Tetra Tech EM, Inc., 11/30/00. P. 200473-200523.

5. Letter to Mr. Ronald Satterfield, Rossville Investments, Inc., from Mr. Kevin Wood, U.S. EPA, re: Request for consent to access property, 12/8/00. P. 200524-200524.

6. Letter to Mr. Ronald Satterfield, Rossville Investments, Inc., from Ms. Humane Zia, U.S. EPA, re: Confirmation of consent to access property, 12/13/00. P. 200525-200526. A facsimile transmittal memorandum is attached.

7. Memorandum to Ms. Jennifer Hubbard, U.S. EPA, from Ms. Patricia Flores-Brown, U.S. EPA, re: Estimation of ambient air concentrations due to use of contaminated groundwater, 12/18/00. P. 200527-200535. The calculations are attached.

8. Memorandum to Mr. Kevin Wood, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Inhalation risks from outdoor water use, 12/20/00. P. 200536-200538.

9. Electronic memorandum to Mr. Romuald Roman, U.S. EPA, and Valmont TCE group, from Mr. Kevin Wood, U.S. EPA, re: December residential well sampling, 2/2/01. P. 200539-200539.

10. Report: Trip Report, prepared by Tetra Tech EM, Inc., 3/1/01. P. 200540-200576. ++

11. Indoor sampling plan meeting minutes, Valmont TCE Site, 4/10/01. P. 200577-200578.

12. Report: Remedial Investigation/Feasibility Study Field Sampling Plan (RI/FS), prepared by Tetra Tech NUS, Inc., 5/01. P. 200579-200673. ++

13. Electronic memorandum to Valmont TCE Group, from Mr. Kevin Wood, U.S. EPA, re: Past air sampling, 5/2/01. P. 200674-200677. ++

14. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Citizen concerns, 5/8/01. P. 200678-200679.

15. Memorandum to Ms. Jennifer Hubbard, U.S. EPA, from Ms. Patricia Flores-Brown, U.S. EPA, re: TCE indoor air concentration calculations, 5/10/01. P. 200680-200687. Sampling data is attached. ++

16. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Estimates of risk from historical air samples, 5/11/01. P. 200688-200725. ++

17. Report: Health and Safety Plan for Valmont Trichloroethylene Site, Hazle Township and West Hazleton Luzerne County, Pennsylvania, prepared by Tetra Tech NUS, Inc., 5/14/01. P. 200726-200796.

18. Report: Analytical Report, prepared by Severn Trent Laboratories, Inc., 6/5/01. P. 200797-200834.

19. Report: Analytical Report, prepared by Severn Trent Laboratories, Inc., 6/7/01. P. 200835-200868.

20. Report: Organic Data Validation Report, Valmont TCE Site, prepared by Lockheed Martin, 6/8/01. P. 200869-200887. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached. ++

21. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Evaluation of groundwater results, 6/14/01. P. 200888-200892.

22. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Response to questions from public meeting, 7/10/01. P. 200893-200894.

23. Memorandum to Mr. Mike Chezik, U.S. DI, Mr. Peter Knight, U.S. EPA, Mr. Anthony Conte, U.S. DI, and Ms. Sharon Shutler, NOAA/OGC, from Mr. Kevin Wood, U.S. EPA, and Mr. Romuald Roman, U.S. EPA, re: Notification of Federal National Trustees, 7/17/01. P. 200895-200895.

24. Report: Level M3 Indoor Air Organic Data Validation Report, prepared by U.S. EPA contractor, 7/25/01. P. 200896-200924. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached. ++

25. Report: Organic Data Validation Report, prepared by U.S. EPA contractor, 7/25/01. P. 200925-200952. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached. ++

26. Report: Level M3 Organic Data Validation Report, prepared by U.S. EPA contractor, 7/25/01. P. 200953-200976. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached. ++

27. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Patricia Flores-Brown, U.S. EPA, re: Review of Data Validation Report, 8/3/01. P. 200977-200985.

28. Electronic memorandum to Mr. Romuald Roman, U.S. EPA, and Valmont group, from Mr. Kevin Wood, U.S. EPA, re: Unaccounted waste at Chromatex Plant #2, 8/7/01. P. 200986-200993. A Material Safety Data Sheet is attached.

29. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: TCE and garden plants, 8/14/01. P. 200994-200996.

30. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of water data,

8/15/01. P. 200997-200997.

31. Report: Organic Data Validation Report, prepared by URS Corp., 12/7/01. P. 200998-201095. A cover memorandum to Ms. Susan Green, Roy F. Weston, Inc., from Mr. Peter Fairbanks, URS Corp., is attached.

32. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of PADEP air samples, 1/24/02. P. 201096-201104.

33. Electronic memorandum to Ms. Jennifer Hubbard, U.S. EPA, and Mr. Romuald Roman, U.S. EPA, from Mr. John Mellow, PADEP, re: Three compounds used in TCE process, 2/15/02. P. 201105-201106.

34. Electronic memorandum to Mr. Romuald Roman, U.S. EPA, and Mr. Bruce Rundell, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Chlorothene NU (TCA) and TCE, 2/15/02. P. 201107-201107.

35. Electronic memorandum to Ms. Jennifer Hubbard, U.S. EPA, and Mr. Bruce Rundell, U.S. EPA, from Mr. John Mellow, PADEP, re: Chlorinated compound degradation in inspection report, 3/12/02. P. 201108-201113.

36. Report: Organic Data Validation Report, prepared by Lockheed Martin, 3/14/02. P. 201114-201143. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

37. Report: Organic Data Validation Report - Case #R31185, prepared by Lockheed Martin, 3/14/02. P. 201144-201180. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

38. Electronic memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. John Mellow, PADEP, re: Valmont information gaps, 3/15/02. P. 201181-201182. ++

39. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Poly Clean Dry Cleaners Site, 3/20/02. P. 201183-201183.

40. Report: Organic Data Validation Report, prepared by Lockheed Martin, 3/28/02. P. 201184-201260. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

41. Electronic memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: PFO sampling, 4/3/02. P. 201261-201262.

42. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of EPA air samples, 6/4/02. P. 201263-201275.

43. Letter to Mr. Romuald Roman, U.S. EPA, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., re: Proposed target list of soil gas analytical parameters, 6/6/02. P. 201276-201282.

44. Revised list of addresses for residential soil gas sampling, 6/11/02. P. 201283-201285. A cover letter to Mr. Romuald Roman, U.S. EPA, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., is attached.

45. Report: Gas Chromatography Analysis Report, Valmont TCE Site, Jaycee Road, West Hazleton, PA, prepared by Accuscience Environmental, 6/21/02. A cover letter to Mr. Vince Shickora, Tetra Tech NUS, Inc., from Mr. Carl Mastropaolo, Accuscience Environmental, and a transmittal letter to Mr. Romuald Roman, U.S. EPA, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., are attached.**

46. Report: Geophysical Survey Results, prepared by Advanced Geological Survey, 6/27/02. P. A cover letter to Mr. Romuald Roman, U.S. EPA, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., is attached.**

47. Letter to Ms. Judy Snyder, Lockheed Martin, from Mr. Daniel Hartigan, Tetra Tech NUS, Inc., re: Case #30647 sampling event documentation errors, 7/29/02. P. 201286-201302. A letter to Ms. Lisa Penix, Lockheed Martin, from Mr. Daniel Hartigan, Tetra Tech NUS, Inc., regarding sampling event documentation errors and sampling data, are attached.

48. Report: Gas Chromatopgraphy Analysis Report, prepared by

Accuscience Environmental, 8/23/02. A September 3, 2002 transmittal letter to Mr. Romuald Roman, U.S. EPA, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., and an August 23, 2002 cover letter to Mr. Neil Teamerson, Tetra Tech NUS, Inc., from Mr. Carl Mastropaolo, Accuscience Environmental, are attached.**

49. Letter to Ms. Lisa Penix, Lockheed Martin Environmental Services, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., re: Case #30790 sampling event documentation errors, 8/28/02. P.201303-201304. A technical drawing is attached.

50. Report: Inorganic Data Validation Report, prepared by Lockheed Martin, 8/29/02. P. 201305-201436. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

51. Letter to Ms. Lisa Penix, Lockheed Martin Environmental Services, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., re: Case #30790 sampling event documentation errors, 8/30/02. P. 201437-201437.

52. Report: Level M3 Organic Data Validation Report, prepared by Lockheed Martin, 9/4/02. P. 201438-201824. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

53. Report: Level M3 Organic Data Validation Report, prepared by Lockheed Martin, 9/10/02. P. 201825-202016. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

54. Report: Level IM2 Inorganic Data Validation Report, prepared by Lockheed Martin, 9/13/02. P. 202017-202056. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

55. Report: Inorganic Data Validation Report, prepared by Lockheed Martin, 9/17/02. P. 202057-202086. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

56. Report: Level M3 Organic Data Validation Report, prepared

by Lockheed Martin, 9/27/02. P. 202087-202130. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

57. Memorandum to Ms. Christine Brussock, Pennsylvania Department of Health (PADH), from Mr. Geroncio Fajardo, PADH, re: Review of Valmont TCE laboratory results, 10/1/02. P. 202131-202132.

58. Report: Organic Data Validation Report, prepared by Lockheed Martin, 10/22/02. P. 202133-202167. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

59. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of Health Consultation, 11/4/02. P. 202168-202170.

60. Report: Health Consultation, Public Health Evaluation of Residential Indoor Air, Valmont TCE Site, West Hazleton, Luzerne County, Pennsylvania, prepared by the U.S. Department of Health and Human Services, 11/18/02. P. 202171-202199.

61. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Risk estimation for garage well near site, 11/18/02. P. 202200-202201.

62. Report: Health Consultation, Valmont TCE Site, West Hazletown, Luzerne County, Pennsylvania, prepared by The Pennsylvania Department of Health, 12/19/02. P. 202202-202224.

63. Letter to Mr. Romuald Roman, U.S. EPA, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., re: Proposed scope of work for Phase II Remedial Investigation Groundwater Investigation, 1/9/03. P. 202225-202325.

64. Report: Correlation Analysis for indoor Air and Soil Gas Data provided by Dr. Fajardo Valmont TCE Site, West Hazleton, Luzerne County, Pennsylvania, (Part of Task 1), prepared by Lockheed Martin, 1/10/03. P. 202326-202342. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. J. Pearson, U.S. EPA, is attached.

65. Report: Correlation and Association Analyses for Soil Gas Versus Basement Air: Round 2 (PADEP) Data, Soil Gas Versus Basement Air: Round 3 (EPA) Data, First Floor Versus Basement Air: Round 3 (EPA) data, Valmont TCE Site, West Hazleton, Luzerne County, Pennsylvania, prepared by Lockheed Martin, 2/4/03. P. 202343-202384. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. J. Pearson, U.S. EPA, is attached.

66. Report: Level M3 Organic Data Validation Report, prepared by Lockheed Martin, 2/13/03. P. 202385-202431.

67. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of data from four wells, 2/26/03. P. 202432-202433.

68. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of RAGS D tables for surface water/sediment, 2/26/03. P. 202434-202435.

69. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of correlation analysis, 2/27/03. P. 202436-202441.

70. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of data from three wells, 2/27/03. P. 202442-202442.

71. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of inorganic data for seven wells, 2/28/03. P. 202443-202444.

72. Phase I groundwater investigation survey tables, 3/14/03. P. 202445-202454. A cover letter to Mr. Romuald Roman, U.S. EPA, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., is attached.

73. Letter to Mr. Romuald Roman, U.S. EPA, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., re: Scope of work for Phase II Remedial Investigation, 3/28/03. P. 202455-202460.

74. Report: Final Report, prepared by Lockheed Martin, 4/03.

P. 202461-202916. A cover memorandum to Mr. David Mickunas, U.S. EPA, from Ms. Danielle McCall, Lockheed Martin, is attached.

75. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of well data, 4/3/03. P. 202917-202920.

76. Report: Health Consultation, Public Health Evaluation of Soil Samples, Valmont TCE Site, West Hazleton, Luzerne County, Pennsylvania, prepared by U.S. Department of Health and Human Services, 4/30/03. P. 202921-202947. A cover memorandum to Mr. Romuald Roman, and Ms. Jennifer Hubbard, U.S. EPA, is attached.

77. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of Health Consultation for Valmont soil samples, 7/21/03. P. 202948-202948.

78. Report: Organic Data Validation Report, prepared by Lockheed Martin, 7/31/03. P. 202949-202967. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

79. Report: Organic Data Validation Report, prepared by Lockheed Martin, 8/8/03. P. 202968-203065. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

80. Report: Inorganic Data Validation Report, prepared by Lockheed Martin, 8/8/03. P. 203066-2063089. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

81. Report: Organic Data Validation Report, prepared by Lockheed Martin, 8/12/03. P. 203090-203094. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

82. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of residential air sampling data, 8/25/03. P. 203095-203099.

83. Report: Organic Data Validation Report, prepared by Lockheed Martin, 9/4/03. P. 203100-203120. A cover memorandum to Mr. Romuald Roman, U.S. EPA, from Mr. Fredrick Foreman, U.S. EPA, is attached.

84. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of residential soil samples, 9/4/03. P. 203121-203134.

85. Electronic memorandum to Ms. Jennifer Hubbard, U.S. EPA, and Mr. Romuald Roman, U.S. EPA, from Mr. John Mellow, PADEP, re: List of fluorocarbons, 10/1/03. P. 203135-203135.

86. Electronic memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: TCE and PCE concentrations of possible concern, 11/20/03. P. 203136-203136.

87. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Risk-based air concentrations of TCE and PCE, 11/24/03. P. 203137-203139.

88. Report: Analytical Report, prepared by Lockheed Martin, 12/03. P. 203140-203251. A cover memorandum to R. Singhvi, U.S. EPA, from V. Kansal, Lockheed Martin, is attached.

89. Valmont TCE figures of residential neighborhood contaminants of potential concerns, 12/12/03. P. 203252-203260. A cover letter to Mr. Romuald Roman, U.S. EPA, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., is attached.

90. Report: Final Report, Volume I of VI, prepared by Lockheed Martin/REAC, 1/04. P. 203261-203971.

91. Report: Final Report, Volume IV of VI, prepared by Lockheed Martin/REAC, 1/04. P. 203972-204425.

92. Report: Final Report, Volume VI of VI, prepared by Lockheed Martin/REAC, 1/04. P. 204426-204884.

93. Report: Final Report, Volume V of VI, prepared by Lockheed Martin/REAC, 1/04. P. 204885-205311.

94. Report: Final Report, Volume III of VI, prepared by Lockheed Martin/REAC, 1/04. P. 205312-205839.

95. Report: Final Report, Volume II of VI, prepared by Lockheed Martin/REAC, 1/04. P. 205840-206434.

96. Report: Risk estimates for 11/04 air sampling SUMMA data event, prepared by U.S. EPA, 2/04. P. 206435-206807.

97. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Summary of indoor air SUMMA data from November 2003 sampling event, 2/2/04. P. 206808-206811.

98. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Summary of indoor air SUMMA data from November 2003 sampling event, 2/4/04. P. 206812-206817.

99. Electronic memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Valmont indoor air sampling issues, 2/18/04. P. 206818-206820.

100. Letter to Mr. Romuald Roman, U.S. EPA, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., re: Technical memorandum - Initial screening of remedial alternatives, 3/5/04. P. 206821-206850.

101. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Vapor-intrusion risks and RI scoping, 4/5/04. P. 206851-206852.

102. Report: Remedial Investigation Report for Operable Unit 3, Volume 2 of 2, Valmont TCE Site, West Hazletown, Luzerne County, Pennsylvania, prepared by Tetra Tech NUS, Inc., 7/04. P. 206853-208025.

103. Report: Remedial Investigation Report for Operable Unit 3, Volume 1 of 2, Valmont TCE Site, West Hazletown, Luzerne County, Pennsylvania, prepared by Tetra Tech NUS, Inc., 7/04. P. 208026-208410. ΔΔ

104. Report: Revised Feasibility Study Report for Operable Unit 3, Valmont TCE Site, Luzerne County, Pennsylvania, prepared by Tetra Tech NUS, Inc., 12/05. P. 208411-208712. A cover letter to Mr. John Banks, U.S. EPA, from Tetra Tech NUS, Inc., is attached. ΔΔ

105. Electronic memorandum to Mr. Bruce Rundell and Mr. Romauld Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Contaminants in on-site soil gas, 6/7/02. P. 208713-208715.

106. Soil Gas Survey Maps, prepared by Tetra Tech NUS, Inc., 7/02. P. 208716-208718. A facsimile transmittal cover memorandum to Mr. Neil Teamerson, Tetra Tech NUS, Inc., from Mr. Romuald Roman, U.S. EPA, is attached.

107. Memorandum to Mr. Romuald Roman, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of ATSDR Public Health Assessment, 7/2/02. P. 208719-208727.

108. Electronic memorandum to Mr. Gareth Pearson, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Statistical correlations, 12/19/02. P. 208728-208730.

109. Memorandum to Mr. Bhupi Khona and Mr. Brad White, U.S. EPA, from Mr. Bruce Rundell, U.S. EPA, re: Evaluations of spatial distribution of metals in the area of Valmont TCE, 4/27/10. P. 208731-208731.

110. Memorandum to Mr. Bhupi Khona, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Valmont TCE warehouse air, 4/29/10. P. 208732-208732.

111. Memorandum to Mr. Bhupi Khona, U.S. EPA, from Ms. Jennifer

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ΔΔ Confidential Business Information has been redacted from this document. The redaction is evident from the face of the document.

Hubbard, U.S. EPA, re: Valmont TCE metals update, 4/29/10. P. 208733-208733.

112. Memorandum to Mr. Bhupi Khona, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of soil confirmation sampling, 6/23/10. P. 208734-208734.

113. Report: Federal On-Scene Coordinator's After Action Report, Valmont TCE Site, VOC-Contaminated Soils (Zone B), West Hazelton, Pennsylvania, November 2006 through April 2010, prepared by U.S. EPA, 7/10. P. 208735-208839. ++ ΔΔ

114. Report: Feasibility Study Report for Contaminated Groundwater, Operable Unit 3 (OU-3), Valmont TCE Site, Hazle Township, West Hazleton Borough, Luzerne County, Pennsylvania, prepared by Tetra Tech NUS, Inc., 7/10. P. 208840-209065. A July 19, 2010, cover letter to Mr. Bhupi Khona, U.S. EPA, from Tetra Tech NUS, Inc., is attached. ΔΔ

115. Report: Treatability Pilot Study Report for Valmont TCE Site, Hazle Township, West Hazleton Borough, Luzerne County, Pennsylvania, prepared by Tetra Tech NUS, Inc., 8/10. P. 209066-209696. An August 6, 2010, cover letter to Mr. Bhupi Khona, U.S. EPA, from Tetra Tech NUS, Inc., is attached. ΔΔ

116. Proposed Plan, Valmont TCE Superfund Site, 8/10. P. 209697-209736.

117. **Memorandum to the File, from Mr. Brad White, U.S. EPA, re: Query as to whether or not there is an ordinance for preventing the use of a private well or installation of a new well in the vicinity of the Valmont TCE Site, 5/6/10. P. 209737-209737.**

118. **Electronic memorandum to Mr. Brad White, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Priority remediation goal calculation, 12/6/10. P. 209738-209741.**

IV. REMOVAL RESPONSE PROJECTS

1. Report: Engineering Evaluation/Cost Analysis (EE/CA) for VOC Contaminated Soils, Valmont TCE Site, West Hazleton, Luzerne County, Pennsylvania, prepared by Tetra Tech NUS, Inc., 1/03. P. 400001-400504.

2. EE/CA Approval Memorandum to the Files, Routed thru Mr. Abraham Ferdas, U.S. EPA, from Mr. Romuald Roman, U.S. EPA, re: Request and documentation of approval for a proposed non-time critical removal at the Valmont TCE Site, and request for funding for an EE/CA, 2/3/03. P. 400505-400506.

