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U.S. Army Corps of Engineers
Kansas City District

Final Feasibility Study Report

Unimatic Manufacturing Corporation Superfund Site

Fairfield, New Jersey

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CDM Smith

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Acronyms

1,1-DCA	1,1-dichloroethane
1,1,1-TCA	1,1,1-trichlorethane
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
amsl	above mean sea level
AOC	area of concern
AOP	advanced oxidative process
ARAR	applicable or relevant and appropriate requirement
AST	above ground storage tank
BCD	base catalyzed decomposition
bgs	below ground surface
BHC	hexachlorocyclohexane
CAA	Clean Air Act
CAMU	Corrective Action Management Unit
CDM Smith	CDM Federal Programs Corporation
CEA	classification exception area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
COC	contaminant of concern
COPC	chemical of potential concern
CSM	conceptual site model
CTE	central tendency exposure
CVOC	chlorinated volatile organic compound
cy	cubic yard
4,4'-DDD	4,4'-dichlorodiphenyldichloroethane
4,4'-DDE	4,4'-dichlorodiphenyldichloroethene
4,4'-DDT	4,4'-dichlorodiphenyltrichloroethane
DOT	Department of Transportation
EC	engineering control
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ESL	ecological screening level
FS	feasibility study
ft	foot
FYR	five-year review
GPCR™	Eco Logic gas phase chemical reduction
GRA	general response action
GZA	GZA GeoEnvironmental, Inc.
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IC	institutional control
IGW	Impact to Groundwater
IGWSRS	Impact to Groundwater Soil Remediation Standards
ISRA	Industrial Site Recovery Act

ISS	in situ solidification/stabilization
JCMUA	Jersey City Municipal Utilities Authority
LDR	Land Disposal Restriction
LTTD	low temperature thermal desorption
M	million
mg/kg	milligrams per kilogram
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
NAAQ	National Primary and Secondary Ambient Air Quality Standard
NCP	National Contingency Plan
ng/kg	nanogram per kilogram
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJDOH	New Jersey Department of Health
NJGQS	New Jersey Groundwater Quality Standard
NJNRDCSRS	NJDEP Non-Residential Direct Contact Soil Remediation Standards
N.J.S.A.	New Jersey Statutes Annotated
NRDCSCC	Non-Residential Direct Soil Cleanup Criteria
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
PPE	personal protective equipment
ppm	parts per million
PRG	preliminary remediation goal
RAGS	Risk Assessment Guidance for Superfund
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RI	remedial investigation
RIR/RAWP	remedial investigation report/remedial action work plan
RME	reasonable maximum exposure
ROD	Record of Decision
RSE	removal site evaluation
RSL	Regional Screening Level
S/S	solidification/stabilization
site	Unimatic Manufacturing Corporation Superfund Site
SLERA	screening level ecological risk assessment
SRP	Site Remediation Program
SVOC	semi-volatile organic compound
2,3,7,8-TCDD	2,3,7,8-tetraclorodibenzodioxin
TBC	to be considered
TCE	trichloroethylene
TCLP	toxicity characteristic leaching procedure
TEQ	toxic equivalence quotient
T/M/V	toxicity/mobility/volume

TSCA	Toxic Substances Control Act
UHC	underlying hazardous constituent
Unimatic	Unimatic Manufacturing Corporation
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
UTS	Universal Treatment Standards
VC	vinyl chloride
VOC	volatile organic compound
ZVI	zero valent iron

Executive Summary

CDM Federal Programs Corporation (CDM Smith) received Task Order No. 023 under the United States Army Corps of Engineers (USACE), Kansas City District Contract No. W912DQ-11-D-3004, to perform a remedial investigation (RI)/feasibility study (FS) at the Unimatic Manufacturing Corporation Superfund Site (the site) in Fairfield Township, Essex County, New Jersey

The FS will focus on addressing the building and soil contamination that has been detected during the RI field investigation. Groundwater contamination will be addressed in a separate operable unit (OU).

Information presented in the FS report is intended to provide regulatory agencies with sufficient information to select a feasible and cost-effective remedial alternative that protects human health and the environment from potential risks at the site. The FS report is also intended to provide the public with information to help understand the remedial alternatives presented in the proposed plan.

The work performed during the FS was in accordance with guidance developed by the U.S. Environmental Protection Agency (EPA) for conducting RI/FSs under the Comprehensive Environmental Response, Compensation, and Liability Act (EPA 1988).

Site Characteristics

The site is in a primarily industrial area with residential subdivisions located approximately 800 feet to the northeast. The 25 Sherwood Lane Property (the Unimatic Property) covers approximately 1.23 acres and contains a centrally located, 22,000-square-foot building on a partially paved parking lot (Figure ES-1).

The Unimatic Property sits at a higher elevation than surrounding properties, with topography generally sloping away from the facility in all directions. Elevations on the Unimatic Property range from approximately 190 feet above mean sea level (amsl) near the southern portion of the building to approximately 176 feet amsl in the northeastern corner of the site.

Stormwater runoff from the front of the facility and southern portion of the eastern parking lot flows south toward stormwater catch basins on Sherwood Lane. Runoff on the remainder of the property generally flows north, northwest, and northeast toward the adjacent properties at 21 and 30 Sherwood Lane and toward the Jersey City Municipal Utilities Authority (JCMUA) property, which is 6 to 8 feet lower in elevation than the Unimatic Property (Figure ES-1).

In the site vicinity, groundwater occurs in both the overburden and the underlying Preakness Basalt bedrock. Groundwater was encountered between 7 and 15 feet bgs within the overburden. Groundwater in both aquifers is generally expected to move toward the north, eventually discharging to the Passaic River or its tributaries. Overburden aquifers in the study area are hydraulically connected with the underlying bedrock aquifers. The presence of a shallow clay layer in the northern portion of the site acts as an aquitard, complicating localized groundwater flow. EPA plans to conduct a detailed groundwater investigation to define the extent of the groundwater contamination and to develop detailed information regarding geology and hydrogeology of the site.

<u>Site History</u>

The Unimatic Manufacturing Corporation (Unimatic) operated an aluminum die casting manufacturing process from 1955 until 2001. Unimatic reported in multiple documents that a lubricating oil used in the manufacturing processes at the site contained polychlorinated biphenyls (PCBs) from at least 1970 until 1979 (Friedman 2005). The lubricating oil was sprayed throughout the shop area and covered the floor and walls to a height of approximately 8 feet. Unimatic washed the PCB oils from the floor and walls into floor trenches, which subsequently conveyed the PCB-contaminated wastewater to pipes that discharged outside the building (Friedman 2011). The wastewater pipes consisted of both cast concrete and corrugated steel that leaked contaminated wastewater into underlying soil and groundwater prior to the discharge point at the northeast corner of the Unimatic Property.

National Pollutant Discharge Elimination System permits indicate that Unimatic discharged large volumes of production waste and wastewater through the leaking wastewater pipes from 1980 until 1998. The EPA and the New Jersey Department of Environmental Protection (NJDEP) issued numerous non-compliance and violation notices to Unimatic beginning in 1982; however, Unimatic continued to discharge large volumes of contaminated water through more than 200 feet of leaking wastewater pipes until 1988 at which time, Unimatic installed a recirculating cooling system that reportedly eliminated discharges to the environment. In 2001, Unimatic ceased all operations, and the New Jersey Industrial Site Recovery Act process was initiated. The Unimatic Property was sold to Cardean, LLC in 2002.

<u>Nature and Extent of Contamination</u>

The primary contaminants of concern at the site are PCBs and pesticides. All RI soil and groundwater PCB samples were analyzed for all PCB Aroclors, and a sub-set of the samples were analyzed for PCB congeners. No consistent relationship could be drawn between the concentrations detected for total Aroclors vs. total PCB congeners. However, in every case where concentrations exceeded 1 milligram per kilogram (mg/kg) for total Aroclors, the corresponding total PCB congener result also exceeded 1 mg/kg. Of the 10 total PCB congener samples, 80 percent exceeded 1mg/kg.

PCBs were detected at the site as both Aroclor 1248 and Aroclor 1254. Aroclor 1254 was only detected in 11 percent of the soil samples collected at the site (in comparison to Aroclor 1248 in 78 percent of the soil samples). The focus of the data discussion in the FS report will be on total Aroclors, referred to as total PCBs.

Building Materials

EPA's 2012 sampling event revealed high concentrations of PCBs in building materials and on surfaces in areas where active manufacturing processes took place. Building material samples included concrete chip samples from building walls and floors, material samples from equipment, and wipe samples from walls, floors, and equipment. Mean concentrations of Aroclor 1248 and Aroclor 1260 in floor samples were 270 and 34 milligrams/kilogram (mg/kg), respectively. Wall chip samples contained Aroclor 1248 and Aroclor 1260 at concentrations ranging from 1.0 to 1,400 mg/kg and 0.33 to 760 mg/kg, respectively. Concrete and wipe sampling results from the 2015 RI confirmed high concentrations of PCBs remain within the building structure.

Soil

PCBs

Results from the EPA soil investigation in 2012 indicated that past cleanup efforts at the site did not adequately address the PCBs in surface soils. Additional sampling conducted by CDM Smith in 2015 for the RI found that in most areas (the northern two-thirds) of the site, PCB concentrations in soil are above 1 mg/kg and generally decreased with depth. The highest concentrations of PCB contamination are generally confined to the Unimatic Property, but PCBs have migrated off of the Unimatic properties in all directions except south. PCBs migrated to the north and west via surficial runoff and to the west where contamination has been discharged from the former outfall pipe. PCB concentrations in soil only exceeded 1mg/kg below the water table in areas related to the direct release of PCB-laden wastewater. These areas include soils below the Unimatic building, soils adjacent to the former outfall pipe, and other surficial discharge (i.e., near doors associated with previous surface discharges of the wastewater from the building).