3. Memorandum to Ms. Marianne Horinko, U.S. EPA, from Mr. Abraham Ferdas, U.S. EPA, re: Approval of a request for exemption from 12-month statutory limit, a change in scope and additional funds for a removal action, 2/13/03. P. 400507-400517. A February 13, 2003, request for exemption from 12-month statutory limit, a change in scope and additional funds for a removal action, is attached.

4. U.S. EPA Special Bulletin B, re: Valmont Site, Letter Contract Status, 10/28/87. P. 400518-400519.

5. Special Bulletin A - U.S. EPA Pollution Report # 1, re: Notification of CERCLA Time Critical Removal Action, 2/11/02.**

6. Memorandum to Mr. Abraham Ferdas, U.S. EPA, from Mr. Romuald Roman, U.S. EPA, re: Request for a non-time critical removal action and additional funds, 2/9/04.**

7. Memorandum to Mr. Thomas Dunne, U.S. EPA, from Mr. Abraham Ferdas, U.S. EPA, re: Approval of a change in scope and additional funds for a time-critical and non-time-critical removal action, 7/7/04. A July 7, 2004, memorandum to Mr. Abraham Ferdas, from Mr. Romuald Roman, U.S. EPA, regarding request for a change in scope and additional funds for a time-critical and non-time-critical removal action, is attached.**

8. Memorandum to Mr. Abraham Ferdas, U.S. EPA, from Mr.

Romuald Roman, U.S. EPA, re: Request for a change in scope for a removal action, 9/30/05. An October 6, 2005, memorandum to Mr. Thomas Dunn, U.S. EPA, from Mr. Abraham Ferdas, U.S. EPA, regarding approval of a change in scope for a removal action, is attached.**

9. Memorandum to Ms. Susan Bodine, U.S. EPA, from Mr. Abraham Ferdas, U.S. EPA, re: Confirmation of the total removal project ceiling for a removal action, 9/29/06. A September 29, 2006, memorandum to Mr. Abraham Ferdas, U.S. EPA, from Ms. Marjorie Easton and Mr. John Banks, U.S. EPA, regarding a request for confirmation of the total removal project ceiling for a removal action, is attached.**

10. U.S. EPA Pollution Report # 29 and Special Bulletin B, Valmont TCE Site, 3/8/07.**

11. Action Memorandum to Ms. Susan Bodine, U.S. EPA, from Mr. James Burke, U.S. EPA, re: Approval Action for funding to conduct a CERCLA non-time critical Removal Action and Approval for a 12-month exemption request, 4/17/08. Memorandum to Mr. James Burke, U.S. EPA, from Mr. Bhupi Khona, U.S. EPA, regarding Request for funding to conduct a CERCLA non-time critical Removal Action and Approval for a 12-month exemption request, and a December 12, 2007 packet of site maps & figures and an April 2008 Responsiveness Summary, is attached.**

12. Change of Scope Memorandum to Mr. James Burke, U.S. EPA from Mr. Bhupi Khona, U.S. EPA, re: Request for a Change in Scope for a Removal Action for Contaminated Groundwater, 10/8/08.**

V. COMMUNITY INVOLVEMENT/CONGRESSIONAL CORRESPONDENCE/IMAGERY

1. U.S. EPA Fact Sheet: Valmont TCE Site, West Hazelton, Luzerne County, Pennsylvania, entitled, "EPA Answers Residents' Questions," 11/01. P. 500001-500002.

2. Untitled U.S. EPA Fact Sheet: Valmont TCE Site, West Hazelton, Luzerne County, Pennsylvania, 1/02. P. 500003-500004.

3. U.S. EPA Fact Sheet: Valmont TCE Site, West Hazelton, Luzerne County, Pennsylvania, entitled, "Home Air Sampling," 3/02. P. 500005-500006.

4. Report: Community Relations Plan, Valmont TCE Site, Luzerne County, West Hazelton, Pennsylvania, 4/02. P. 500007-500038.

5. U.S. EPA Fact Sheet: Valmont TCE Site, West Hazelton, Luzerne County, Pennsylvania, entitled, "Site Update," (undated). P. 500039-500040.

6. Federal Register Notice, Volume 66, No. 115: EPA 40 CFR Part 300, "National Priorities List for Uncontrolled Hazardous Waste Sites, Proposed Rule No. 36," 6/14/01. P. 500041-500047.

7. Newspaper article entitled, "DER tell homeowners," Standard Speaker, 10/22/87. P. 500048-500048.

8. Newspaper article entitled, "Investigators seek cause," Standard Speaker, 10/23/87. P. 50049-500050.

9. Newspaper article entitled, "DER: 12 more wells unsafe," Standard Speaker, 10/24/87. P. 500051-500051.

10. U.S. EPA Fact Sheet: Valmont TCE Site, Hazle Township and West Hazelton, Pennsylvania, entitled, "Groundwater contamination at Deer Run Road and Bent Pine Trail," 10/29/87. P. 500052-500052.

11. Newspaper article entitled, "Agencies close to finding contaminants source," Standard Speaker, 10/29/87. P. 500053-500053.

12. Newspaper article entitled, "Elected officials to meet with residents," Standard Speaker, 11/6/87. P. 500054-500054.

13. Newspaper article entitled, "Residents seek Federal study of TCE effects," Standard Speaker, 11/9/87. P. 500055-500056.

14. Newspaper article entitled, "HCA awards pact for Deer Run Road water line," Standard Speaker, 11/19/87. P. 500057-500057.

15. Newspaper article entitled, "DER-Chromatex probable source of TCE, discovery relieves residents and probable sources found, but investigation goes on," Standard Speaker, 12/4/87. P. 500058-500058.

16. Letter to Mr. James Seif, PADEP, from Mr. Abraham Ferdas, U.S. EPA, re: National Priorities List, 8/14/00. P. 500059-500059.

17. Letter to Mr. Abraham Ferdas, U.S. EPA, from Mr. James Seif, PADEP, re: National Priorities List, 9/27/00. P. 500060-500060.

18. Letter to Resident, West Hazleton, from Mr. Kevin Wood, U.S. EPA, re: Transmittal of health-related information, 12/29/00. P. 500061-500061. ++

19. Untitled U.S. EPA Fact Sheet: Valmont TCE Site, West Hazelton, Luzerne County, Pennsylvania, 1/01. P. 500062-500063.

20. Newspaper article entitled, "Hazleton Chromatex Plant to close doors," Times-News, 1/9/01. P. 500064-500064.

21. Newspaper article entitled, "Chromatex to close plant; 84 jobs to be lost," Standard Speaker, 1/9/01. P. 500065-500065.

22. Letter to Mr. Tom Bass, Hazle Township Supervisors, from Mr. Kevin Wood, U.S. EPA, re: Residential well sampling and transmittal of trip report, 4/4/01. P. 500066-500067.

23. Newspaper article entitled, "EPA to clean up spill," The Reporter, 4/16/01. P. 500068-500068.

24. Newspaper article entitled, "EPA to clean site of 14 year old spill in West Hazleton," Lehigh Valley News, 4/16/01. P. 500069-500070.

25. Letter to Mr. Kevin Wood, U.S. EPA, from Mr. Timothy Tucker, Borough of West Hazleton, re: Chromatex Plant spill reopening, 4/17/01. P. 500071-500071.

26. Newspaper article entitled, "Spill's duration comes as shock," Times Leader, 4/17/01. P. 500072-500076.

27. Letter to Mr. Kevin Wood, U.S. EPA, from Mr. Todd Eachus, Pennsylvania House of Representatives, re: Status of site cleanup, 4/18/01. P. 500077-500077.

28. Electronic memorandum to Valmont TCE Group, from Mr. Kevin Wood, U.S. EPA, re: Residential basement air sampling, 4/18/01. P. 500077A-500077A. ++

29. Newspaper article entitled, "EPA sends out fact sheets to residents near Valmont Spill," The Standard Speaker, 4/28/01. P. 500077B-500077B.

30. Handwritten letter to whom it may concern, from Resident, re: Home well and air sampling, 5/2/01. P. 500078-500078. ++

31. Electronic memorandum to Valmont TCE Group, from Mr. Kevin Wood, U.S. EPA, re: Residential well sampling in the Chapel Hill area of West Hazleton, 5/4/01. P. 500079-500087. ++

32. Letter to Mr. Romuald Roman, U.S. EPA, from Mr. Ted Vinatieri, Grace Fellowship Church, re: Residential property sampling, 5/7/01. P. 500088-500088.

33. Letter to Mr. Romuald Roman, U.S. EPA, from Resident, re: Residential property sampling, 5/7/01. P. 500089-500089. ++

34. Letter to Mr. Romuald Roman, U.S. EPA, from Resident, ++
re: Residential property sampling, 5/7/01. P. 500090-500090.

35. Electronic memorandum to Mr. William Hudson, U.S. EPA, ++
and Mr. Romuald Roman, U.S. EPA, from Mr. Kevin Wood, U.S. EPA, re: Residential well testing, 5/9/01. P. 500091-500091.

36. Electronic memorandum to Mr. William Hudson, U.S. EPA, ++
and Mr. Romuald Roman, U.S. EPA, from Mr. Kevin Wood, U.S. EPA, re: Residential well testing, 5/9/01. P. 500092-500092.

37. Electronic memorandum to Mr. William Hudson, U.S. EPA, ++
and Mr. Romuald Roman, U.S. EPA, from Mr. Kevin Wood, U.S. EPA, re: Residential well testing and orange goo, 5/11/01. P. 500093-500093.

38. Electronic memorandum to Mr. William Hudson, U.S. EPA, ++
and Mr. Romuald Roman, U.S. EPA, from Mr. Kevin Wood, U.S. EPA, re: Residential air sampling request, 5/11/01. P. 500094-500094.

39. Electronic memorandum to Mr. Neil Teamerson, Tetra Tech ++
NUS, Inc., from Mr. Kevin Wood, U.S. EPA, re: Sampling requests, 5/14/01. P. 500095-500104.

40. Newspaper article entitled, "EPA to start testing Chapel Hill homes," The Standard Speaker, 5/17/01. P. 500105-500105.

41. U.S. EPA Fact Sheet: Valmont TCE Site, Hazle Township and West Hazelton, Pennsylvania, entitled, "National Priorities List (NPL)," 6/01. P. 500106-500106.

42. Newspaper article entitled, "Chromatex to get Superfund status," Times Leader, 6/12/01. P. 500107-500107.

43. U.S. EPA Press Release, Valmont TCE Site, re: Valmont TCE Site Proposed for Superfund Hazardous Site List, 6/14/01. P. 500108-500109.

44. Public meeting presentation handouts, prepared by Mr. Kevin Wood, U.S. EPA, 6/20/01. P. 500110-500113.

45. Newspaper article entitled, "Federal officials to address residents on Valmont spill," The Standard Speaker, 6/20/01. P. 500114-500114.

46. U.S. EPA Public Notice, Valmont TCE Site, re: Public Meeting, 6/20/01. P. 500115-500115.

47. Newspaper article entitled, "Federal officials explain TCE spill," The Standard Speaker, 6/21/01. P. 500116-5001118.

48. Letter to Resident, from Mr. Abraham Ferdas, U.S. EPA, ++ re: Illegal disposal of chemicals in West Hazleton, 7/24/01. P. 500119-500119.

49. Letter to Docket Coordinator, U.S. EPA, from Mr. Andy Benyo, Mr. Anthony Matz, and Ms. Ruth Klatz, Hazle Township Supervisors, re: Placement of the site on the National Priorities List and well issues, 7/27/01. P. 500120-500126. A packet of maps are attached.

50. Letter to Mr. Rick Santorum, U.S. Senate, from Mr. Donald Welsh, U.S. EPA, re: Suggestion to place Valmont TCE on the National Priorities List (NPL), 8/23/01. P. 500127-500128. A July 30, 2001 letter to Mr. Donald Welsh, U.S. EPA, from Mr. Rick Santorum, U.S. Senate, regarding the Valmont TCE and the NPL, is attached.

51. U.S. EPA Fact Sheet: Valmont TCE Site, West Hazleton, Luzerne County, Pennsylvania entitled, "National Priorities List (NPL)," 9/01. P. 500129-500129.

52. Valmont TCE 6/14/01 NPL proposal public comment index, ++ 9/01. P. 500130-500132.

53. Letter to Resident, from Mr. Abraham Ferdas, U.S. EPA, ++ re: Home relocation, 9/4/01. P. 500133-500159. The following are attached:

a) an August 9, 2001 handwritten letter to Ms. Christie Whitman, U.S. EPA, from Resident,

regarding home relocation;

b) a June 14, 2001 press release entitled, "Valmont TCE Site Proposed for Superfund Hazardous Site List;"

c) an August 20, 2001 letter to U.S. EPA, from Resident, regarding U.S. EPA issues and relocation;

d) an August 20, 2001 letter to U.S. EPA, from Resident, regarding home relocation;

e) an August 20, 2001 letter to U.S. EPA, from Resident, regarding home relocation;

f) an August 20, 2001 letter to U.S. EPA, from Resident, regarding home relocation;

g) an August 20, 2001 letter to U.S. EPA, from Resident, regarding home relocation.

54. U.S. EPA Press Release: Valmont TCE Site, West Hazleton, Luzerne County, Pennsylvania entitled, "Valmont TCE Site finalized on Superfund Hazardous Site List," 9/13/01. P. 500160-500161.

55. Newspaper article entitled, "Eachus blasts EPA's handling of area chemical spills during town meeting," The Standard Speaker, 9/20/01. P. 500162-500162.

56. Letter to Resident, from Ms. Jennifer Hubbard, U.S. EPA, re: Reproductive and ovarian toxicity of trichloroethylene (TCE), 10/29/01. P. 500163-500165.

57. Letter to Mr. Andy Benyo, Hazle Township Supervisors, from Mr. Joseph Brogna, PADEP, re: Request for information, 12/11/01. P. 500166-500169. A fax cover sheet is attached.

58. Newspaper article entitled, "Hazleton couple files suit over contamination," The Citizens' Voice, 1/6/02. P. 500170-500170.

59. Handwritten letter to Mr. Romuald Roman, U.S. EPA, from Resident, re: Basement sampling, 1/21/02. P. 500171-500171. ++

60. Letter to Mr. Romuald Roman, U.S. EPA, from Resident, re: Home sampling, 1/28/02. P. 500172-500172. ++

61. Letter to Mr. Romuald Roman, U.S. EPA, from Resident, re: Basement sampling, 1/28/02. P. 500173-500173. ++

62. Newspaper article entitled, "Fed outlines plan to clean up TCE spill," The Standard Speaker, 1/29/02. P. 500174-500174.

63. Letter to Resident, from Mr. John Mellow, PADEP, re: Results of air quality samples, 1/31/02. P. 500175-500188. Sampling results are attached. ++

64. Letter to Resident, from Mr. John Mellow, PADEP, re: Results of air quality samples, 1/31/02. P. 500189-500203. Sampling results are attached. ++

65. Letter to Resident, from Mr. John Mellow, PADEP, re: Results of air quality samples, 1/31/02. P. 500204-500217. Sampling results are attached. ++

66. Letter to Resident, from Mr. John Mellow, PADEP, re: Results of air quality samples, 1/31/02. P. 500218-500259. Sampling results are attached. ++

67. Electronic memorandum to Mr. Geroncio Fajardo, PA Department of Health, Ms. Lora Werner, U.S. EPA, and Ms. Jennifer Hubbard, U.S. EPA, Mr. Romuald Roman, U.S. EPA, and Mr. John Mellow, PADEP, from Ms. Barbara Allerton, re: Action items from Valmont TCE community visits, 2/25/02. P. 500260-500260. ++

68. Newspaper article entitled, "Feds to test air in sewer lines near Valmont Park," The Standard Speaker, 2/26/02. P. 500261-500261.

69. Newspaper article entitled, "EPA gets approval to investigate site of Valmont spill," The Standard Speaker, 3/19/02. P. 500262-500262.

70. Letter to Mr. Romuald Roman, U.S. EPA, from Residents, ++ re: Home sampling, 3/25/02. P. 500263-500263.

71. Letter to Resident, from Ms. Lora Werner, ATSDR, re: ++ Information on community health studies with volatile organic compounds (VOCs), 4/2/02. P. 500264-500264.

72. Letter to Resident, from Ms. Lora Werner, ATSDR, re: ++ **Affect of trichloroethylene on dogs, 4/2/02. TCE Exposure data is attached.** P. 500265-500268.

73. Newspaper article entitled, "EPA tours, tests former Chromatex building," The Standard Speaker, 4/10/02. P. 500269-500270.

74. Newspaper article entitled, "Official plans to move quickly remediating Valmont spill site," The Standard Speaker, 4/23/02. P. 500271-500271.

75. Newspaper article entitled, "EPA, DEP brief Valmont residents on TCE at former Chromatex Site," The Standard Speaker, 7/19/02. P. 500272-500272.

76. Letter to Residents, Hazle Township and West Hazleton Borough, from Mr. Neil Teamerson, Tetra Tech NUS, Inc., re: Scheduling of residential soil gas sampling, 8/7/02. P. 500273-500273.

77. Letter to Resident, from Ms. Jennifer Hubbard, U.S. EPA, ++ re: Volatile solvents found in soil sampling, 10/11/02. P. 500274-500276.

78. U.S. EPA Fact Sheet: Valmont TCE Site, West Hazleton, Luzerne County, Pennsylvania, entitled, "Information Update," 11/02. P. 500277-500278.

79. Newspaper article entitled, "EPA unveils cleanup plans for Chromatex," The Standard Speaker, 2/9/03. P. 500279-500283.

80. Letter to Mr. Romuald Roman, U.S. EPA, from Ms. Debbie Lutz, Valmont Residents Against Pollution, re: Review of Engineering Evaluation/Cost Analysis (EE/CA), 4/7/03. P. 500284-500290.

81. Letter to Resident, from Mr. Kevin Boyd, U.S. EPA, re: Residential sampling event, 6/9/03. P. 500291-500312. Sampling results are attached. ++

82. Letter to Resident, from Mr. Kevin Boyd, U.S. EPA, re: Residential sampling event, 6/9/03. P. 500313-500336. Sampling results are attached. ++

83. Letter to Resident, from Mr. Kevin Boyd, U.S. EPA, re: Residential sampling event, 6/9/03. P. 500337-500364. Sampling results are attached. ++

84. Electronic memorandum to Ms. Jennifer Hubbard, U.S. EPA, from Mr. Ed Shoener, McLane & Shoener, Inc., re: Valmont Residents Against Pollution (VRAP) and indoor air level issues, 8/19/03. P. 500365-500369.

85. Letter to Resident, from Mr. Romuald Roman, U.S. EPA, re: Home sampling results, 9/24/03. P. 500370-500375. ++

86. Letter to Mr. Paul Kanjorski, Congress of the United States, (no author cited), re: VRAP concerns, 9/30/03. P. 500376-500376.

87. Letter to Resident, from U.S. EPA, re: Sampling residents' indoor air, 10/7/03. P. 500377-500378. A property access consent form is attached.

88. Letter to Mr. Donald Welsh, U.S. EPA, from Mr. Paul Kanjorski, re: List of residential concerns, 10/22/03. P. 500379-500383.

89. U.S. EPA Public Notice, Valmont TCE Site, re: Public Meeting, 12/17/03. P. 500384-500384.

90. Community update information slides, Valmont TCE Site, 12/17/03. P. 500385-500389.

91. Newspaper article entitled, "Valmont residents ask HASB for tax relief as of TCE spill," The Standard Speaker, 2/5/04. P. 500390-500392.

92. Newspaper article entitled, "EPA: More homes near spill need air filters," The Standard Speaker, 2/17/04. P. 500393-500395.

93. Newspaper article entitled, "EPA: TCE spill not as big as expected," The Standard Speaker, 2/19/04. P. 500396-500399.

94. U.S. EPA Public Notice, Valmont TCE Site, re: Public Meeting, 2/19/04. P. 500400-500401.

95. Community update information slides, Valmont TCE Site, 2/19/04. P. 500402-500418.

96. Newspaper article entitled, "Clearing the air at Valmont," The Standard Speaker, 2/22/04.**

97. Newspaper article entitled, "EPA comes under fire during Wed. meeting concerning Valmont spill," The Standard Speaker, (undated). P. 500419-500419.