Pesticides

Aldrin and dieldrin were the two pesticides most frequently detected above NJDEP Non-Residential Direct Contact Soil Remediation Standards (NJNRDCSRS) criteria (0.2 mg/kg) throughout the site although analysis for pesticides was limited to surface and near surface soils. Hotspots of these pesticides coincided with PCB hotspots, including below the northern portion of the building, the entire eastern side of the Unimatic Property, and north of the building, suggesting that the pesticides were deposited in a similar fashion as the PCBs. Other pesticides were also detected at high concentrations with a similar distribution (see Appendix B).

Other Contaminants

Dioxin/furan concentrations did not exceed the NJDEP proposed soil remediation standard for 2,3,7,8-tetraclorodibenzodioxin (2,3,7,8-TCDD) of 0.7 µg/kg. Detections of dioxins and furans correlate spatially with the distribution of PCBs sufficiently to suggest that it is likely that the dioxins/furans were generated from the aluminum die casting process at the Unimatic property.

The most frequently detected VOCs were various CVOCs, acetone, and toluene. None were detected above the NJNRDCSRS. Toluene was primarily found in shallow soils beneath the facility. The majority of CVOCs are detected below the water table, related to chlorinated groundwater contamination.

The most frequently detected SVOCs included several polycyclic aromatic hydrocarbons (PAHs) and bis(2-ethylhexyl) phthalate. Only three PAHs: benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene were detected above the NJNRDCSRS. Nearly all of the PAHs detected above the NJNRDCSRSs were found on either the 21 Sherwood Lane property or on the JCMUA right of way, which suggests that PAHs are not related to the Unimatic Property.

Only one detection of metal in soil, manganese, exceeded the NJNRDCSRS. This sample was collected on the eastern side of the Unimatic property (25 Sherwood Lane).

Groundwater

PCBs in groundwater at the site are found throughout the saturated overburden and in the upper portion of the bedrock. The highest levels of PCBs in groundwater were found in the wells in the northeast portion of the property, specifically in the MW-4 cluster (as high as 270 micrograms/liter).

Pesticides exceeding RI screening criteria included dieldrin, gamma-hexachlorocyclohexane (BHC), trans-chlordane, 4,4'-dichlorodiphenyldichloroethene (4,4'-DDE), and 4,4'-dichlorodiphenyltrichloroethane (4,4'-DDT). The highest levels of pesticides were found in the northeast portion of the property, specifically in the monitoring well cluster MW-4.

CVOCs exceeding the RI screening criteria included trichloroethylene (TCE), vinyl chloride (VC), tetrachloroethylene, 1,1-dichloroethylene, cis-1,2-dichloroethene (cis-1,2-DCE), 1,1,1-trichloroethane (1,1,1-TCA), and 1,1-dichloroethane (1,1-DCA). The CVOCs in groundwater were not found in the unsaturated soils at the site.

Aluminum, cobalt, iron, manganese, and sodium were the only metals to exceed the RI screening criteria in the majority of the 11 wells sampled for metals analysis.

Two samples collected from two wells, MW-4 and MW-4a, exceeded the RI screening criterion for dioxins/furans.

A comprehensive groundwater investigation is planned for the site as Operable Unit 2 (OU2) which will evaluate the full nature and extent of groundwater contamination.

<u>Identification of Contaminants of Concern</u>

The site-specific human health risk assessment (HHRA) evaluated risks posed to human health for the detected contaminants. Soil samples were screened against benchmark levels as part of the HHRA and screening level ecological risk assessment (SLERA), and chemicals of potential concern (COPCs) were identified. The HHRA identified the following chemicals as COPCs in soils:

- Trichloroethene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- 4,4'-DDE
- 4,4'-DDT
- Aldrin

- Alpha-chlordane
- Aroclor-1248
- Aroclor-1254
- Delta-BHC
- Dieldrin
- Gamma-chlordane
- Heptachlor
- Heptachlor epoxide
- Arsenic
- Chromium
- Iron
- Manganese

Of the listed COPCs, only the PCBs were identified as human health risk drivers; however, pesticides also were detected at high concentrations and for the most part were co-located with PCB detections. Several of the pesticides were found in soils at concentrations exceeding NJNRDCSRS and New Jersey Impact to Groundwater (IGW) default screening levels. The remaining COPCs were not, or only sporadically, detected above NJNRDCSRS or ambient soil concentrations for urban Piedmont province soils (Sanders 2003).