98. U.S. EPA Public Notice, Valmont TCE, re: A Proposed Plan Public Meeting, 8/23/10. P. 500420-500420.

99. Transcript of Public Meeting Minutes, Valmont TCE Superfund Site Proposed Plan, 9/16/10. P. 500421-500491.

100. Letter to Mr. Bhupi Khona and Mr. William Hudson, U.S. EPA, from Mr. John Krill, Jr., K & L Gates LLP, re: Comments on the August 2010 Proposed Plan for Valmont TCE Superfund Site, 9/30/10. P. 500492-500493.

GUIDANCE DOCUMENTS

1. EPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. OSWER Directive 9355.3-01. Office of Emergency and Remedial Response. Washington, DC. October.

2. EPA, 1989a. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.

3. EPA, 1991. Risk Assessment Guidance for Superfund: Volume 1, Human Health Evaluation Manual (Parts B Development of Risk-based Preliminary Remediation Goals): EPA/540/R-92/OU3. Office of Emergency and Remedial Response. Washington, DC.

4. EPA October 1991: Risk Assessment Guidance for Superfund, Volume 1 - Human Heath Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives) EPA Publication 9285.7-01C; OERR; Washington, DC.

5. EPA, 1993b. Selecting Exposure Routes and Contaminants of Concern by Risk Based Screening. EPA/903/R-93-001. Hazardous Site Control Division. Philadelphia, Pennsylvania. Including Update Spring, 2003.

6. EPA, 1998a. Risk Assessment Guidance for Superfund: Volume 1. Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments). Office of Emergency and Remedial Response. Washington, DC. January.

7. EPA, 2002c. Evaluating the Vapor Intrusion into Indoor Air. EPA-530-F-02-052. Office of Solid Waste. Washington, DC. November.

8. EPA, 2002d. Drinking Guidance for Evaluating the Vapor Intrusions to Indoor Air Pathway from Groundwater and Soils. Office of Solid Waste and Emergency Response. Washington, DC. November.

9. **EPA, 1999. A Guide to Preparing Superfund Proposed Plans,**

Records of Decision, and Other Remedy Selection Documents. EPA 540/R-98/031. Office of Emergency and Remedial Response. Washington, DC.

10. EPA, 2009. Memorandum: Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration. OSWER Directive 9283.1-33. Office of Solid Waste and Emergency Response. Washington, DC.

APPENDIX B – Site Figures

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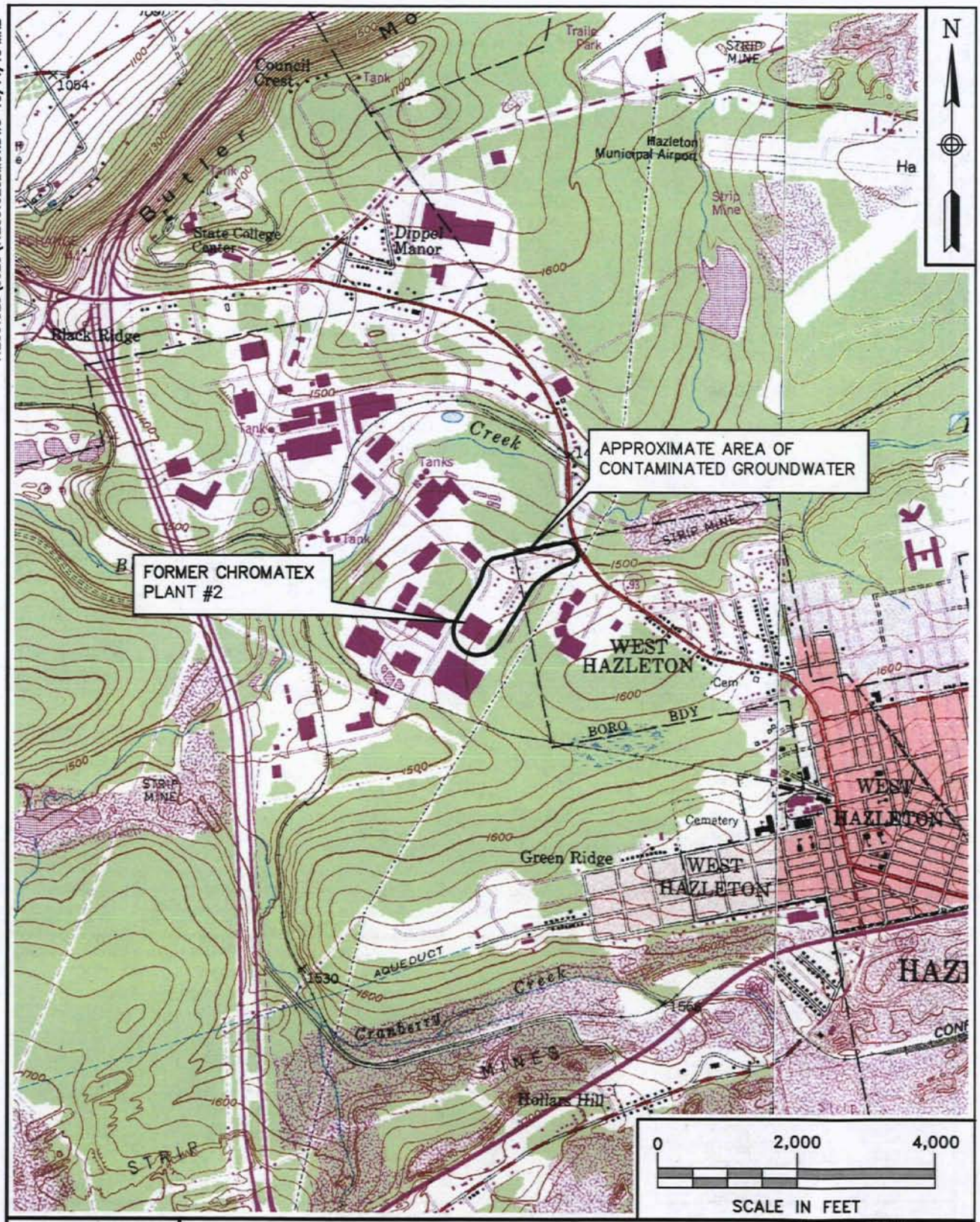
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APPROXIMATE AREA OF CONTAMINATED GROUNDWATER
FORMER CHROMATEX PLANT #2
WEST HAZLETON
Council Crest
Dippel Manor
State College Center
Black Ridge
Hazleton Municipal Airport
Green Ridge
Cranberry Creek
Hollars Hill
STRIP MINE
Cemetery
BORO BDY
AQUEDUCT
0
2,000
4,000
SCALE IN FEET
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
SITE LOCATION MAP
VALMONT TCE SITE
HAZLE TOWNSHIP AND
WEST HAZLETON BOROUGH
LUZERNE COUNTY, PENNSYLVANIA
SCALE
AS NOTED
FILE
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REV
0
DATE
10/14/10
FIGURE NUMBER
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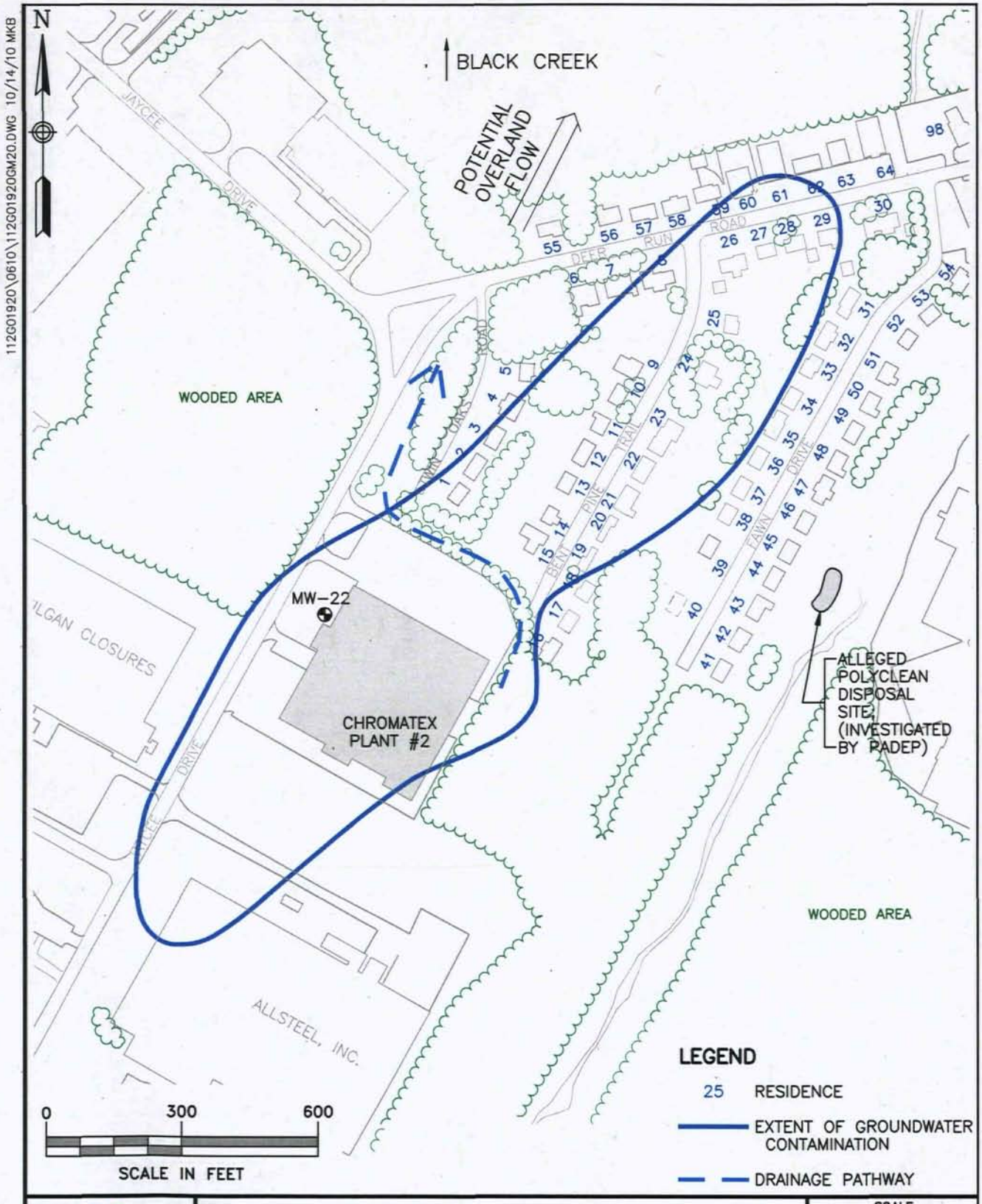

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SITE MAP
VALMONT TCE SITE
HAZLE TOWNSHIP AND
WEST HAZLETON BOROUGH
LUZERNE COUNTY, PENNSYLVANIA

SCALE	AS NOTED
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DATE	10/14/10
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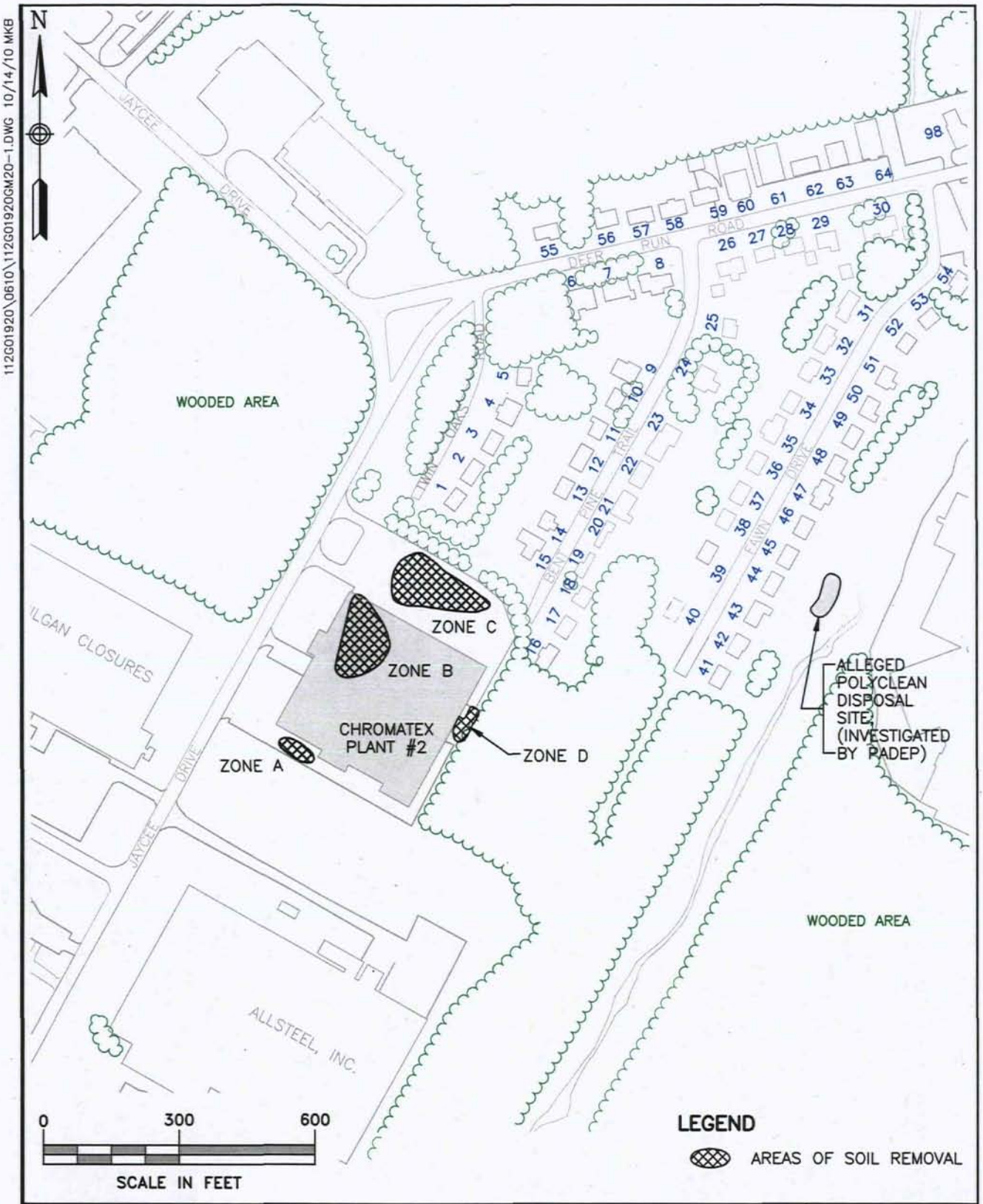

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

AREAS OF SOIL REMOVAL
VALMONT TCE SITE
HAZLE TOWNSHIP AND
WEST HAZLETON BOROUGH
LUZERNE COUNTY, PENNSYLVANIA

SCALE	AS NOTED
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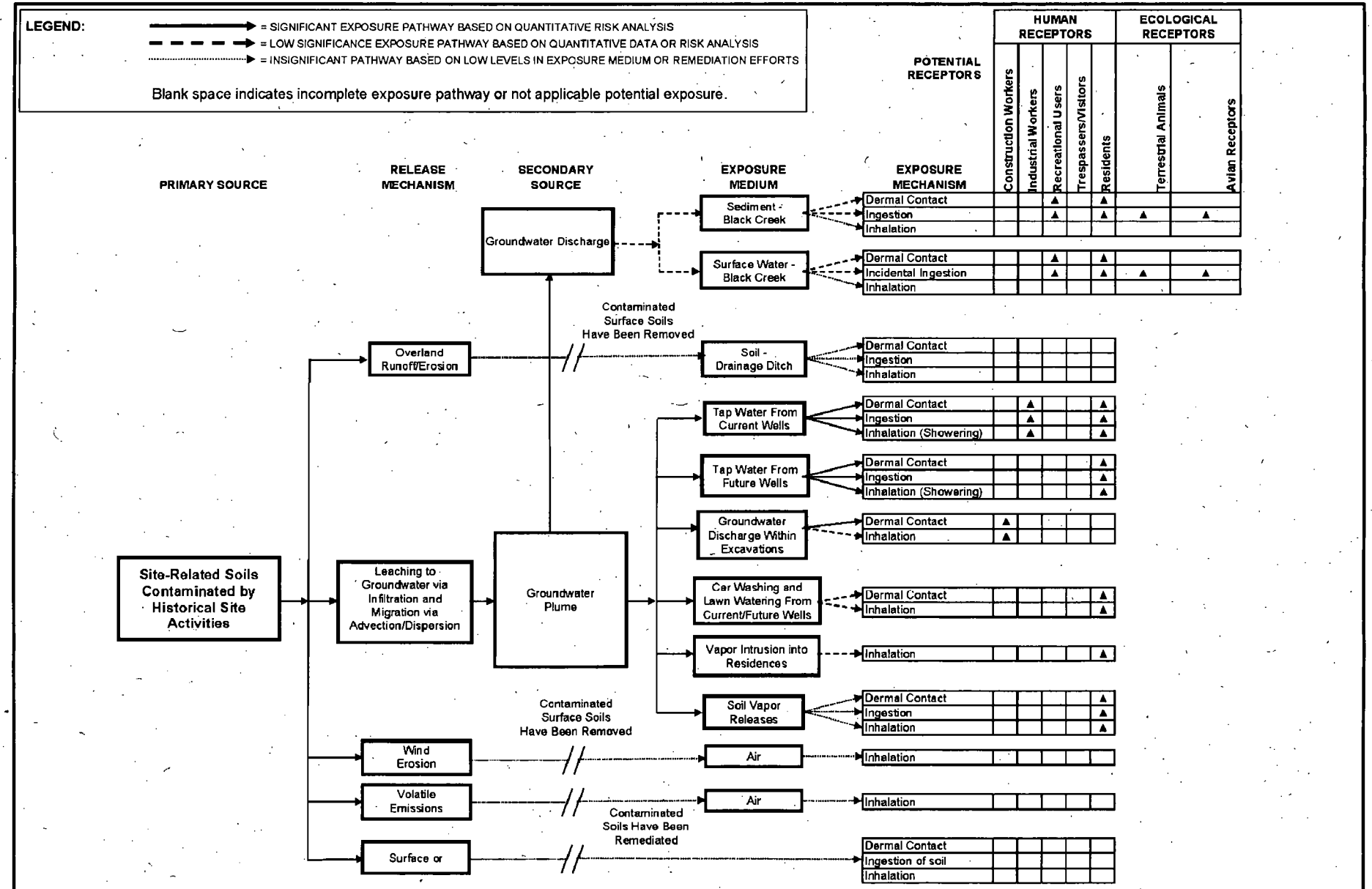