Results of the SLERA indicate potential risks exist at the site to ecological receptors from exposure to VOCs, PCBs, SVOCs, pesticides, and metals. Based on historical information, PCBs are the only site-related contaminant. Because VOCs, SVOCs, and metals were not identified as site related, these chemicals were not retained as chemicals of potential concern (COPC). However, the highest concentrations of pesticides were found to be co-located with PCBs indicating potential usage. The high HQs determined in the SLERA indicate potential risks exist at the site to ecological receptors from exposure to contaminants in soil. However, the site is an industrial site and based on observations made during the ecological reconnaissance, the site has limited vegetation and wildlife, and little to no viable habitat to support ecological receptors. Furthermore, no threatened and endangered species were observed on site. All of these findings indicate that ecological threats at the site are negligible. Thus, despite the high HQs from PCBs and pesticides, it is recommended that no further ecological investigation is warranted to evaluate the potential for risks to ecological receptors from exposure to contaminants at the site.

Based on the RI data, the results of the HHRA and SLERA, and available promulgated remediation standards, the following COPCs are considered contaminants of concern (COCs) for the completion of the FS:

- 4,4'-DDE
- 4,4'-DDT
- Aldrin
- Alpha- and gamma-chlordane
- Dieldrin
- Heptachlor
- Heptachlor epoxide
- Lindane
- Total PCBs

Lindane is also considered a site COC and was added to the list above based on its co-location with other detected pesticides and exceedance of NJDEP groundwater quality standard and the remediation standard for the impact to groundwater pathway.

Media of Concern

The OU addressed in this FS focuses on remediating the contaminated soil and the building at the site. In addition to the Unimatic facility at 25 Sherwood Lane, the site includes contamination that has extended to properties at 21 Sherwood, 30 Sherwood, and the JCMUA. Indoor air screening results, as presented in the HHRA, indicate that current and future workers may be exposed to PCB vapor via the ambient air in the building via vaporization, which was detected in the walls and floors of the building. This FS will focus directly on addressing the contamination found in and beneath Unimatic building and on the properties of the JCMUA, 21, 25, and 30 Sherwood Lane. EPA plans to conduct a detailed groundwater investigation to define the extent of the groundwater contamination and to develop detailed information regarding geology and hydrogeology of the site.

Remedial Action Objectives

The following remedial action objectives (RAOs) have been proposed to mitigate the potential present and/or future risks associated with exposure to contamination in the site building and soils.

Building

- Reduce or eliminate human exposure via inhalation, incidental ingestion, and dermal absorption to contamination present within the site building.

Soil

- Reduce or eliminate the human exposure threat via inhalation, incidental ingestion, and dermal adsorption to contaminated site soils to levels protective of current land and anticipated future use.

- Prevent/minimize the migration of site contaminants off site through surface runoff and storm sewer discharge.
- Prevent/minimize the migration of contamination in soil to groundwater and surface water/sediment.

Preliminary Remediation Goals

Preliminary remediation goals (PRGs) were developed for the list of COCs identified for the site to aid in defining the extent of contaminated media requiring remedial action. PRGs are generally chemical-specific for each medium and/or exposure route that are established to protect human health and the environment. They can be derived from applicable or relevant and appropriate requirements (ARARs), risk-based levels (human health and ecological), and from comparison to background concentrations, where available. At the site, PCBs are identified as one of the primary COCs in the soil. The PRGs for the PCB contamination is the NJDEP Non-Residential Direct Contact Soil Remediation Standard (NJNRDCSRS) of 1 part per million (ppm). Other contaminants detected in the soil are co-located with the PCBs, remediating PCBs to meet the PRG would also remediate the other contaminants that were detected in the soil to their respective PRGs. Table 2-4 summarizes the PRGs for the COCs.

The EPA Toxic Substances Control Act (TSCA) provides federal PCB remediation policy. The TSCA regulates PCBs at concentrations greater than 1 part per million (ppm). The applicable promulgated state ARAR for soil PRG development is New Jersey Administrative Code, Title 7, Chapter 26D, which establishes the minimum non-residential direct contact soil remediation standards. The IGW pathway is part of the Soil Standards Rule and must be addressed whenever a discharge or potential discharge of a contaminant has occurred in the unsaturated zone.

CDM Smith calculated Impact to Groundwater Soil Remediation Standards (IGWSRS) for total PCBs and pesticides by using the soil partition equation included in Development of Impact to Groundwater Soil Remediation Standards using the Soil-Water Partition Equation, Version 2.0 – November 2013 (NJDEP 2013).

Identification of General Response Actions

General response actions (GRAs) were considered to address the RAOs for the contaminated material at the site. GRAs considered for source material at the site include the following:

- No Action
- Institutional Controls /Engineering Controls
- Inspection, Maintenance, and Monitoring
- Containment
- Removal

- Disposal
- Treatment

Remedial technologies and process options under each of these GRAs were identified and evaluated as part of a screening process based on a consideration of effectiveness, implementability, and relative cost. Retained remedial technologies and process options were carried forward for development of remedial alternatives.

Development of Alternatives

Retained remedial technologies and process options for GRAs considered to address the contaminant source material were combined into a range of remedial action alternatives. The following remedial action alternatives were assembled:

Alternative 1	No Action
Alternative 2	Excavation of Soils above 10 ppm PCBs to Water Table and Offsite Disposal, and In Situ Solidification/Stabilization (ISS) and Capping of Remaining Soils above PRGs
Alternative 3	ISS and Capping of Soils above PRGs
Alternative 4	Excavation of Soils above PRGs, and Offsite Disposal
Alternative 5	Excavation and Onsite Treatment of Soils above PRGs, and Backfill of Treated Material
Alternative 6	Targeted Excavation, and Offsite Disposal

All six alternatives were carried forward for detailed analysis.

Detailed and Comparative Analyses of Alternatives

During detailed analysis, each alternative is assessed using the two threshold criteria and five balancing criteria mandated by the National Contingency Plan (NCP)**.** The two threshold criteria must be satisfied by the remedial alternative being considered as the preferred remedy. The five balancing criteria consist of the technical criteria evaluated among those alternatives that satisfy the threshold criteria. Each of the six remedial alternatives underwent detailed and comparative analyses using the two threshold criteria of overall protection of human health and the environment and compliance with ARARs and the five balancing criteria of long-term effectiveness and permanence, reduction of toxicity/mobility/volume through treatment, short-term effectiveness, implementability, and cost.

Overall Protection of Human Health and the Environment

All retained alternatives, except for Alternative 1 and Alternative 6, would address RAOs for the building and contaminated soils through removal and offsite disposal or treatment. Alternative 1 would not provide protection of human health and the environment. Alternative 6 would address direct contact and surface water runoff RAOs but would not address impact to groundwater RAO, as residual contaminated soil would continue to impact the groundwater quality.

Alternatives 2 to 5 would provide overall protection of human health and the environment. Alternatives 2, 3, and 4 would prevent further migration of COCs to groundwater and offsite surface water by minimizing the availability of contaminants to the environment through ISS or removal and offsite disposal. Alternative 5 would prevent further migration of COCs to groundwater and offsite surface water by removing contaminants from soil via LTTD, with additional treatment implemented to address contaminants in the off-gas. Residuals from off-gas treatment would be treated or disposed of at a permitted waste disposal facility.

Compliance with ARARs

Because no action would be taken under Alternative 1, the presence of unaddressed contaminated soil would not meet chemical-specific ARARs, and the presence of PCB contamination in the building would not meet TSCA requirements for re-using the building.

Alternatives 2, 3, and 4 would meet chemical-specific ARARs (TSCA [40 CFR Part 761.61 – PCB Remediation Waste] and NJDEP Non-Residential Direct Contact and Impact to Groundwater Standards [N.J.A.C. 26D]), which are "To be Considered" (TBC) at this site, through removal/offsite disposal and/or ISS of soils with COC concentrations exceeding PRGs. However, meeting the chemical-specific ARARs under Alternatives 2 and 3 would be dependent on developing an effective ISS mix for stabilizing the PCB and pesticide COCs during treatability testing.

Alternative 5 would meet the chemical-specific ARARs for soils through LTTD treatment of excavated soils prior to backfilling the treated material on site.

Under Alternative 6, some soils with COC concentrations exceeding PRGs would remain below the water table. Direct contact ARARS applicable to these soils would be met by application of the approximate 15-foot layer of clean fill that will be used to replace the excavated soil from above the water table. However, Alternative 6 would not meet the impact to groundwater RAO.

Site activities for Alternatives 2 through 6 would be designed to meet location- and action-specific ARARs

Long-Term Effectiveness and Permanence

Alternative 1 would provide no long-term effectiveness and permanence because no action would be taken. Risks from the site contaminants would remain the same.

Alternative 4 would provide the highest degree of long-term protectiveness and permanence because contaminated building debris and soil above the PRGs, including the principal threat waste, would be removed from the site. Alternative 5 would also provide a high degree of long-term effectiveness and permanence through the irreversible treatment of contaminated soil, including the principal threat waste to meet the PRGs prior to backfilling the treated material on site.

Alternatives 2 and 3, which both involve ISS of contaminated soil, would respectively provide moderate and low to moderate long-term effectiveness and permanence. While ISS has been successfully implemented at many sites and is considered a reliable technology to immobilize organic COCs such as PCBs, toxicity would not be reduced and volume would increase. Alternative 3 would leave the largest amount of residual contamination, including the principal threat waste, behind; while Alternative 2 would leave the second largest amount of residual contamination behind, but all principal threat waste would be removed under Alternative 2. As a result, under Alternative 3, placement, long-term inspection, monitoring and maintenance of a soil cap to eliminate or minimize residual risks from the treated soil would be required as part of the alternatives.

Long-term effectiveness and permanence of Alternatives 2 and 3 also would be dependent on the development of an effective ISS mix to address both PCBs and pesticides. In addition, because groundwater is contaminated with VOCs and is likely to remain contaminated, the potential long-term impact of that groundwater on the stabilized materials would need to be assessed as part of the development of the ISS mix.