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

CONCEPTUAL SITE MODEL
VALMONT TCE SITE
HAZLE TOWNSHIP AND
WEST HAZLETON BOROUGH
LUZERNE COUNTY, PENNSYLVANIA

SCALE	AS NOTED
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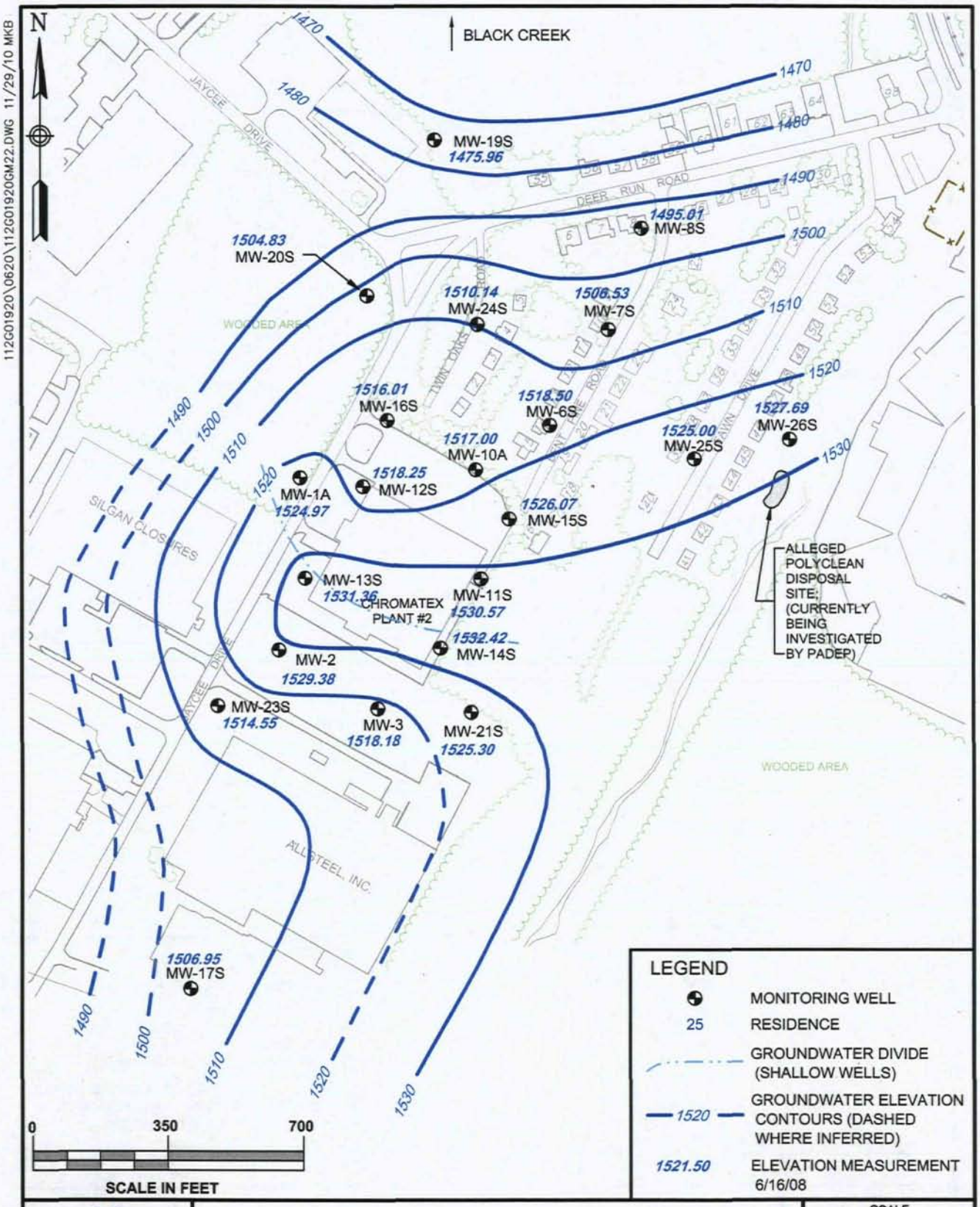

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

GROUNDWATER FLOW MAP (SHALLOW WELLS) (JUNE 2008) HAZLE TOWNSHIP AND WEST HAZLETON BOROUGH LUZERNE COUNTY, PENNSYLVANIA

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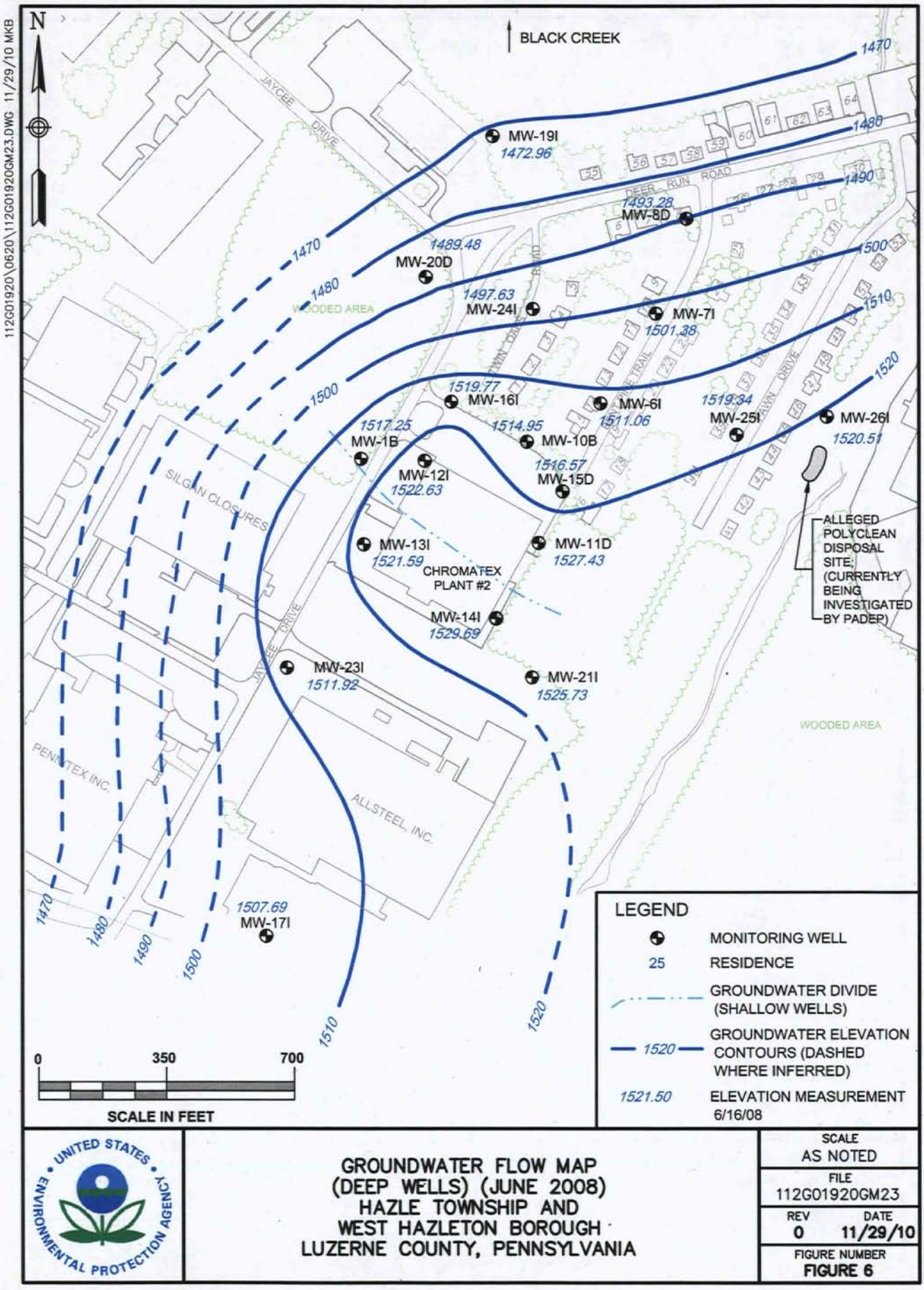

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

GROUNDWATER FLOW MAP (DEEP WELLS) (JUNE 2008) HAZLE TOWNSHIP AND WEST HAZLETON BOROUGH LUZERNE COUNTY, PENNSYLVANIA

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REV	0
DATE	11/29/10
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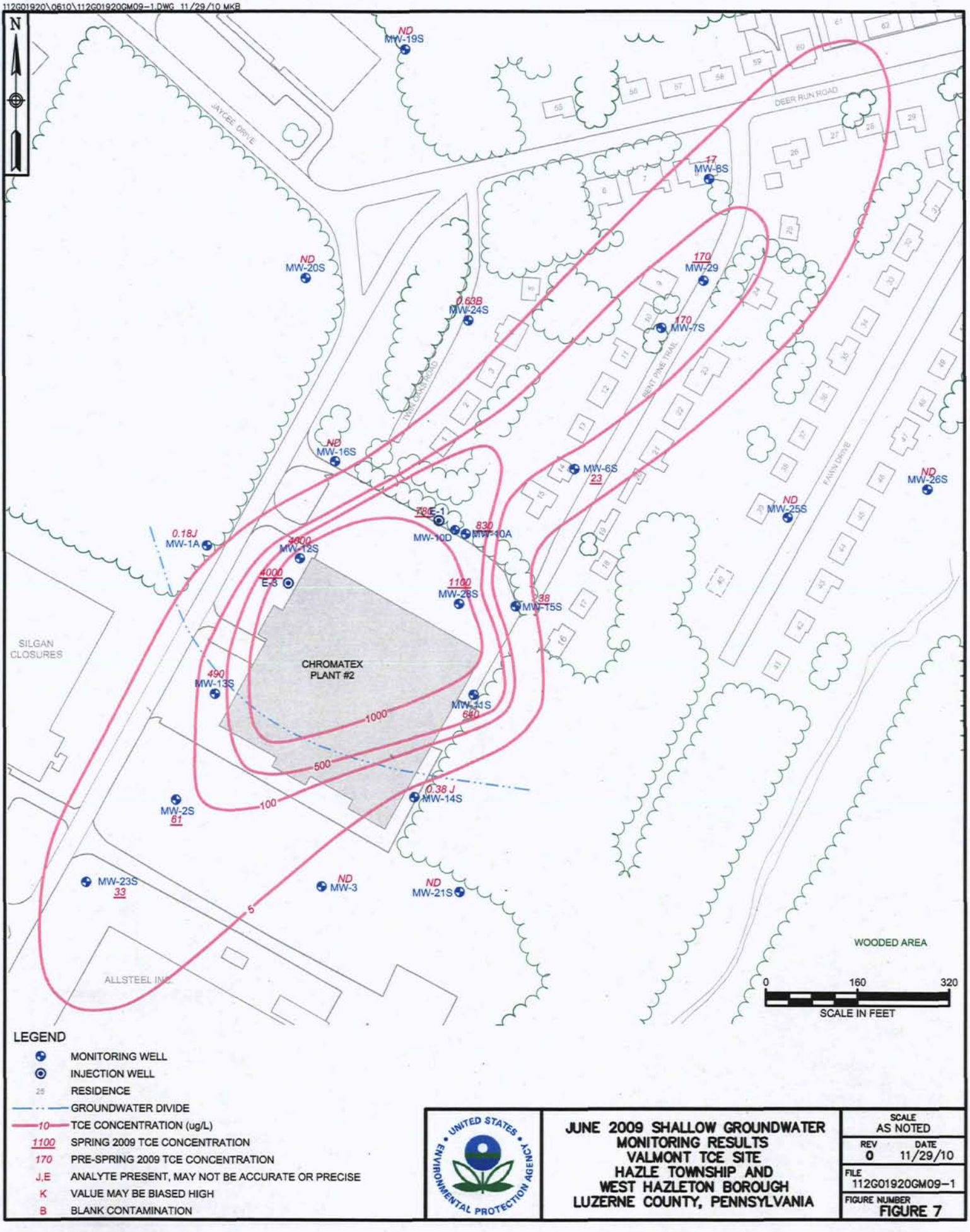
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ND MW-19S
JAYCEE DRIVE
DEER RUN ROAD
17 MW-8S
ND MW-20S
170 MW-29
0.63B MW-24S
170 MW-7S
TWIN OAKS ROAD
BENT PINE TRAIL
FAWN DRIVE
ND MW-16S
MW-6S 23
ND MW-26S
ND MW-25S
780 E-1
MW-10D
830 MW-10A
0.18J MW-1A
4000 MW-12S
4000 E-3
1100 MW-28S
238 MW-15S
SILGAN CLOSURES
CHROMATEX PLANT #2
490 MW-13S
MW-11S 640
1000
500
100
0.38 J MW-14S
MW-2S 61
MW-23S 33
ND MW-3
ND MW-21S
5
ALLSTEEL INC
WOODED AREA
0 160 320
SCALE IN FEET
LEGEND
MONITORING WELL
INJECTION WELL
25 RESIDENCE
GROUNDWATER DIVIDE
10 TCE CONCENTRATION (ug/L)
1100 SPRING 2009 TCE CONCENTRATION
170 PRE-SPRING 2009 TCE CONCENTRATION
J,E ANALYTE PRESENT, MAY NOT BE ACCURATE OR PRECISE
K VALUE MAY BE BIASED HIGH
B BLANK CONTAMINATION
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
JUNE 2009 SHALLOW GROUNDWATER MONITORING RESULTS
VALMONT TCE SITE
HAZLE TOWNSHIP AND
WEST HAZLETON BOROUGH
LUZERNE COUNTY, PENNSYLVANIA
SCALE AS NOTED
REV 0
DATE 11/29/10
FILE 112G01920GM09-1
FIGURE NUMBER FIGURE 7

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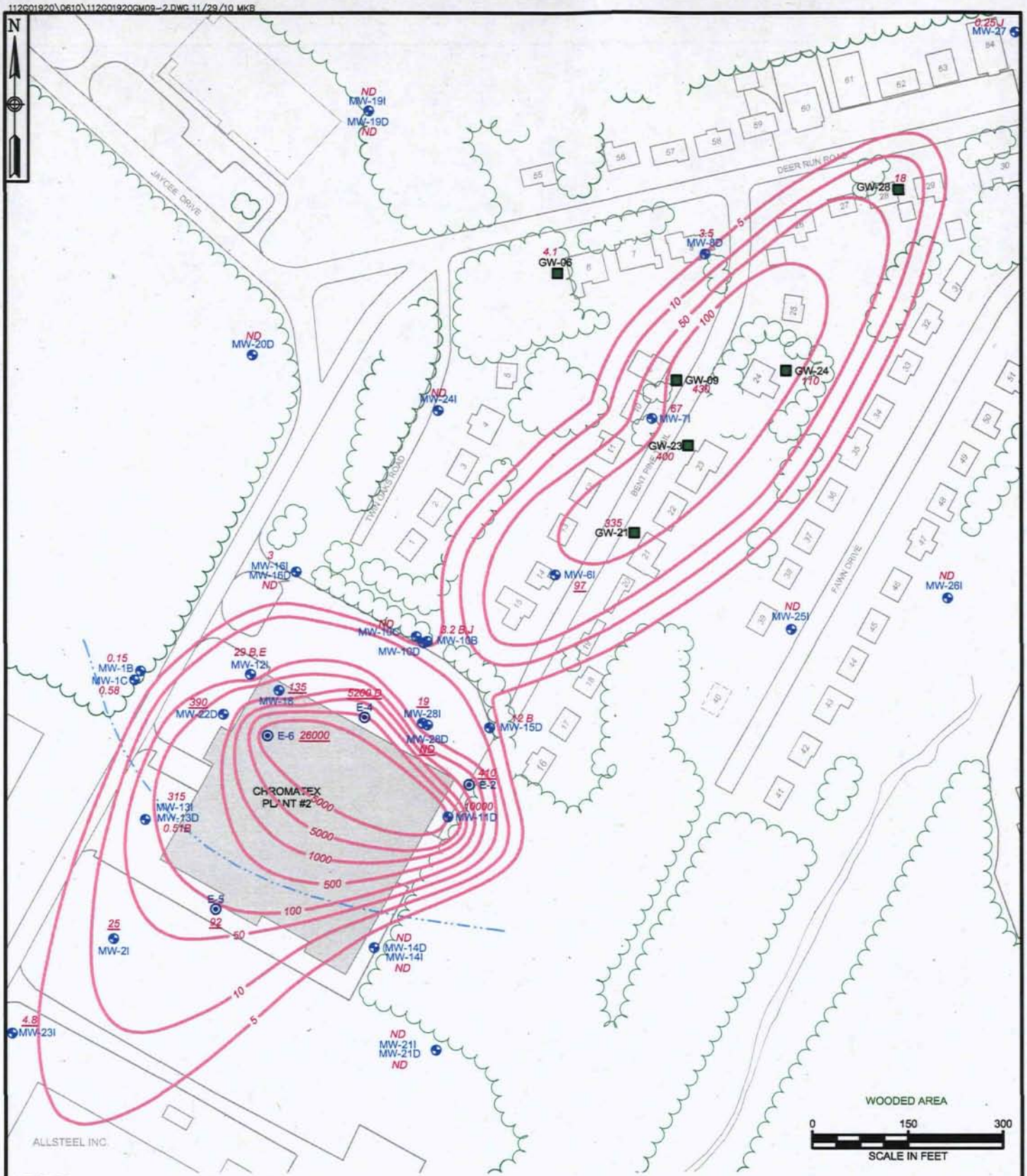
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JAYCEE DRIVE
DEER RUN ROAD
TWIN OAKS ROAD
BENT PINE TRAIL
FAWN DRIVE
ALLSTEEL INC.
WOODED AREA
0 150 300
SCALE IN FEET
ND MW-19I
MW-19D ND
0.25 J MW-27
GW-28 18
3.5 MW-8D
4.1 GW-06
ND MW-20D
ND MW-24I
GW-09 430
GW-24 170
67 MW-7I
GW-23 400
335 GW-21
3 MW-16I
MW-16D ND
MW-6I 97
ND MW-26I
ND MW-25I
ND MW-10S
MW-10D
3.2 BJ MW-10B
0.15 MW-1B
MW-1C 0.58
29 B,E MW-12I
135 MW-18
390 MW-22D
5200 B E-4
19 MW-28I
MW-28D ND
E-6 26000
42 B MW-15D
410 E-2
CHROMATEX PLANT #2
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MW-13D 0.51B
10000 MW-11D
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10
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E-5
92
25 MW-2I
ND (MW-14D
MW-14I ND
4.8 MW-23I
ND MW-21I
MW-21D ND
LEGEND
MONITORING WELL
INJECTION WELL
RESIDENTIAL WELL
RESIDENCE
GROUNDWATER DIVIDE
10 TCE CONCENTRATION (ug/L)
1100 SPRING 2009 TCE CONCENTRATION
170 PRE-SPRING 2009 TCE CONCENTRATION
J,E,D ANALYTE PRESENT, MAY NOT BE ACCURATE OR PRECISE
K VALUE MAY BE BIASED HIGH
B BLANK CONTAMINATION
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
JUNE 2009 DEEPER GROUNDWATER MONITORING RESULTS
VALMONT TCE SITE
HAZLE TOWNSHIP AND
WEST HAZLETON BOROUGH
LUZERNE COUNTY, PENNSYLVANIA
SCALE AS NOTED
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DATE 11/29/10
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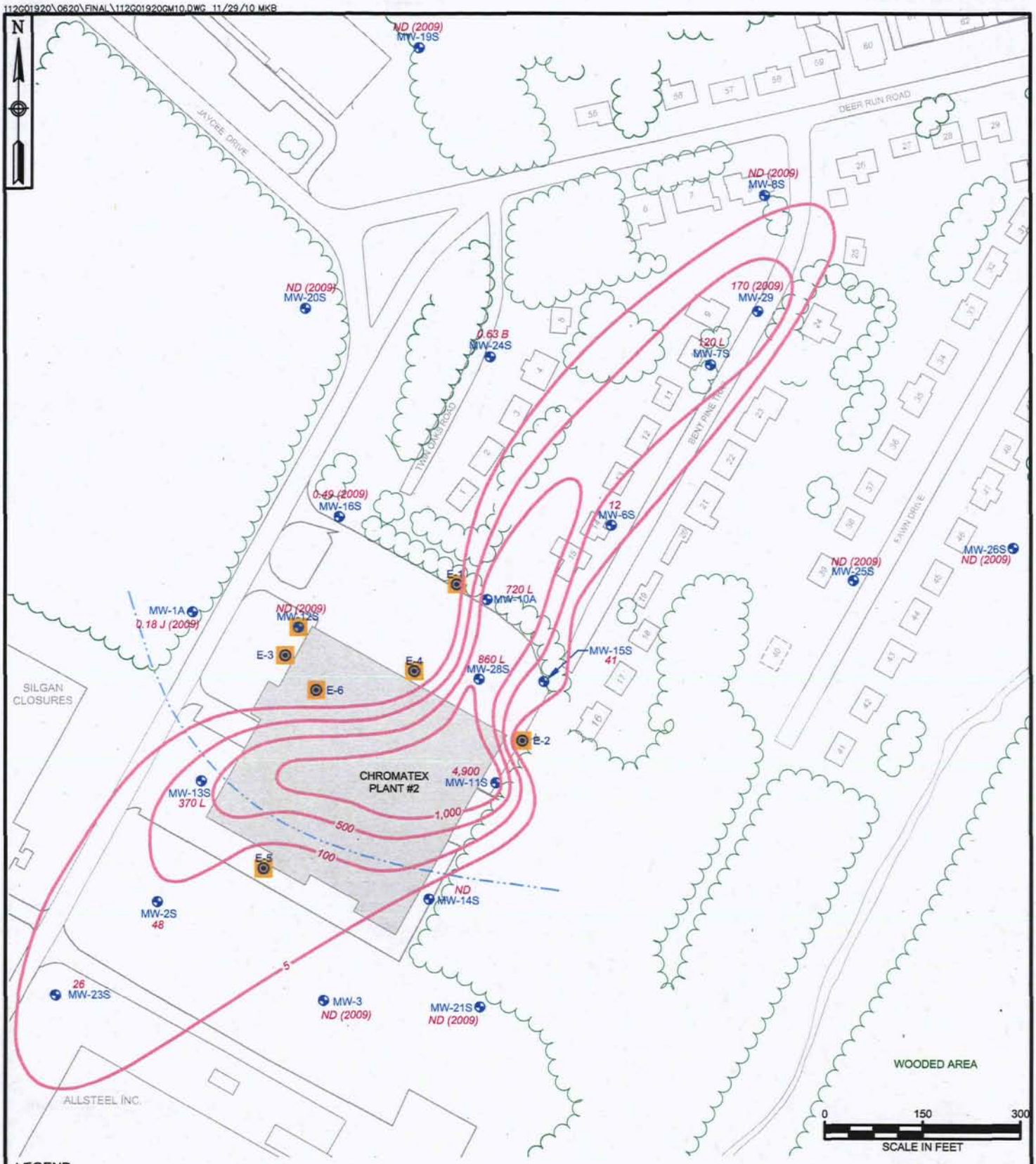

LEGEND

- MONITORING WELL
- INJECTION WELL
- PRESENCE OF PERMANGANATE
- RESIDENTIAL WELL
- 25 RESIDENCE
- GROUNDWATER DIVIDE
- 5 TCE CONCENTRATION (ug/L)
- 170 TCE CONCENTRATION
- ND NON-DETECT
- J,E ANALYTE PRESENT, MAY NOT BE ACCURATE OR PRECISE
- K VALUE MAY BE BIASED HIGH
- B BLANK CONTAMINATION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

APRIL 2010 SHALLOW GROUNDWATER MONITORING RESULTS
VALMONT TCE SITE
HAZLE TOWNSHIP AND WEST HAZLETON BOROUGH
LUZERNE COUNTY, PENNSYLVANIA

SCALE	AS NOTED
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DATE	11/29/10
FILE	112G01920GM10
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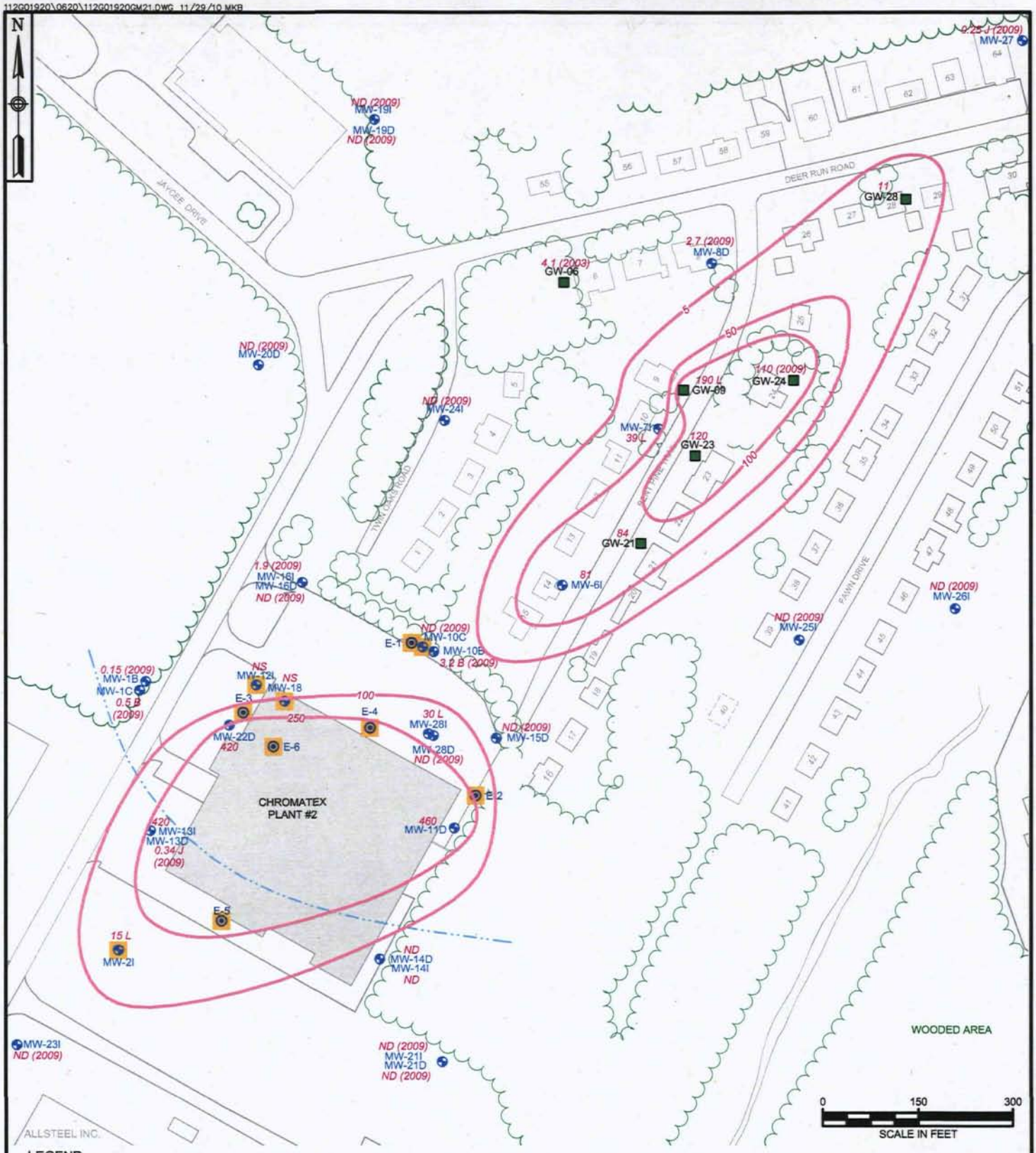
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DEER RUN ROAD
IVY OAK ROAD
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2.7 (2009)
MW-8D
4.1 (2003)
GW-06
ND (2009)
MW-20D
ND (2009)
MW-24I
190 L
GW-09
140 (2009)
GW-24
MW-7I
39 L
120
GW-23
84
GW-21
81
MW-6I
1.9 (2009)
MW-16I
MW-16D
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ND (2009)
MW-10C
E-1
MW-10E
3.2 B (2009)
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MW-25I
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MW-12I
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MW-18
E-3
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E-4
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MW-28I
MW-22D
420
E-6
MW-28D
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ND (2009)
MW-15D
E-2
CHROMATEX
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MW-13D
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MW-21I
MW-21D
ND (2009)
WOODED AREA
ALLSTEEL INC.
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SCALE IN FEET
LEGEND
MONITORING WELL
INJECTION WELL
PRESENCE OF PERMANGANATE
RESIDENTIAL WELL
RESIDENCE
GROUNDWATER DIVIDE
5 TCE CONCENTRATION (ug/L)
170 TCE CONCENTRATION
ND NON-DETECT
J,E ANALYTE PRESENT, MAY NOT BE ACCURATE OR PRECISE
K VALUE MAY BE BIASED HIGH
B BLANK CONTAMINATION
L ANALYTE PRESENT, REPORTED VALUE MAY BE BIASED LOW.
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
APRIL 2010 DEEPER
GROUNDWATER MONITORING RESULTS
VALMONT TCE SITE
HAZLE TOWNSHIP AND
WEST HAZLETON BOROUGH
LUZERNE COUNTY, PENNSYLVANIA
SCALE
AS NOTED
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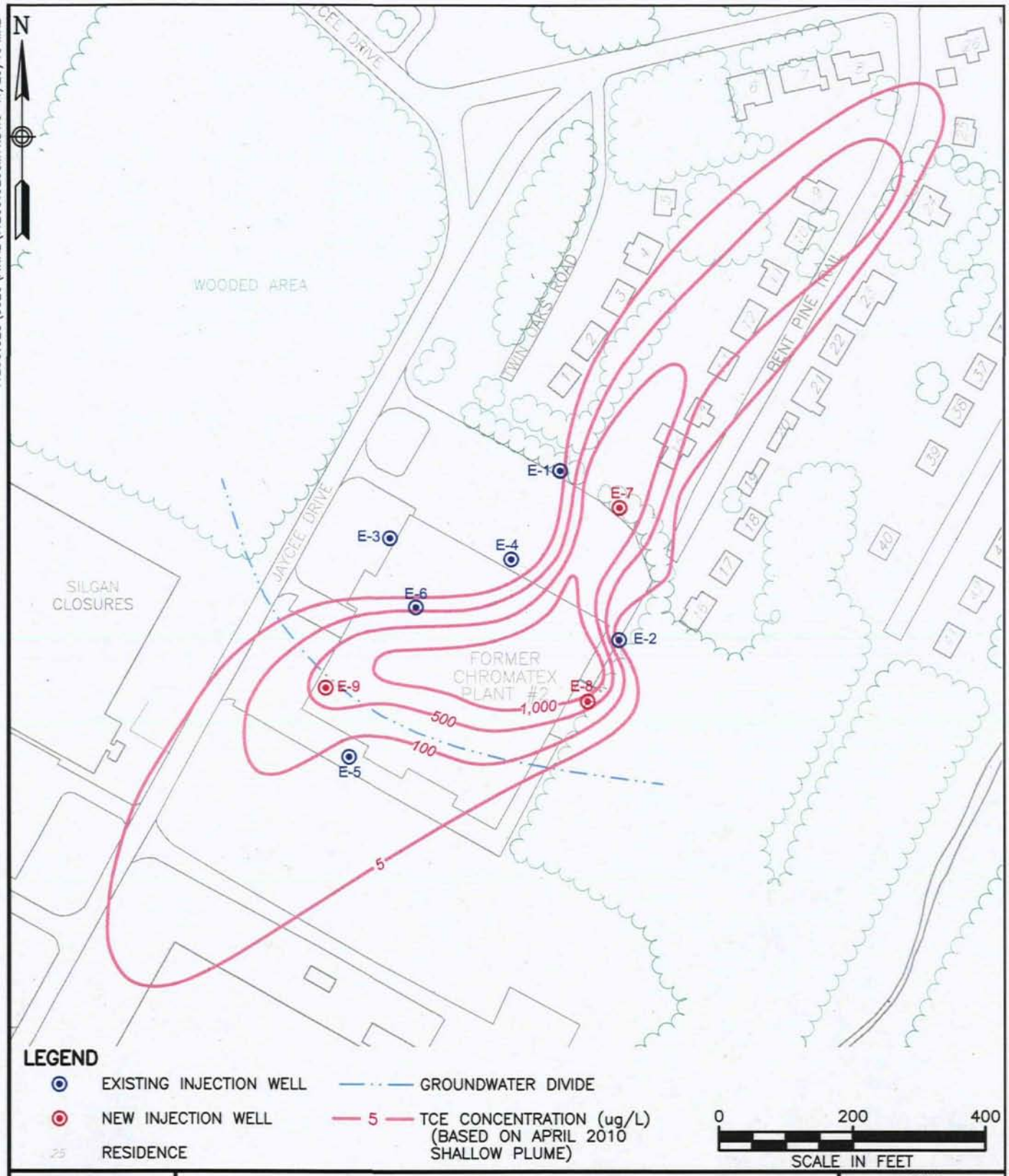

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SITE LAYOUT FOR FULL SCALE ISCO CONCEPT
VALMONT TCE SITE
HAZLE TOWNSHIP AND
WEST HAZLETON BOROUGH
LUZERNE COUNTY, PENNSYLVANIA

SCALE	AS NOTED
FILE	112G01920GM11
REV	0
DATE	11/29/10
FIGURE NUMBER	FIGURE 11

APPENDIX C - Supporting Risk Assessment Tables

TABLE C-1
SUMMARY OF CANCER AND NON-CANCER RISKS - GROUNDWATER
VALMONT TCE SITE
(from 2004 RI)

Exposure	Adult Resident		Child Resident		Construction / Industrial Worker		Lifetime Resident	Comments
	Carcinogenic	Non-Carcinogenic	Carcinogenic	Non-Carcinogenic	Carcinogenic	Non-Carcinogenic	Carcinogenic	
Groundwater Plume								
RME	1.60E-02	1.89E+02	7.30E-03	5.86E+02	1.90E-05	2.92E+00	2.30E-02	RME ICR > E-04; RME HI > 1
CTE	4.30E-03	1.36E+02	1.60E-03	3.53E+02	NA	2.01E-03	6.30E-03	CTE ICR > E-04; CTE HI > 1
Well GW-70 (Private Drinking Water)								
Post-Treatment	3.08E-06	5.18E-01	1.33E-06	1.62E+00	NA	NA	4.40E-06	RME HI > 1
Pre-Treatment	NA	3.09E-01	NA	9.67E-01	NA	NA	NA	
Well GW-71 / RW-1 (Unrestricted Use)								
1987	2.40E-05	1.20E-01	1.30E-05	2.90E-01	1.20E-05	5.41E-02	3.70E-05	
2001	3.60E-06	1.85E-02	1.90E-06	4.34E-02	1.70E-06	8.33E-03	5.50E-06	
Hypothetical Residential Well (Non-Potable Water)								
Lawn Watering	4.50E-07	1.14E-03	3.17E-03	3.19E-03	NA	NA	7.67E-07	
Car Washing	4.80E-07	1.19E-03	3.34E-03	3.34E-03	NA	NA	8.11E-07	

Notes:

NA - Not applicable for this receptor, or not calculated.

RME = Reasonable Maximum Exposure.
ICR = Incremental Cancer Risk.

HI = Hazard Index.
Shading denotes industrial worker instead of construction worker receptor.

TABLE C-2
SUMMARY OF CANCER AND NON-CANCER RISKS - INDOOR AIR
VALMONT TCE SITE
(from 2004 RI)

Residence	Adult Resident		Child Resident		Lifetime Resident	Comments
	Carcinogenic	Non-Carcinogenic	Carcinogenic	Non-Carcinogenic	Carcinogenic	
1	3.80E-04	1.28E+01	2.65E-04	3.66E+01	6.45E-04	RME ICR > E-04; RME HI > 1
2	1.64E-04	1.01E+01	1.14E-04	2.84E+01	2.78E-04	*RME ICR > E-04; RME HI > 1*
3	1.89E-05	2.87E-01	1.27E-05	8.03E-01	3.16E-05	
4	NA	2.40E+00	NA	6.60E+00	5.00E-05	*RME HI > 1*
6	NA	3.00E-01	NA	3.00E-01	2.00E-05	
8	NA	2.00E+00	NA	2.00E+00	2.00E-04	RME ICR > E-04
9	4.20E-04	5.85E+00	3.00E-04	1.68E+01	7.20E-04	RME ICR > E-04; RME HI > 1
10	NA	4.00E+00	NA	7.40E+00	9.00E-05	*RME HI > 1*
13	7.50E-06	3.80E-02	5.30E-06	1.06E-01	1.28E-05	
14	NA	1.00E+00	NA	1.00E+00	3.00E-04	*RME ICR > E-04*
15	NA	5.00E+01	NA	5.00E+01	9.00E-04	RME ICR > E-04; RME HI > 1
16	NA	2.00E+00	NA	2.00E+00	3.00E-05	The residential child HI was not >1 when target organs were considered.
17	NA	8.00E+00	NA	8.00E+00	2.00E-04	*RME ICR > E-04*
21	NA	9.00E+00	NA	2.50E+01	4.20E-05	*RME HI > 1*
22	3.14E-03	5.70E+00	2.23E-03	1.60E+01	5.36E-03	*RME ICR > E-04; RME HI > 1*
23	NA	3.00E-01	NA	3.00E-01	4.00E-04	RME ICR > E-04
24	NA	2.80E+00	NA	8.20E+00	2.00E-04	RME HI > 1
25	NA	1.70E+00	NA	4.80E+00	3.20E-05	*RME HI > 1*
26	NA	2.00E+00	NA	2.00E+00	1.00E-04	*RME ICR > E-04; RME HI > 1*
27	NA	4.00E-01	NA	4.00E-01	7.00E-04	RME ICR > E-04
28	1.64E-04	2.35E+01	1.17E-04	6.58E+01	2.81E-04	RME ICR > E-04; RME HI > 1
34	NA	3.60E+00	NA	1.05E+01	8.00E-05	*RME HI > 1*
35	NA	3.00E-01	NA	3.00E-01	5.00E-05	
36	3.78E-05	1.46E+01	2.69E-05	4.09E+01	6.47E-05	*RME HI > 1*
37	6.38E-04	1.19E+01	4.32E-04	3.30E+01	1.07E-03	RME ICR > E-04; RME HI > 1
38	NA	3.80E+00	NA	1.07E+01	5.00E-05	*RME HI > 1*

TABLE C-2
SUMMARY OF CANCER AND NON-CANCER RISKS - INDOOR AIR
VALMONT TCE SITE
(from 2004 RI)

39	NA	8.90E+00	NA	2.48E+01	4.40E-05	*RME HI > 1*
40	NA	1.60E+00	NA	4.60E+00	2.00E-05	*RME HI > 1*
41	9.40E-05	2.50E+01	6.50E-05	7.05E+01	1.80E-04	*RME ICR > E-04; RME HI > 1*
43	1.70E-06	9.69E-03	1.20E-06	2.71E-02	2.90E-06	
45	NA	1.80E+01	NA	1.80E+01	5.00E-03	*RME ICR > E-04; RME HI > 1*
48	NA	2.00E+00	NA	6.00E+00	7.00E-05	*RME HI >1*
49	NA	6.00E+00	NA	6.00E+00	3.00E-04	*RME ICR > E-04; RME HI > 1*
51	7.33E-05	1.87E+01	5.07E-05	5.24E+01	1.24E-04	*RME ICR > E-04; RME HI > 1*
52	NA	9.00E-01	NA	9.00E-01	1.00E-04	*RME ICR > E-04*
53	9.00E-05	1.12E+01	6.00E-05	3.14E+01	1.50E-04	*RME ICR > E-04; RME HI > 1*
54	NA	5.60E+00	NA	1.60E+01	9.00E-05	*RME HI > 1*
55	NA	2.45E+01	NA	7.00E+01	2.00E-04	*RME ICR > E-04; RME HI > 1*
56	NA	9.00E+00	NA	9.00E+00	4.00E-04	RME ICR > E-04; RME HI > 1
59	NA	6.00E-01	NA	6.00E-01	8.00E-05	
60	NA	2.21E-02	NA	6.18E-02	NA	
70	8.60E-06	1.46E-01	5.80E-06	4.09E-01	1.46E-05	
90	5.30E-06	7.96E-02	3.40E-05	2.23E-01	4.30E-05	Background

Notes:

NA - Not applicable for this receptor, or not calculated.

Based on maximum indoor air detections during any one round, regardless of location (first floor or basement).

RME = Reasonable Maximum Exposure.

ICR = Incremental Cancer Risk.

HI = Hazard Index.

* - Indicates that the risks and hazards for these residences are not believed to be site-related.

Shaded residences were provided air filtration units and/or sump covers by EPA.