Alternative 6 would not provide long-term effectiveness and permanence because untreated soil above PRGs would remain below the water table. Further remedial action would be required to address the residual contaminated soil that would remain under Alternative 6.

Reduction of Toxicity, Mobility, or Volume through Treatment

Because no action would be taken, Alternative 1 would not address this criterion.

Alternative 5 would be rated high for this criterion. Thermal desorption is an irreversible treatment process, and there would be high reductions in toxicity, mobility, and volume of contaminated soil treated thermally. Alternative 5 satisfies the statutory preference for treatment as a principal element of the remedial action and uses treatment to address soils exceeding PRGs, including those soils defined as principal threat waste as described in Section 1.6.2.

Alternatives 2, 3 and 4 would all be rated moderate for this criterion. Like Alternative 5, Alternative 3 satisfies the statutory preference for treatment as a principal element of the remedial action and uses treatment to address soils exceeding PRGs, including those soils defined as principal threat waste. Under Alternative 3, the mobility of COCs in the treated soil would be greatly reduced, however, toxicity would not change and the volume of the ISS-treated soils would likely be greater than the pre-treated soils due to the addition of the stabilization agent. In addition, the irreversibility of the ISS treatment process would be dependent on developing an effective ISS mix for stabilizing the COCs and withstanding the potential long-term impact of VOC-contaminated groundwater (if any) on the stabilized materials.

Alternative 2 uses ISS to treat those soils with PCB concentrations above 1 mg/kg that remain after excavation of soils above the water table with PCB concentrations greater than 10 mg/kg. Hence, relative to Alternatives 3 and 5, Alternative 2 would only partially meet the statutory preference for treatment. In addition, all the soils defined as principal threat waste would be addressed by excavation and offsite disposal, not treatment.

Under Alternative 4 for debris and soils removed for offsite disposal that are deemed hazardous under these alternatives, reduction of toxicity and mobility would occur through treatment at a RCRA-permitted treatment/disposal facility to meet Universal Treatment Standards (UTS). However, it is anticipated only a small volume of contaminated soil would exceed the hazardous waste criterion; the majority of the wastes would be disposed in permitted landfills. This would reduce the mobility of the waste, including the soil defined as principal threat waste through containment. Toxicity and volume would not be changed.

Alternative 6 would not achieve the same level of reduction in mobility as Alternative 4 because it would leave approximately 5,000 CY of untreated contaminated soil behind at the site.

Short-Term Effectiveness

Alternative 1 would not have any impacts to the community and workers because no action would be taken. The remaining alternatives, to varying degrees, all would result in short-term risks to the community and potential impact on workers carrying out the remedial action. This is due in part not only to the nature of the activities that would be conducted for each alternative, but also because those activities are required in a very small footprint (approximately 1.2 acres) that would present significant implementation challenges. All alternatives, other than no action, would require the usage of space from neighboring properties for implementation of the alternatives.

Of the alternatives other than No Action, Alternative 5 would require the largest amount of space to effectively carry out all components of the alternative (i.e., excavation, dewatering operation, water treatment, staging, treatment, and backfill operations). As a result, Alternative 5 would likely cause the greatest level of short-term risk to the community and potential impact to workers due to the need to safely manage and conduct significant excavation, dewatering, ex situ treatment, and backfill operations in a very small space. Heavy construction activities would require implementation of dust control measures and stormwater runoff control. Excavation below the water table would pose significant challenge because of dewatering requirements and water treatment operations. Vibration from installation of sheet piling to support deep excavation needs to be very carefully conducted so that there is no impact to the integrity of the nearby JCMUA pipelines, which provide drinking water supply to Jersey City. In addition, air monitoring would be required to reduce risks to workers and the community from fugitive emissions during construction and remediation. Potential risk to remediation workers associated with direct contact with contaminated material would be mitigated through the use of PPE and standard health and safety practices.

In addition to short-term risk to the community and potential impact to workers associated with construction activities, Alternative 5 also presents additional risks and impacts related to the use of thermal treatment. Thermal treatment has high energy demands, which would require power be delivered to the site. Higher capacity and high voltage electrical power lines would likely need to be installed to supply the electrical needs of the thermal treatment system and would pose a short-term risk to workers. Off-gas releases from thermal treatment system also could occur and would need to be mitigated through air treatment and monitoring to reduce risks to workers and the community.

Alternatives 2, 3, 4, and 6 would have risks and impacts associated with heavy construction activities associated with excavation, ISS treatment, and/or offsite disposal. All four alternatives would temporarily increase particulate emissions and would require the implementation of dust control measures, stormwater runoff control, and air monitoring to reduce risks to the community and workers.