TABLE C-3
SUMMARY OF CANCER RISKS – SUB-SLAB VAPOR INTRUSION
VALMONT TCE SITE
(from 2007 EE/CA for Contaminated Indoor Air)

	Receptor:	Lifetime Resident		Child Resident		Adult Resident
Area of Interest	Substance	Cancer Risks (IUR Calculation)	Cancer Risks (SFi Calculation)	Cancer Risks (IUR Calculation)	Cancer Risks (SFi Calculation)	Cancer Risks (IUR and SFi Calc.)
Dwelling No. 02	1,3-Butadiene	3.5E-07	5.2E-07	6.9E-08	2.4E-07	2.8E-07
	Carbon Tetrachloride	5.5E-07	8.2E-07	1.1E-07	3.8E-07	4.4E-07
	Chloroform	1.7E-05	2.6E-05	3.4E-06	1.2E-05	1.4E-05
	Tetrachloroethene	2.6E-07	3.9E-07	5.2E-08	1.8E-07	2.1E-07
	Trichloroethene	4.0E-06	6.0E-06	8.0E-07	2.8E-06	3.2E-06
	Total Cancer Risk:	2.2E-05	3.3E-05	4.4E-06	1.6E-05	1.8E-05
Dwelling No. 05	Total Cancer Risk:	--	--	--	--	--
Dwelling No. 06	Trichloroethene	4.7E-05	7.0E-05	9.4E-06	3.3E-05	3.8E-05
	Total Cancer Risk:	4.7E-05	7.0E-05	9.4E-06	3.3E-05	3.8E-05
Dwelling No. 08	Chloroform	2.2E-05	3.3E-05	4.3E-06	1.5E-05	1.7E-05
	Tetrachloroethene	4.2E-07	6.3E-07	8.5E-08	3.0E-07	3.4E-07
	Trichloroethene	9.9E-04	1.5E-03	2.0E-04	6.9E-04	7.9E-04
	Total Cancer Risk:	1.0E-03	1.5E-03	2.0E-04	7.1E-04	8.1E-04
Dwelling No. 10	Trichloroethene	2.2E-05	3.2E-05	4.3E-06	1.5E-05	1.7E-05
	Total Cancer Risk:	2.2E-05	3.2E-05	4.3E-06	1.5E-05	1.7E-05
Dwelling No. 11	1,3-Butadiene	7.5E-07	1.1E-06	1.5E-07	5.3E-07	6.0E-07
	Chloroform	9.5E-07	1.4E-06	1.9E-07	6.6E-07	7.6E-07
	Total Cancer Risk:	1.7E-06	2.5E-06	3.4E-07	1.2E-06	1.4E-06
Dwelling No. 12	Carbon Tetrachloride	3.9E-06	5.9E-06	7.9E-07	2.8E-06	3.2E-06
	Chloroform	1.7E-04	2.6E-04	3.4E-05	1.2E-04	1.4E-04
	Tetrachloroethene	9.2E-06	1.4E-05	1.8E-06	6.4E-06	7.3E-06
	Trichloroethene	2.3E-01^	3.2E-01^	5.1E-02^	1.6E-01^	1.9E-01^
	Total Cancer Risk:	2.3E-01^	3.2E-01^	5.1E-02^	1.6E-01^	1.9E-01^
Dwelling No. 13	1,3-Butadiene	4.1E-07	6.1E-07	8.1E-08	2.8E-07	3.3E-07
	Chloroform	1.0E-06	1.6E-06	2.1E-07	7.3E-07	8.3E-07

TABLE C-3
SUMMARY OF CANCER RISKS – SUB-SLAB VAPOR INTRUSION
VALMONT TCE SITE
(from 2007 EE/CA for Contaminated Indoor Air)

	Tetrachloroethene	2.8E-07	4.2E-07	5.6E-08	2.0E-07	2.3E-07
	Trichloroethene	1.7E-03	2.5E-03	3.4E-04	1.2E-03	1.4E-03
	Total Cancer Risk:	1.7E-03	2.5E-03	3.4E-04	1.2E-03	1.4E-03
Dwelling No. 14	1,3-Butadiene	3.6E-07	5.4E-07	7.2E-08	2.5E-07	2.9E-07
	Chloroform	6.8E-07	1.0E-06	1.4E-07	4.8E-07	5.4E-07
	Trichloroethene	5.6E-05	8.5E-05	1.1E-05	3.9E-05	4.5E-05
	Total Cancer Risk:	5.7E-05	8.6E-05	1.1E-05	4.0E-05	4.6E-05
Dwelling No. 16	Chloroform	1.2E-06	1.8E-06	2.5E-07	8.6E-07	9.8E-07
	Tetrachloroethene	4.7E-07	7.0E-07	9.4E-08	3.3E-07	3.8E-07
	Trichloroethene	2.4E-04	3.7E-04	4.9E-05	1.7E-04	2.0E-04
	Total Cancer Risk:	2.5E-04	3.7E-04	4.9E-05	1.7E-04	2.0E-04
Dwelling No. 17	1,3-Butadiene	2.5E-06	3.7E-06	4.9E-07	1.7E-06	2.0E-06
	Tetrachloroethene	2.8E-05	4.2E-05	5.6E-06	2.0E-05	2.3E-05
	Total Cancer Risk:	3.1E-05	4.6E-05	6.1E-06	2.1E-05	2.5E-05
Dwelling No. 18	Chloroform	9.1E-07	1.4E-06	1.8E-07	6.4E-07	7.3E-07
	Tetrachloroethene	1.9E-06	2.8E-06	3.7E-07	1.3E-06	1.5E-06
	Total Cancer Risk:	2.8E-06	4.1E-06	5.5E-07	1.9E-06	2.2E-06
Dwelling No. 20*	1,3-Butadiene	1.2E-06	1.7E-06	2.3E-07	8.1E-07	9.3E-07
	Trichloroethene	7.5E-06	1.1E-05	1.5E-06	5.3E-06	6.0E-06
	Total Cancer Risk:	8.7E-06	1.3E-05	1.7E-06	6.1E-06	6.9E-06
Dwelling No. 21	Chloroform	7.4E-06	1.1E-05	1.5E-06	5.2E-06	5.9E-06
	Tetrachloroethene	3.3E-07	4.9E-07	6.6E-08	2.3E-07	2.6E-07
	Trichloroethene	9.4E-06	1.4E-05	1.9E-06	6.6E-06	7.5E-06
	Total Cancer Risk:	1.7E-05	2.6E-05	3.4E-06	1.2E-05	1.4E-05
Dwelling No. 22	1,3-Butadiene	6.8E-07	1.0E-06	1.4E-07	4.7E-07	5.4E-07
	Carbon Tetrachloride	5.8E-07	8.7E-07	1.2E-07	4.1E-07	4.6E-07
	Chloroform	2.1E-06	3.1E-06	4.2E-07	1.5E-06	1.7E-06
	Tetrachloroethene	4.0E-07	6.0E-07	8.0E-08	2.8E-07	3.2E-07
	Trichloroethene	2.1E-05	3.1E-05	4.1E-06	1.4E-05	1.7E-05
	Total Cancer Risk:	2.4E-05	3.7E-05	4.9E-06	1.7E-05	2.0E-05

TABLE C-3
SUMMARY OF CANCER RISKS – SUB-SLAB VAPOR INTRUSION
VALMONT TCE SITE
(from 2007 EE/CA for Contaminated Indoor Air)

Dwelling No. 25	Chloroform	2.0E-06	3.0E-06	4.0E-07	1.4E-06	1.6E-06
	Tetrachloroethene	3.5E-07	5.3E-07	7.0E-08	2.5E-07	2.8E-07
	Trichloroethene	2.1E-03	3.1E-03	4.1E-04	1.4E-03	1.7E-03
	Total Cancer Risk:	2.1E-03	3.1E-03	4.1E-04	1.4E-03	1.7E-03
Dwelling No. 26	1,2-Dichloroethane	1.1E-06	1.6E-06	2.1E-07	7.5E-07	8.5E-07
	1,3-Butadiene	6.0E-07	9.1E-07	1.2E-07	4.2E-07	4.8E-07
	Total Cancer Risk:	1.7E-06	2.5E-06	3.3E-07	1.2E-06	1.3E-06
Dwelling No. 29	Chloroform	1.1E-05	1.7E-05	2.3E-06	7.9E-06	9.1E-06
	Tetrachloroethene	1.4E-06	2.1E-06	2.9E-07	1.0E-06	1.1E-06
	Trichloroethene	2.4E-03	3.7E-03	4.9E-04	1.7E-03	2.0E-03
	Total Cancer Risk:	2.5E-03	3.7E-03	4.9E-04	1.7E-03	2.0E-03
Dwelling No. 33	1,3-Butadiene	3.9E-07	5.9E-07	7.9E-08	2.8E-07	3.2E-07
	Chloroform	3.2E-05	4.8E-05	6.4E-06	2.2E-05	2.6E-05
	Tetrachloroethene	8.5E-07	1.3E-06	1.7E-07	5.9E-07	6.8E-07
	Trichloroethene	1.9E-03	2.8E-03	3.8E-04	1.3E-03	1.5E-03
	Total Cancer Risk:	1.9E-03	2.9E-03	3.8E-04	1.3E-03	1.5E-03
Dwelling No. 34	1,2-Dichloroethane	1.3E-06	1.9E-06	2.6E-07	9.0E-07	1.0E-06
	Chloroform	7.2E-07	1.1E-06	1.4E-07	5.0E-07	5.7E-07
	Tetrachloroethene	4.7E-05	7.0E-05	9.4E-06	3.3E-05	3.8E-05
	Trichloroethene	8.0E-04	1.2E-03	1.6E-04	5.6E-04	6.4E-04
	Total Cancer Risk:	8.5E-04	1.3E-03	1.7E-04	5.9E-04	6.8E-04
Dwelling No. 36	1,3-Butadiene	1.8E-06	2.8E-06	3.7E-07	1.3E-06	1.5E-06
	Total Cancer Risk:	1.8E-06	2.8E-06	3.7E-07	1.3E-06	1.5E-06
Dwelling No. 37	1,3-Butadiene	3.8E-07	5.7E-07	7.6E-08	2.7E-07	3.1E-07
	Total Cancer Risk:	3.8E-07	5.7E-07	7.6E-08	2.7E-07	3.1E-07
Dwelling No. 49	1,3-Butadiene	4.3E-07	6.5E-07	8.6E-08	3.0E-07	3.5E-07
	Total Cancer Risk:	4.3E-07	6.5E-07	8.6E-08	3.0E-07	3.5E-07
Dwelling No. 52	Tetrachloroethene	1.5E-06	2.2E-06	3.0E-07	1.0E-06	1.2E-06
	Trichloroethene	4.7E-06	7.0E-06	9.4E-07	3.3E-06	3.8E-06
	Total Cancer Risk:	6.2E-06	9.3E-06	1.2E-06	4.3E-06	4.9E-06

TABLE C-3
SUMMARY OF CANCER RISKS – SUB-SLAB VAPOR INTRUSION
VALMONT TCE SITE
(from 2007 EE/CA for Contaminated Indoor Air)

Dwelling No. 54	Tetrachloroethene	4.2E-07	6.3E-07	8.5E-08	3.0E-07	3.4E-07
	Total Cancer Risk:	4.2E-07	6.3E-07	8.5E-08	3.0E-07	3.4E-07
Dwelling No. 59	Chloroform	2.2E-06	3.3E-06	4.3E-07	1.5E-06	1.7E-06
	Trichloroethene	8.9E-06	1.3E-05	1.8E-06	6.2E-06	7.1E-06
	Total Cancer Risk:	1.1E-05	1.7E-05	2.2E-06	7.8E-06	8.9E-06
Dwelling No. 60	1,3-Butadiene	3.9E-07	5.9E-07	7.9E-08	2.8E-07	3.2E-07
	Chloroform	1.3E-05	2.0E-05	2.6E-06	9.3E-06	1.1E-05
	Tetrachloroethene	1.1E-06	1.6E-06	2.1E-07	7.4E-07	8.5E-07
	Trichloroethene	9.4E-03	1.4E-02^	1.9E-03	6.6E-03	7.5E-03
	Total Cancer Risk:	9.4E-03	1.4E-02^	1.9E-03	6.6E-03	7.5E-03

Values in the row for Total of Cancer Risk display cancer risks for indoor air inhalation from sub-slab vapor intrusion for associated compounds.

A DASH indicates that there were no cancer risks for this dwelling.

^ - Cancer risk exceeds 0.01 and corrected value is shown based on formula cancer risk = 1 - exp(-carcinogenic risk)

* Note that Dwelling No. 20 risks were based on soil gas, since a mobile home was located on this property.

TABLE C-4
SUMMARY OF NONCANCER RISKS – SUB-SLAB VAPOR INTRUSTION
VALMONT TCE SITE
(from 2007 EE/CA for Contaminated Indoor Air)

	Child Resident (RfC Calculation)	Child Resident (RfDi Calculation)	Adult Resident (RfC and RfDi Calculation)
Area of Interest	Individual HQ	Individual HQ	Individual HQ
Dwelling No. 02	5.98E-02	2.1E-01	5.98E-02
Dwelling No. 05	2.15E-03	7.6E-03	2.15E-03
Dwelling No. 06	3.75E-02	1.3E-01	3.75E-02
Dwelling No. 08	6.46E-01	2.2E+00	6.46E-01
Dwelling No. 10	3.07E-02	1.1E-01	3.07E-02
Dwelling No. 11	4.02E-02	1.4E-01	4.02E-02
Dwelling No. 12	1.51E+02	5.3E+02	1.51E+02
Dwelling No. 13	1.02E+00	3.6E+00	1.02E+00
Dwelling No. 14	5.50E-02	2.0E-01	5.50E-02
Dwelling No. 16	3.07E-01	1.1E+00	3.07E-01
Dwelling No. 17	1.71E-01	6.1E-01	1.71E-01
Dwelling No. 18	5.52E-02	2.0E-01	5.52E-02
Dwelling No. 20	5.59E-02	2.0E-01	5.59E-02
Dwelling No. 21	3.08E-02	1.1E-01	3.08E-02
Dwelling No. 22	5.52E-02	1.9E-01	5.52E-02
Dwelling No. 25	1.22E+00	4.3E+00	1.22E+00
Dwelling No. 26	3.52E-02	1.2E-01	3.52E-02
Dwelling No. 29	1.44E+00	5.1E+00	1.44E+00
Dwelling No. 33	1.19E+00	4.1E+00	1.19E+00
Dwelling No. 34	6.10E-01	2.1E+00	6.10E-01
Dwelling No. 36	8.27E-02	2.9E-01	8.27E-02
Dwelling No. 37	2.56E-02	8.9E-02	2.56E-02
Dwelling No. 49	2.75E-02	9.6E-02	2.75E-02
Dwelling No. 52	1.22E-02	4.3E-02	1.22E-02
Dwelling No. 54	1.44E-02	5.2E-02	1.44E-02

TABLE C-4
SUMMARY OF NONCANCER RISKS – SUB-SLAB VAPOR INTRUSTION
VALMONT TCE SITE
(from 2007 EE/CA for Contaminated Indoor Air)

Dwelling No. 59	2.17E-02	7.5E-02	2.17E-02
Dwelling No. 60	5.60E+00	1.9E+01	5.60E+00

TABLE C-5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GROUNDWATER PLUME
VALMONT TCE SITE, LUZERNE COUNTY, PENNSYLVANIA

Scenario Timeframe: Future
Medium:
Groundwater
Exposure Medium:
Groundwater
Exposure Point: Tap Water Contact with Groundwater

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	ug/L	686	1850	17400		ug/L	1850	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2	1850	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2
Antimony	ug/L	17	26.1	5.4		ug/L	5.4	Max	Max<97.5%UCL-Cheby	5.4	Max	Max<97.5%UCL-Cheby
Arsenic	ug/L	5.03	6.46	13.4	J	ug/L	6.46	95%UCL-Cheby	Wt>Wno&Wlg,0.5<=lgsd	6.46	95%UCL-Cheby	Wt>Wno&Wlg,0.5<=lgsd
Barium	ug/L	64.1	79.7	552		ug/L	79.7	95%UCL-H	lgsd<1.0	79.7	95%UCL-H	lgsd<1.0
Chromium	ug/L	14.5	30.8	124		ug/L	30.8	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2	30.8	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2
Iron	ug/L	3130	7370	39500		ug/L	7370	95%UCL-H	1.5<=lgsd<2,N>49	7370	95%UCL-H	1.5<=lgsd<2,N>49
Lead	ug/L	3.91	4.6	28		ug/L	3.91	Mean-N	IEUBK Uses AVG	3.91	Mean-N	IEUBK Uses AVG
Manganese	ug/L	182	323	1260		ug/L	323	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2	323	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2
Nickel	ug/L	12	19.2	135		ug/L	19.2	95%UCL-Cheby	Wt>Wno&Wlg,0.5<=lgsd	19.2	95%UCL-Cheby	Wt>Wno&Wlg,0.5<=lgsd
Thallium	ug/L	7.47	11	3.4		ug/L	3.4	Max	Max<97.5%UCL-Cheby	3.4	Max	Max<97.5%UCL-Cheby
Vanadium	ug/L	12.8	20.7	64.4		ug/L	20.7	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2	20.7	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2

TABLE C-5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GROUNDWATER PLUME
VALMONT TCE SITE, LUZERNE COUNTY, PENNSYLVANIA

Scenario Timeframe: Future
Medium:
Groundwater
Exposure Medium:
Groundwater
Exposure Point: Tap Water Contact with Groundwater

4-Methylphenol	ug/L	3.81	4.24	27		ug/L	4.24	95%UCL-N	lgsd<0.5,use normal	4.24	95%UCL-N	lgsd<0.5,use normal
Benz(a)anthracene	ug/L	3.55	3.77	1.2	J	ug/L	1.2	Max	Max<95%UCL-N	1.2	Max	Max<95%UCL-N
Benzo(a)pyrene	ug/L	3.56	3.78	1.8	J	ug/L	1.8	Max	Max<95%UCL-N	1.8	Max	Max<95%UCL-N
Benzo(b)fluoranthene	ug/L	3.56	3.78	2.3	J	ug/L	2.3	Max	Max<95%UCL-N	2.3	Max	Max<95%UCL-N
Benzo(k)fluoranthene	ug/L	3.56	3.77	1.7	J	ug/L	1.7	Max	Max<95%UCL-N	1.7	Max	Max<95%UCL-N
Bis(2-ethylhexyl) Phthalate	ug/L	5.43	12.8	110		ug/L	12.8	95%UCL-Cheby	Wt>Wno&Wlg,0.5<=lgsd	12.8	95%UCL-Cheby	Wt>Wno&Wlg,0.5<=lgsd
Indeno(1,2,3-cd)pyrene	ug/L	3.56	3.77	1.7	J	ug/L	1.7	Max	Max<95%UCL-N	1.7	Max	Max<95%UCL-N
Naphthalene	ug/L	3.48	3.7	1	J	ug/L	1	Max	Max<95%UCL-N	1	Max	Max<95%UCL-N
Perfluorooctanoic Acid (pfoa)	ug/L	0.21	0.346	0.78		ug/L	0.346	95%UCL-H	lgsd<1.0	0.346	95%UCL-H	lgsd<1.0
Perfluorooctanyl Sulfonate (pfos)	ug/L	0.219	0.457	0.77		ug/L	0.457	95%UCL-Cheby	Wt>Wno&Wlg,0.5<=lgsd	0.457	95%UCL-Cheby	Wt>Wno&Wlg,0.5<=lgsd
1,1,1-Trichloroethane	ug/L	20.4	63.8	560		ug/L	63.8	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2	63.8	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2
1,1,2,2-Tetrachloroethane	ug/L	2.98	5.89	0.062	J	ug/L	0.062	Max	Max<97.5%UCL-Cheby	0.062	Max	Max<97.5%UCL-Cheby
1,1,2-Trichloroethane	ug/L	2.95	5.86	1.3		ug/L	1.3	Max	Max<97.5%UCL-Cheby	1.3	Max	Max<97.5%UCL-Cheby
1,1-Dichloroethene	ug/L	4.37	9.78	56		ug/L	9.78	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2	9.78	97.5%UCL-Cheby	Wt>Wno&Wlg,1<=lgsd<2
1,2-Dichloroethene (cis)	ug/L	11.3	37.3	150		ug/L	37.3	99%UCL-Cheby	Wt>Wno&Wlg,2<=lgsd<3	37.3	99%UCL-Cheby	Wt>Wno&Wlg,2<=lgsd<3
1,4-Dioxane	ug/L	5.49	8.65	16		ug/L	8.65	95%UCL-H	lgsd<1.0	8.65	95%UCL-H	lgsd<1.0
Benzene	ug/L	2.98	5.89	0.8		ug/L	0.8	Max	Max<97.5%UCL-Cheby	0.8	Max	Max<97.5%UCL-Cheby
Carbon Tetrachloride	ug/L	3.63	8.36	62		ug/	8.36	97.5%UCL-	Wt>Wno&Wlg,1	8.36	97.5%UCL-	Wt>Wno&Wlg,1

TABLE C-5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - GROUNDWATER PLUME
VALMONT TCE SITE, LUZERNE COUNTY, PENNSYLVANIA

Scenario Timeframe: Future
Medium:
Groundwater
Exposure Medium:
Groundwater
Exposure Point: Tap Water Contact with Groundwater

						L		Cheby	<=lgsd<2		Cheby	<=lgsd<2
Chloroform	ug/L	3.85	7.68	1.7		ug/L	1.7	Max	Max<97.5%UCL-Cheby	1.7	Max	Max<97.5%UCL-Cheby
cis-1,3-Dichloropropene	ug/L	4.74	5.65	1.1	J	ug/L	1.1	Max	Max<95%UCL-Cheby	1.1	Max	Max<95%UCL-Cheby
Methyl Tert-butyl Ether (mtbe)	ug/L	2.96	5.86	4	J	ug/L	4	Max	Max<97.5%UCL-Cheby	4	Max	Max<97.5%UCL-Cheby
Methylene Chloride	ug/L	4.64	6.23	4.4		ug/L	4.4	Max	Max<95%UCL-Cheby	4.4	Max	Max<95%UCL-Cheby
Tetrachloroethene	ug/L	3.09	6.18	11		ug/L	6.18	97.5%UCL-Cheby	Wt>Wno&Wlg,1 <=lgsd<2	6.18	97.5%UCL-Cheby	Wt>Wno&Wlg,1 <=lgsd<2
Trichloroethene	ug/L	441	1850	8800		ug/L	1850	99%UCL-Cheby	Wt>Wno&Wlg,2 <=lgsd<3	1850	99%UCL-Cheby	Wt>Wno&Wlg,2 <=lgsd<3
Vinyl Chloride	ug/L	3.07	5.99	7.2		ug/L	5.99	97.5%UCL-Cheby	Wt>Wno&Wlg,1 <=lgsd<2	5.99	97.5%UCL-Cheby	Wt>Wno&Wlg,1 <=lgsd<2

Data on this table represent well water samples collected in untreated form.