Alternative 4 would have the second highest impact to the workers and community, followed by Alternative 6. To allow for segregation and staging of soils prior to offsite disposal, Alternatives 4 and 6 would have similar space requirements as Alternative 5, but more flexibility in phasing operations, which would result in less of a short-term impact of the community. Between Alternatives 4 and 6, Alternative 4 would require the largest amount of soils to be excavated and shipped off-site and therefore would have the bigger impact to the community because of heavy truck traffic associated with trucks hauling contaminated debris and soil away from the site and trucks hauling backfill material to the site. Because Alternative 6 would require the excavation of a smaller amount of contaminated soil than Alternative 4, it would be expected to pose slightly less of an impact to community and workers, however Alternative 6 leaves approximately 5,000 cy of contaminated soil in place. Like Alternative 5, both Alternatives 4 and 6 would require excavation below the water table, therefore add an additional waste stream to manage within the compact site footprint. Water generated from dewatering of excavation areas would need to be treated on site and discharged to the stormwater system. Vibration from installation of sheet piling to support deep excavation needs to be very carefully conducted so that there is no impact to the integrity of the nearby JCMUA pipelines, which provide drinking water supply to Jersey City.

Alternatives 2 and 3 would have slightly less short-term impacts to the workers and the community, when compared to Alternatives 4 and 6. Alternative 2 would require less excavation and offsite disposal than Alternatives 4, 5 and 6, however it includes an ISS component that would contribute to construction-related short-term risk. Alternative 3 would likely have the smallest impact to the community because all contaminated soils would be addressed on the site via ISS meaning minimal truck traffic-related concerns relative to the alternatives that include significant excavation components. However, Alternative 3 could still require some excavation (or an alternate more expensive and time-consuming jet grouting process) if, after building demolition, any subsurface structures (e.g., foundations, column piers, concrete/steel pipes, or other obstruction) remain and must be removed before ISS can proceed.

Implementability

Alternative 1 would be the easiest to implement since it involves no action. The remaining alternatives, to varying degrees, all would have implementability issues. This is due in part not only to the nature of the activities that would be conducted for each alternative, but also because those activities are required in a very small footprint (approximately 1.2 acres) that itself presents significant implementation challenges.

Alternative 5 would be the most difficult alternative to implement. This is because it would require excavation (of approximately 26,000 cy of soil), ex-situ treatment, and backfilling of treated soil and additional clean fill to occur almost concurrently within a footprint of less than 1.2 acres. The construction activities may need to proceed in stages, but even in stages, excavation, treatment and backfilling all would be occurring within a particular stage. In addition, Alternative 5 would also need to meet substantive requirements of permitting related to assembly and construction of the thermal treatment unit as well as permitting for the release of treated off-gas emissions. Administrative challenges in obtaining the required thermal treatment air permit could be prohibitively difficult.

Alternatives 4 and 6 would require the excavation of 26,000 CY, and 21,000 CY, respectively, of contaminated soil for offsite disposal. While these alternatives do not include an on-site treatment component, they would require dewatering of soils excavated from below the water table and onsite treatment of the water before discharge to the stormwater system. In addition, the excavated soils would need to be sufficiently segregated based on characterization data into different stockpiles based on the ultimate disposition of the different categories of soil. The need to undertake all these components in the small site footprint could make Alternatives 4 and 6 only slightly less challenging then Alternative 5. However, the advantage offered by Alternatives 4 and 6 over Alternative 5 is that they could be implemented in phases, sequentially, in small portions of the site, without the need to consider excavation rates and locations relative to the input and output rates of the thermal treatment unit employed under Alternative 5. Therefore, Alternatives 4 and 6 are considered more implementable than Alternative 5.

Although excavation under Alternative 2 is limited to soils above the water table with PCB concentrations above 10 mg/kg, Alternative 2 would still require sufficient space to segregate excavated soils for appropriate offsite disposal based on characterization data. In addition, the ISS component of the alternative would require the completion of a wide range of performance tests in conjunction with S/S treatability studies to determine the effectiveness of the process on site soils and evaluate the potential long-term impact of VOC-contaminated groundwater (if any) on the stabilized materials. Nonetheless, Alternative 2 would be easier to implement than Alternatives 4 and 6.

The performance tests and S/S treatability studies also would be required for Alternative 3. Because Alternative 3 would use ISS to treat all soils with contaminant levels above PRGs, the impact of an increase in volume caused by the ISS treatment process would be greater under Alternative 3 than Alternative 2 and may cause an unacceptably large change to site elevations. Alternatives 3 and 2, respectively, would leave the largest and second largest amount of contaminants behind and the presence of the stabilized material, particularly for Alternative 3, would limit options for future re-use of the site. This may or may not be acceptable to the community. Both Alternatives 2 and 3 would require ongoing inspection, maintenance, and monitoring activities of the soil cap placed over the ISS-treated soils. These activities could be easily implemented using available materials, equipment, and labor resources.

Cost

A comparison of alternative costs is presented below.