Statistics: Maximum Detected Value (Max)
Rationale: Maximum value of all field sampling rounds
-- - Statistical UCL (t, H-, chebychev) does not apply.

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APPENDIX D – Applicable or Relevant and Appropriate Requirements

TABLE D-1
PROPOSED ARARs AND TBCs
VALMONT TCE SITE

ARAR	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARAR in the context of the Remedial Action Alternatives
1. Safe Drinking Water Act: Maximum Contaminant Levels (MCLs)	Federal: 40 CFR 141 (including 141.61-.62) State: 25 Pa. Code Chapter 109	Relevant and Appropriate	Under the Federal Safe Drinking Water Act, MCLs are enforceable standards for public drinking water supply systems which have at least 15 service connections or are used by at least 25 persons. MCLs are relevant and appropriate requirements for groundwater cleanup. Substantive provisions of State Safe Drinking Water Act may apply to extent more stringent or additional scope.	Groundwater at the Site is a potential future source of drinking water; therefore, the drinking water MCLs for contaminants of concern (COCs) are to be met in the groundwater plume. The MCLs for COCs at the Site are: Vinyl chloride: 2 ug/l TCE: 5 ug/l 1,1,1-TCA: 200 ug/l (cis)1,2-DCE: 70 ug/l
2. Underground Injection Control Program	40 CFR Part 144 and 146	Applicable	Establishes classes of injection wells and establishes requirements for the Underground Injection Control Program.	The applicable, substantive portions of these regulations apply to the in-situ portion of the remedy, which requires injection of an oxidant into the aquifer.
3. Water Well Drillers License Act	17 Pa. Code Chapter 47	Applicable	Establishes regulations relating to water supply and water monitoring wells.	Substantive provisions may apply to any new wells installed as part of the remedy.
4. Act 2 The Land Recycling and Environmental Remediation	25 Pa. Code Chapter 250.304 and 250.704	To be considered	Contains health standards for COCs and attainment requirements.	Act 2 standards will be considered to the extent there are

Standards Act.				substantive requirements more stringent than federal requirements.

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APPENDIX E – Supporting Cost Documentation

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 1: NO ACTION
ANNUAL COSTS

Item	Cost per Year Year 1	Cost per Year Years 2 & 3	Cost per Year Years 4 thru 30	Item Cost per 5 Years	Notes
Site Review	$0	$0	$0	$48,000	Review of documents and data evaluation/recommendations, preparation of summary reports for 5-year CERCLA reviews.
TOTALS	$0	$0	$0	$48,000	

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 1: NO ACTION
PRESENT WORTH ANALYSIS

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$0	$0	$0	1.000	$0
1		$0	$0	0.935	$0
2		$0	$0	0.873	$0
3		$0	$0	0.816	$0
4		$0	$0	0.763	$0
5		$48,000	$48,000	0.713	$34,224
6		$0	$0	0.666	$0
7		$0	$0	0.623	$0
8		$0	$0	0.582	$0
9		$0	$0	0.544	$0
10		$48,000	$48,000	0.508	$24,384
11		$0	$0	0.475	$0
12		$0	$0	0.444	$0
13		$0	$0	0.415	$0
14		$0	$0	0.388	$0
15		$48,000	$48,000	0.362	$17,376
16		$0	$0	0.339	$0
17		$0	$0	0.317	$0
18		$0	$0	0.296	$0
19		$0	$0	0.277	$0
20		$48,000	$48,000	0.258	$12,384
21		$0	$0	0.242	$0
22		$0	$0	0.226	$0
23		$0	$0	0.211	$0
24		$0	$0	0.197	$0
25		$48,000	$48,000	0.184	$8,832
26		$0	$0	0.172	$0
27		$0	$0	0.161	$0
28		$0	$0	0.150	$0
29		$0	$0	0.141	$0
30		$48,000	$48,000	0.131	$6,288
				TOTAL PRESENT WORTH	**$103,488**

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 2: LIMITED ACTIONS
CAPITAL COSTS

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Total Cost Subcontract	Total Cost Material	Total Cost Labor	Total Cost Equipment	Total Direct Cost
1 PROJECT DOCUMENTS/INSTITUTIONAL CONTROLS											
1.1 Prepare Sampling Plan	100	hr			$35.00		$0	$0	$3,500	$0	$3,500
1.2 Prepare Institutional Controls	200	hr			$35.00		$0	$0	$7,000	$0	$7,000
Subtotal							$0	$0	$10,500	$0	$10,500
Local Area Adjustments							100.0%	90.7%	106.6%	106.6%	
Subtotal							$0	$0	$11,193	$0	$11,193
Overhead on Labor Cost @ 60%									$6,716		$6,716
G & A on Labor Cost @ 10%									$1,119		$1,119
G & A on Material Cost @ 10%								$0			$0
G & A on Subcontract Cost @ 10%							$0				$0
Total Direct Cost							$0	$0	$19,028	$0	$19,028
Indirects on Total Direct Cost @ 30%											$951
Profit on Total Direct Cost @ 10%											$1,903
Subtotal 3											$21,882
Health & Safety Monitoring @ 0%											$0
Total Field Cost											$21,882
Contingency on Total Field Cost @ 20%											$4,376
Engineering on Total Field Cost @ 0%											$0
TOTAL COST											**$26,259**

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 2: LIMITED ACTIONS
ANNUAL COSTS

Item	Cost per Year Year 1	Cost per Year Years 2 & 3	Cost per Year Years 4 thru 30	Item Cost per 5 Years	Notes
Sampling	$27,920	$13,960	$6,980	$0	Collect groundwater samples, 20 wells
Analysis/Water	$12,000	$6,000	$3,000	$0	Water samples, 20 wells (including lab and in-house QA) for selected VOCs.
	$2,000	$1,000	$500	$0	Water samples, 10 wells (including lab and in-house QA) for selected metals.
Sampling	$0	$0	$0	$8,550	Collect indoor air samples at 17 homes (8 homes with current suction systems, plus up to 9 homes without suction systems)
Inspect Subslab Suction Systems	$2,240	$2,240	$2,240	$0	8 hours per inspection, annually, for 8 homes with current suction systems
Analysis/Air	$0	$0	$0	$3,000	Air samples at 17 homes plus lab & in-house QA for selected VOCs (total of 20 samples)
Report	$10,800	$5,400	$2,700	$2,700	Document sampling events and results
Site Review	$0	$0	0%	$48,000	Review of documents and data evaluation/recommendations, preparation of summary reports for 5-year CERCLA reviews.
TOTALS	$54,960	$28,600	$15,420	$62,250	

Year 1 - Well sampling and analysis quarterly

Years 2 & 3 - Well sampling and analysis semi-annually

Years 4 through 30 - Well sampling and analysis annually

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 2:. LIMITED ACTIONS
PRESENT WORTH ANALYSIS

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$26,259		$26,259	1.000	$26,259
1		$54,960	$54,960	0.935	$51,388
2		$28,600	$28,600	0.873	$24,968
3		$28,600	$28,600	0.816	$23,338
4		$15,420	$15,420	0.763	$11,765
5		$77,670	$77,670	0.713	$55,379
6		$15,420	$15,420	0.666	$10,270
7		$15,420	$15,420	0.623	$9,607
8		$15,420	$15,420	0.582	$8,974
9		$15,420	$15,420	0.544	$8,388
10		$77,670	$77,670	0.508	$39,456
11		$15,420	$15,420	0.475	$7,325
12		$15,420	$15,420	0.444	$6,846
13		$15,420	$15,420	0.415	$6,399
14		$15,420	$15,420	0.388	$5,983
15		$77,670	$77,670	0.362	$28,117
16		$15,420	$15,420	0.339	$5,227
17		$15,420	$15,420	0.317	$4,888
18		$15,420	$15,420	0.296	$4,564
19		$15,420	$15,420	0.277	$4,271
20		$77,670	$77,670	0.258	$20,039
21		$15,420	$15,420	0.242	$3,732
22		$15,420	$15,420	0.226	$3,485
23		$15,420	$15,420	0.211	$3,254
24		$15,420	$15,420	0.197	$3,038
25		$77,670	$77,670	0.184	$14,291
26		$15,420	$15,420	0.172	$2,652
27		$15,420	$15,420	0.161	$2,483
28		$15,420	$15,420	0.150	$2,313
29		$15,420	$15,420	0.141	$2,174
30		$77,670	$77,670	0.131	$10,175
				TOTAL PRESENT WORTH	**$411,047**

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 3: GROUNDWATER EXTRACTION, TREATMENT, AND DISCHARGE
CAPITAL COSTS

Item	Quantity	Unit	Unit Cost				Extended Cost				
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Sampling Plan	100	hr			$30.00		$0	$0	$3,000	$0	$3,000
1.2 Institutional Controls	200	hr			$30.00		$0	$0	$6,000	$0	$6,000
2 MOBILIZATION/DEMOBILIZATION AND FIELD SUPPORT											
2.1 Office Trailer(1 each)	4	mo		$350.00			$0	$1,400	$0	$0	$1,400
2.2 Storage Trailer (1 each)	4	mo		$200.00			$0	$800	$0	$0	$800
2.3 Temporary Site Utilities	4	mo	$1,000.00				$4,000	$0	$0	$0	$4,000
2.4 Professional Oversight (2p*4 mo)	32	mwk			$3,000.00	$500.00	$0	$0	$96,000	$16,000	$112,000
2.5 Survey 2 New Wells	1	ls	$1,500.00				1500	$0	$0	$0	$1,500
3 DECONTAMINATION											
3.1 TemporaryEquipment Decon Pad	1	ls	$350.00	$150.00		$350.00	$350	$150	$0	$350	$850
3.2 Decontamination Services	2	wk		$105.00	$900.00	$315.00	$0	$210	$1,800	$630	$2,640
3.3 Decon Water	660	gal		$0.20			$0	$132	$0	$0	$132
3.4 Water Storage Tank, 1,500 gallon	1	ea		$1,500.00			$0	$1,500	$0	$0	$1,500
3.5 Management and Disposal of Drill Cuttings	12	cy	$225.00				$2,700	$0	$0	$0	$2,700
3.6 Management and Disposal of Liquid Wastes	3,000	gal	$0.55				$1,650	$0	$0	$0	$1,650
4 GROUNDWATER EXTRACTION SYSTEM											
4.1 Drill Rig Mobilization/Demobilization	1	ls	$5,000.00				$5,000	$0	$0	$0	$5,000
4.2 Drill 8" boreholes using air rotary method (2 wells), 120' each	240	lf	$22.00				$5,280	$0	$0	$0	$5,280
4.3 Drill 12" boreholes usign air rotary method (2 wells), 20' each	40	lf	$42.00				$1,680	$0	$0	$0	$1,680
4.4 Hydrofracturing (hydraulic), shallow (80') and deeper (100') depths	2	well	$2,700.00		$240.00		$5,400	$0	$480	$0	$5,880
4.5 Borehole logging with traditional and source tools (2 wells)	16	hr	$325.00		$35.00		$5,200	$0	$560	$0	$5,760
4.6 Borehole logging reporting	1	ls	$2,000.00				$2,000	$0	$0	$0	$2,000
4.7 Packer testing	14	hr	$350.00				$4,900	$0	$0	$0	$4,900
4.8 Well Development, 4 hrs per well	8	hr	$315.00		$35.00		$2,520	$0	$280	$0	$2,800
4.9 Casing, 20' Steel Casing, 2 wells	40	lf	$26.00		$30.00		$1,040	$0	$1,200	$0	$2,240
4.10 Well Pump, 1.5 gpm, 56', 0.5 HP, Submersible	9	ea		$1,828.00			$0	$16,452	$0	$0	$16,452
4.11 Well Vault	9	ea		$2,000.00			$0	$18,000	$0	$0	$18,000
4.12 Extraction Piping, 2" PVC, Buried	3,900	lf		$1.07	$1.02		$0	$4,173	$3,978	$0	$8,151
4.13 Trench w/backfill (2' wide by 4' deep)	3,900	lf			$3.17	$1.34	$0	$0	$12,363	$5,226	$17,589
4.14 Pipe Bedding	3900	sf		$0.64	$0.55	$0.50	$0	$2,496	$2,145	$1,950	$6,591
5 GROUNDWATER TREATMENT SYSTEM											
5.1 Building Foundation, 20' x 20'	400	sf	$5.50				$2,200	$0	$0	$0	$2,200
5.2 Treatment System Building, 20' x 20' x 18' High	1	ls	$6,000.00				$6,000	$0	$0	$0	$6,000
5.3 Building Misc. (doors/vents/insulation/lights,etc.)	1	ea	$2,500.00				$2,500	$0	$0	$0	$2,500
5.4 Feed Tank, 350 gal, steel	1	ea		$1,125.00	$212.00		$0	$1,125	$212	$0	$1,337
5.5 Feed Pump, 10 gpm, 1/2 HP, Centrifugal	1	ea		$692.67	$224.06		$0	$693	$224	$0	$917
5.6 Air Stripper, Tray Type, 4 Trays, 220 scfm Blower, 5 HP	1	ea		$9,586.00			$0	$9,586	$0	$0	$9,586
5.7 Floor Sumps and Weir, 3' x 5' x 3' Deep	1	ea		$795.00	$1,005.00	$770.00	$0	$795	$1,005	$770	$2,570
5.8 Vapor Phase GAC, 2,000 cfm/2,000 lb. Unit	2	ea		$5,500.00	$556.00		$0	$11,000	$1,112	$0	$12,112
5.9 GAC Feed Heater, 500 watt	1	ls		$1,240.00			$0	$1,240	$0	$0	$1,240
5.10 Instruments and Controls, Electrify System, Plumbing	1	ls		$12,000.00	$11,000.00		$0	$12,000	$11,000	$0	$23,000
6 DISCHARGE TO SANITARY SEWER											
6.1 Discharge Piping, 4" PVC, buried	500	lf		$3.70	$1.87		$0	$1,850	$935	$0	$2,785
6.2 Trench w/backfill (2' wide by 4' deep)	500	lf			$3.17	$1.34	$0	$0	$1,585	$670	$2,255
6.3 Pipe Bedding	500	lf		$0.64	$0.55	$0.50	$0	$320	$275	$250	$845
7 SITE RESTORATION											
7.1 Vegetate Disturbed Areas	1	ls		$250.00	$400.00		$0	$250	$400	$0	$650
7.2 Road Repair	500	sy		$10.40	$24.00	$1.96	$0	$5,200	$12,000	$980	$18,180
Subtotal							$53,920	$89,372	$156,554	$26,826	$326,672
Local Area Adjustments							100.0%	90.7%	106.6%	106.6%	

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 3: GROUNDWATER EXTRACTION, TREATMENT, AND DISCHARGE
CAPITAL COSTS

Item	Quantity	Unit	Unit Cost				Extended Cost				
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	Subtotal
Subtotal							$53,920	$81,060	$166,887	$28,597	$330,463
Overhead on Labor Cost @ 50%									$83,443		$83,443
G & A on Labor Cost @ 10%									$16,689		$16,689
G & A on Material Cost @ 10%								$8,106			$8,106
G & A on Subcontract Cost @ 10%							$5,392				$5,392
Total Direct Cost							$59,312	$89,166	$267,019	$28,597	$444,093
Indirects on Total Direct Cost @ 30%											$133,228
Profit on Total Direct Cost @ 10%											$44,409
Subtotal											$621,731
Health & Safety Monitoring @ 2%											$12,435
Total Field Cost											$634,165
Contingency on Total Field Cost @ 20%											$126,833
Engineering on Total Field Cost @ 20%											$126,833
TOTAL COST											**$887,831**

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 3: GROUNDWATER EXTRACTION, TREATMENT, AND DISCHARGE
OPERATION AND MAINTENANCE COSTS PER YEAR

	Item	Qty	Unit	Unit Cost	Subtotal Cost	Notes
1	Energy - Electric	52,259	kWh	$0.06	$3,136	
2	Maintenance	1	ls	$9,424.99	$9,425	5% of Installation Cost
3	GAC Inlet Sampling	12	ea	$105	$1,260	VOCs, monthly
4	GAC Outlet Sampling	12	ea	$105	$350	VOCs, monthly
5	Stripper Feed Sampling	12	ea	$125	$200	VOCs, Fe, monthly
6	Stripper Effluent Sampling	12	ea	$145	$1,740	VOCs, Fe, TSS monthly
7	Operating Labor	1040	hr	$45.00	$46,800	20 hr per week
8	POTW Charge	3,942,000	gal	$0.005	$19,710	10,800 gallons per day
9	Replace spent GAC	4000	lb	$3.00	$12,000	Replace GAC twice per year
	Subtotal Cost for One Year Operation				$94,621	

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 3: GROUNDWATER EXTRACTION, TREATMENT, AND DISCHARGE
ANNUAL COSTS

Item	Cost per Year Year 1	Cost per Year Years 2 & 3	Cost per Year Years 4 thru 20	Item Cost per 5 Years	Notes
Sampling	$27,920	$13,960	$6,980		Collect groundwater samples, 20 wells
Analysis/Water	$12,000	$6,000	$3,000		Water samples, 20 wells (including lab and in-house QA) for TCL VOCs
Sampling	$0	$0	$0	$8,550	Collect indoor air samples at 17 homes (8 homes with current suction systems, plus up to 9 homes without suction systems)
Inspect Subslab Suction Systems	$2,240	$2,240	$2,240	$0	8 hours per inspection, annually, for 8 homes with current suction systems
Analysis/Air	$0	$0	$0	$3,000	Air samples at 17 homes plus lab & in-house QA for selected VOCs (total of 20 samples)
Report	$10,800	$5,400	$2,700	$2,700	Document sampling events and results
Site Review	$0	$0	$0	$48,000	Review of documents and data evaluation/recommendations, preparation of summary reports for 5-year CERCLA reviews.
TOTALS	$52,960	$27,600	$14,920	$62,250	

Year 1 - Well sampling and analysis quarterly

Years 2 & 3 - Well sampling and analysis semi-annually

Years 4 through 20 - Well sampling and analysis annually

Every 5 Years - Air sampling and analysis to monitor and evaluate suction system

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 3: GROUNDWATER EXTRACTION, TREATMENT, AND DISCHARGE
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$887,831			$887,831	1.000	$887,831
1		$94,621	$52,960	$147,581	0.935	$137,988
2		$94,621	$27,600	$122,221	0.873	$106,699
3		$94,621	$27,600	$122,221	0.816	$99,732
4		$94,621	$14,920	$109,541	0.763	$83,579
5		$94,621	$77,170	$171,791	0.713	$122,487
6		$94,621	$14,920	$109,541	0.666	$72,954
7		$94,621	$14,920	$109,541	0.623	$68,244
8		$94,621	$14,920	$48,000	0.582	$27,936
9		$94,621	$14,920	$109,541	0.544	$59,590
10		$94,621	$77,170	$171,791	0.508	$87,270
11		$94,621	$14,920	$109,541	0.475	$52,032
12		$94,621	$14,920	$109,541	0.444	$48,636
13		$94,621	$14,920	$109,541	0.415	$45,459
14		$94,621	$14,920	$109,541	0.388	$42,502
15		$94,621	$77,170	$171,791	0.362	$62,188
16		$94,621	$14,920	$109,541	0.339	$37,134
17		$94,621	$14,920	$109,541	0.317	$34,724
18		$94,621	$14,920	$109,541	0.296	$32,424
19		$0	$14,920	$14,920	0.277	$4,133
20		$0	$77,170	$77,170	0.258	$19,910
				TOTAL PRESENT WORTH		$2,133,451

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 4: IN-SITU CHEMICAL OXIDATION
CAPITAL COSTS

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING										
1.1 Prepare Sampling and Analysis Plan; Other Plans	100	hr				$0	$0	$3,000	$0	$3,000
1.2 Institutional Controls	200	hr				$0	$0	$6,000	$0	$6,000
2 MOBILIZATION/DEMOBILIZATION AND FIELD SUPPOR										
2.1 Professional Oversight (1p*6 wks)	6	mwk				$0	$0	$10,500	$0	$10,500
2.2 Survey 3 new wells	1	ls	$2,000.00			$2,000	$0	$0	$0	$2,000
3 DECONTAMINATION AND WASTE MANAGEMEN										
3.1 Temporary Equipment Decon Pac	1	ls	$500.00	$300.00	$350.00	$500	$300	$0	$350	$1,150
3.2 Decontamination Services	1	mo		$210.00	$315.00	$0	$210	$900	$315	$1,425
3.3 Decon Water	2,000	gal		$0.20		$0	$400	$0	$0	$400
3.4 Cleaning 5,000-Gal Frac Tank	1	ea	$1,500.00			$1,500	$0	$0	$0	$1,500
3.5 Off-Site Disposal of Drill Cuttings	18	cy	$115.00			$2,070	$0	$0	$0	$2,070
3.6 Delivery of 15-CY Roll Offs for Drill Cuttings	2	ea	$1,000.00			$2,000	$0	$0	$0	$2,000
3.7 Rental of 15-CY Roll Off Containers	2	mo	$1,250.00			$2,500	$0	$0	$0	$2,500
3.8 Delivery of 5,000-Gal Frac Tank	1	ea	$1,000.00			$1,000	$0	$0	$0	$1,000
3.9 *Rental of 5,000-Gal Frac Tank*	2	*ea*	*$1,000.00*		*$635.00*	*$2,000*	$0	*$0*	*$1,270*	*$3,270*
3.9 Off-Site Disposal of Liquid Wastes	5,000	gal	$1.00			$5,000	$0	$0	$0	$5,000
4 WELL DRILLING SUPPORT										
4.1 Drill Rig Mobilization/Demobilization	1	ls	$5,000.00			$5,000	$0	$0	$0	$5,000
4.2 Drill 8" boreholes using air rotary method (3 wells)	390	ft	$22.00			$8,580	$0	$0	$0	$8,580
4.3 Drill 12" boreholes using air rotary method (3 wells)	60	ft	$42.00			$2,520	$0	$0	$0	$2,520
4.4 Casing, 20' Steel, 3 Wells	60	ft	$26.00			$1,560	$0	$0	$0	$1,560
4.3 Flush Mounts, 3 Wells	3	ea	$350.00			$1,050	$0	$0	$0	$1,050
4.4 Well Development, 4 hrs per well	12	hr	$315.00			$3,780	$0	$420	$0	$4,200
4.5 Management of Drill Cuttings	18	cy	$225.00			$4,050	$0	$0	$0	$4,050
4.6 Water Management	5,000	gal	$0.55			$2,750	$0	$0	$0	$2,750
5 BOREHOLE GEOPHYSICS AND PACKER TESTING										
5.1 Mobilization/Demobilization	1	ls	$1,000.00			$1,000	$0	$0	$0	$1,000
5.2 Borehole logging with traditional and source tools (3 wells)	24	hr	$325.00			$7,800	$0	$840	$0	$8,640
5.3 Reporting	1	ls	$3,000.00			$3,000	$0	$0	$0	$3,000
5.4 Packer Testing	21	hr	$350.00			$7,350	$0	$735	$0	$8,085
6 CHEMICAL INJECTION										
6.1 Chemicals (oxidants) for initial injections	18,000	lb		$3.50		$0	$63,000	$0	$0	$63,000
6.2 Hydrofracturing Mobilization/Demobilization	1	ls	$5,000.00			$5,000	$0	$0	$0	$5,000
Every 5 Years - Air sampling and analysis to monitor and evaluate suction systems										
Note: Initial injections into 3 wells (including hydrofracturing support)	9	int	$2,700.00			$24,300	$0	$5,400	$0	$29,700
6.4 Mixing Support Mobilization/Demobilization	1	ls	$4,900.00			$4,900	$0	$0	$0	$4,900
6.5 Mixing support during initial injections into 3 new wells	5	day	$4,900.00	$100.00		$24,500	$500	$0	$0	$25,000
6.6 Equipment, vehicle rentals; supplies (per initial event)	1	ls	$1,000.00	$500.00	$5,875.00	$1,000	$500	$0	$5,875	$7,375
6.7 Chemicals (oxidants) for subsequent injections into 9 wells	13,000	lb		$3.50		$0	$45,500	$0	$0	$45,500
6.8 Injection events (6 days to inject 9,900 gal per subsequent events)	4	evt	$7,500.00			$30,000	$0	$22,800	$0	$52,800
6.9 Equipment, vehicle rentals; supplies (per subsequent events)	4	evt	$1,000.00	$250.00	$2,000.00	$4,000	$1,000	$0	$8,000	$13,000
7 SITE RESTORATION										
7.1 Vegetate Disturbed Areas	1	ls		$250.00		$0	$250	$400	$0	$650
Subtotal						$160,710	$111,660	$50,995	$15,810	$339,175
Local Area Adjustments						100.0%	90.7%	106.6%	106.6%	
Subtotal						$160,710	$101,276	$54,361	$16,853	$333,200
Overhead on Labor Cost @ 60%								$32,616		$32,616
G & A on Labor Cost @ 10%								$5,436		$5,436
G & A on Material Cost @ 10%							$10,128			$10,128
G & A on Subcontract Cost @ 10%						$16,071				$16,071
Total Direct Cost						$176,781	$111,403	$92,413	$16,853	$397,451
Indirects on Total Direct Cost @ 30%										$119,235
Profit on Total Direct Cost @ 10%										$39,745
Subtotal										$556,431
Health & Safety Monitoring @ 2%										$11,129
Total Field Cost										$567,560
Contingency on Total Field Cost @ 20%										$113,512
Engineering on Total Field Cost @ 10%										$56,756
TOTAL COST										**$737,828**

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 4: IN-SITU CHEMICAL OXIDATION
ANNUAL COSTS

Item	Cost per Year Year 1	Cost per Year Years 2 & 3	Cost per Year Years 4 thru 15	Item Cost per 5 Years	Notes
Sampling	$14,000	$0	$0	$0	Collect groundwater samples after initial injections, 10 wells/mo for 4 months, $350/well
Sampling	$14,000	$14,000	$7,000	$0	Collect groundwater samples for subsequent injections, 20 wells, $350/well
Sampling	$0	$0	$0	$8,550	Collect indoor air samples at 17 homes (8 homes with current suction systems, plus up to 9 homes without suction systems)
Analysis/Water	$7,200	$0	$0	$0	Water samples after initial injections, 40 wells (including lab and in-house QA) for selected VOCs, TOCs and chloride, $145/well.
Analysis/Water	$7,200	$7,200	$3,600	$0	Water samples for subsequent injections, 20 wells (including lab and in-house QA) for selected VOCs, TOCs and chloride, $145/well.
Analysis/Water	$2,000	$2,000	$1,000	$0	Water samples for subsequent injections, 10 wells (including lab and in-house QA) for selected metals, $100/well.
Analysis/Air	$0	$0	$0	$3,000	Air samples at 17 homes plus lab & in-house QA for selected VOCs (total of 20 samples)
Inspect Subslab Suction Systems	$2,240	$2,240	$2,240	$0	8 hours per inspection, annually, for 8 homes with current suction systems
Report	$5,400	$5,400	$2,700	$2,700	Document sampling events and results
Site Review	$0	$0	$0	$48,000	Review of documents and data evaluation/recommendations, preparation of summary reports for 5-year CERCLA reviews.
TOTALS	$52,040	$30,840	$16,540	$48,000	

Year 1 - Well sampling and analysis semi-annually, plus monthly sampling for 4 monts after initial injections

Years 2 & 3 - Well sampling and analysis semi-annually

Years 4 through 5 - Well sampling and analysis annually

Year 5 - One additional round of sampling and analysis for 16 wells would be performed, but is not reflected here.

Every 5 Years - Air sampling and analysis to monitor and evaluate suction systems

Note: The costs of additional oxidant injection events over a five-year period is reflected in Capital Costs.

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANI/
ALTERNATIVE 4: IN-SITU CHEMICAL OXIDATIOI

PRESENT WORTH ANALYSIS

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$737,828		$737,828	1.000	$737,828
1		$52,040	$52,040	0.935	$48,657
2		$30,840	$30,840	0.873	$26,923
3		$30,840	$30,840	0.816	$25,165
4		$16,540	$16,540	0.763	$12,620
5		$64,540	$64,540	0.713	$46,017
6		$16,540	$16,540	0.666	$11,016
7		$16,540	$16,540	0.623	$10,304
8		$16,540	$16,540	0.582	$9,626
9		$16,540	$16,540	0.544	$8,998
10		$64,540	$64,540	0.508	$32,786
			TOTAL PRESENT WORTH		$969,941

VALMONT TCE SITE

HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA

ALTERNATIVE 4: IN-SITU CHEMICAL OXIDATION (MINUS DESIGN COSTS OF $108,500)

CAPITAL COSTS

Item	Quantity	Unit	Unit Cost				Extended Cost				
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Sampling and Analysis Plan; Other Plans	60	hr			$30.00		$0	$0	$1,800	$0	$1,800
1.2 Institutional Controls	200	hr			$30.00		$0	$0	$6,000	$0	$6,000
2 MOBILIZATION/DEMOBILIZATION AND FIELD SUPPORT											
2.1 Professional Oversight (1p*3 wks)	3	mwk			$1,750.00		$0	$0	$5,250	$0	$5,250
2.2 Survey 3 new wells	0	ls	$2,000.00				$0	$0	$0	$0	$0
3 DECONTAMINATION AND WASTE MANAGEMENT											
3.1 Temporary Equipment Decon Pad	1	ls	$500.00	$300.00		$350.00	$500	$300	$0	$350	$1,150
3.2 Decontamination Services	1	mo		$210.00	$900.00	$315.00	$0	$210	$900	$315	$1,425
3.3 Decon Water	0	gal		$0.20			$0	$0	$0	$0	$0
3.4 Cleaning 10,000- and 20,000-Gal Tanks	2	ea	$2,000.00				$4,000	$0	$0	$0	$4,000
3.5 Off-Site Disposal of Drill Cuttings	0	cy	$115.00				$0	$0	$0	$0	$0
3.6 Delivery of 10,000-Gal Frac Tank	1	ea	$1,750.00				$1,750	$0	$0	$0	$1,750
3.7 Rental of 10,000-Gal Frac Tank	1	mo	$1,500.00				$1,500	$0	$0	$0	$1,500
3.8 Delivery of 21,000-Gal Frac Tank	1	ea	$1,750.00				$1,750	$0	$0	$0	$1,750
3.9 Rental of 21,000-Gal Frac Tank	1	ea	$1,750.00			$635.00	$1,750	$0	$0	$635	$2,385
3.9 Off-Site Disposal of Liquid Wastes	0	gal	$1.00				$0	$0	$0	$0	$0
4 WELL DRILLING SUPPORT											
4.1 Drill Rig Mobilization/Demobilization	0	ls	$5,000.00				$0	$0	$0	$0	$0
4.2 Drill 8" boreholes using air rotary method (3 wells)	0	ft	$22.00				$0	$0	$0	$0	$0
4.3 Drill 12" boreholes using air rotary method (3 wells)	0	ft	$42.00				$0	$0	$0	$0	$0
4.4 Casing, 20' Steel, 3 Wells	0	ft	$26.00				$0	$0	$0	$0	$0
4.3 Flush Mounts, 3 Wells	0	ea	$350.00				$0	$0	$0	$0	$0
4.4 Well Development, 4 hrs per well	0	hr	$315.00		$35.00		$0	$0	$0	$0	$0
4.5 Management of Drill Cuttings	0	cy	$225.00				$0	$0	$0	$0	$0
4.6 Water Management	0	gal	$0.55				$0	$0	$0	$0	$0
5 BOREHOLE GEOPHYSICS AND PACKER TESTING											
5.1 Mobilization/Demobilization	0	ls	$1,000.00				$0	$0	$0	$0	$0
5.2 Borehole logging with traditional and source tools (3 wells)	0	hr	$325.00		$35.00		$0	$0	$0	$0	$0
5.3 Reporting	0	ls	$3,000.00				$0	$0	$0	$0	$0
5.4 Packer Testing	0	hr	$350.00		$35.00		$0	$0	$0	$0	$0
6 CHEMICAL INJECTION											
6.1 Chemicals (oxidants) for initial injections	18,000	lb		$3.50			$0	$63,000	$0	$0	$63,000
6.2 Hydrofracturing Mobilization/Demobilization	1	ls	$5,000.00				$5,000	$0	$0	$0	$5,000
6.3 Initial injections into 3 wells (including hydrofracturing support)	9	int	$2,700.00		$600.00		$24,300	$0	$5,400	$0	$29,700
6.4 Mixing Support Mobilization/Demobilization	1	ls	$4,900.00				$4,900	$0	$0	$0	$4,900
6.5 Mixing support during initial injections into 3 new wells	5	day	$4,900.00	$100.00			$24,500	$500	$0	$0	$25,000
6.6 Equipment, vehicle rentals; supplies (per initial event)	1	ls	$1,000.00	$500.00		$5,875.00	$1,000	$500	$0	$5,875	$7,375
6.7 Chemicals (oxidants) for subsequent injections into 9 wells	13,000	lb		$3.50			$0	$45,500	$0	$0	$45,500
6.8 Injection events (6 days to inject 9,900 gal per subsequent evei	4	evt	$7,500.00		$5,700.00		$30,000	$0	$22,800	$0	$52,800
6.9 Equipment, vehicle rentals; supplies (per subsequent events)	4	evt	$1,000.00	$250.00		$2,000.00	$4,000	$1,000	$0	$8,000	$13,000
7 SITE RESTORATION											
7.1 Vegetate Disturbed Areas	1	ls		$250.00	$400.00		$0	$250	$400	$0	$650
Subtotal							$104,950	$111,260	$42,550	$15,175	$273,935
Local Area Adjustments							100.0%	90.7%	106.6%	106.6%	
Subtotal							$104,950	$100,913	$45,358	$16,177	$267,398
Overhead on Labor Cost @ 60%									$27,215		$27,215
G & A on Labor Cost @ 10%									$4,536		$4,536
G & A on Material Cost @ 10%								$10,091			$10,091

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA
ALTERNATIVE 4: IN-SITU CHEMICAL OXIDATION (MINUS DESIGN COSTS OF $108,500)
CAPITAL COSTS

Item	Quantity	Unit	Unit Cost				Extended Cost				Subtotal
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	
G & A on Subcontract Cost @	10%						$10,495				$10,495
Total Direct Cost							$115,445	$111,004	$77,109	$16,177	$319,735
Indirects on Total Direct Cost @	30%										$95,920
Profit on Total Direct Cost @	10%										$31,973
Subtotal											$447,629
Health & Safety Monitoring @	2%										$8,953
Total Field Cost											$456,581
Contingency on Total Field Cost @	20%										$91,316
Engineering on Total Field Cost @	10%										$45,658
TOTAL COST											**$593,556**

VALMONT TCE SITE
HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE C
ALTERNATIVE 4: IN-SITU CHEMICAL OXIDATION (MINUS DES
ANNUAL COSTS

Item	Cost per Year Year 1	Cost per Year Years 2 & 3	Cost per Year Years 4 thru 15	Item Cost per 5 Years
Sampling	$14,000	$0	$0	$0
Sampling	$11,750	$14,000	$7,000	$0
Sampling	$0	$0	$0	$8,550
Analysis/Water	$7,200	$0	$0	$0
Analysis/Water	$6,150	$7,200	$3,600	$0
Analysis/Water	$2,000	$2,000	$1,000	$0
Analysis/Air	$0	$0	$0	$3,000
Inspect Subslab Suction Systems	$2,240	$2,240	$2,240	$0
Report	$4,500	$5,400	$2,700	$2,700
Site Review	$0	$0	$0	$48,000
TOTALS	$47,840	$30,840	$16,540	$48,000

Year 1 - Well sampling and analysis semi-annually, plus monthly sampling for 4 months after initial injections

Years 2 & 3 - Well sampling and analysis semi-annually

Years 4 through 5 - Well sampling and analysis annually

Year 5 - One additional round of sampling and analysis for 16 wells would be performed, but is not reflected he

Every 5 Years - Air sampling and analysis to monitor and evaluate suction systems

Note: The costs of additional oxidant injection events over a five-year period is reflected in Capital Costs.

VALMONT TCE SITE

HAZLE TOWNSHIP, WEST HAZLETON BOROUGH, LUZERNE COUNTY, PENNSYLVANIA

ALTERNATIVE 4: IN-SITU CHEMICAL OXIDATION (MINUS DESIGN COSTS OF $108,500)

PRESENT WORTH ANALYSIS

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$593,556		$593,556	1.000	$593,556
1		$47,840	$47,840	0.935	$44,730
2		$30,840	$30,840	0.873	$26,923
3		$30,840	$30,840	0.816	$25,165
4		$16,540	$16,540	0.763	$12,620
5		$64,540	$64,540	0.713	$46,017
6		$16,540	$16,540	0.666	$11,016
7		$16,540	$16,540	0.623	$10,304
8		$16,540	$16,540	0.582	$9,626
9		$16,540	$16,540	0.544	$8,998
10		$64,540	$64,540	0.508	$32,786
			TOTAL PRESENT WORTH		$821,742