Alternative	Estimated Capital Costs	Total Annual Cost	Total Periodic Cost	Total Present Worth
1	$0	$0	$0	$0
2	$13.9M	$360,000	$308,000	$14.3M
3	$6.1M	$360,000	$308,000	$6.4M
4	$18.1M	$0	$0	$18.1M
5	$15.1M	$0	$0	$15.1M
6	$16.4M	$0	$0	$16.4M

No costs are estimated for Alternative 1 as no action would be taken.

Alternative 4, which involves the excavation and offsite disposal of all contaminated soils exceeding PRGs, has the highest present value ($18.1M), but would result in the elimination of the principle threat waste.   No annual or periodic costs would be incurred under Alternative 4.

Alternative 6, which involves a targeted excavation of soils below the water table but would not achieve the groundwater protection RAO, has the next highest present value ($16.4M). No annual or periodic costs would be incurred under Alternative 6.

Alternative 5, which includes excavation and thermal treatment of soils exceeding PRGs and would be the most difficult alternative to implement, has the third highest present value ($15.1M). No annual or periodic costs would be incurred under Alternative 5.

Alternative 2, which combines excavation and offsite disposal with ISS to address soil contamination, has the fourth highest present value ($14.3M). Total annual and periodic costs for Alternative 2 are, respectively, $360,000 for cap maintenance and $308,000 for long-term monitoring.

Alternative 3, which uses ISS to treat all soils with contaminant concentrations exceeding PRGs but leaves the largest amount of contamination behind and would limit options for site re-use, has the lowest present value ($6.4M). The total annual and periodic costs for Alternative 3 are, respectively, $360,000 for cap maintenance and $308,000 for long-term monitoring.

Section 1

Introduction

CDM Federal Programs Corporation (CDM Smith) received Task Order No. 023 under the United States Army Corps of Engineers (USACE), Kansas City District Contract No. W912DQ-11-D-3004, to perform a remedial investigation (RI)/feasibility study (FS) at the Unimatic Manufacturing Corporation Superfund Site (the site) in Fairfield Township, Essex County, New Jersey. Figures 1-1 and 1-2 show the site location and Unimatic property boundaries.

1.1 Purpose and Organization of the Report

The purpose of the FS is to identify, develop, screen, and evaluate a range of remedial alternatives for the contaminated media and provide the regulatory agencies with sufficient information to select a feasible and cost-effective remedial alternative that protects public health and the environment from potential risks at the site. This FS report is comprised of five sections as described below.

- **Section 1 – Introduction** provides a summary of the RI, including study area description, history, and physical characteristics; RI sampling results; nature and extent of contamination; conceptual site model (CSM); and human health and ecological risks.

- **Section 2 – Development of Remedial Action Objectives and Technology Screening** develops a list of remedial action objectives (RAOs) by considering the characteristics of contaminants, the risk assessments, and compliance with applicable or relevant and appropriate requirements (ARARs). Section 2 also documents the quantities of contaminated media, identifies general response actions (GRAs), and identifies and screens remedial technologies and process options.

- **Section 3 – Development of Remedial Action Alternatives** presents the remedial alternatives developed by combining the retained technologies and process options.

- **Section 4 – Detailed Analysis of Remedial Action Alternatives** provides conceptual design assumptions for the alternatives. This section also provides a detailed analysis of each alternative with respect to the following seven criteria: overall protection of human health and the environment; compliance with ARARs; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume (T/M/V) through treatment; short-term effectiveness; implementability; and cost. Two additional criteria – state acceptance and community acceptance – are not evaluated in this FS. Assessment of state and community concerns will be completed after comments on the FS and proposed plan have been received by EPA and are addressed in the Record of Decision (ROD). This section also provides an overall comparative analysis of the remedial alternatives.

- **Section 5 – References** provides a list of reference used to prepare the FS.

1.2 Site Description

The site encompasses four properties, including the 25 Sherwood Lane property (the Unimatic Property), and the three adjacent properties: 30 Sherwood Lane to the east, 21 Sherwood Lane to the west, and a public water service delivery pipeline property for the Jersey City Municipal Utilities Authority (JCMUA) to the north. The former Unimatic facility is the only known source of soil contamination at the site. The site is in a primarily industrial area with residential subdivisions located approximately 800 feet to the northeast. The 25 Sherwood Lane Property (the Unimatic Property) covers approximately 1.23 acres and contains a centrally located, 22,000-square-foot building on a partially paved parking lot. The 22,000-square-foot building is a result of two expansions of the building between construction in 1955 and 1970. The property is fenced on all sides, with 2 gates located even with the front of the building providing access for each driveway. The western boundary is partially fenced and separates the 21 Sherwood Lane property from the Unimatic property. The 21 Sherwood Lane property is partially paved in the front with a single story business which is occupied by a single tenant. The JCMUA property is on the northern boundary of the Unimatic property. Historically no fence existed, however, New Jersey Department of Environmental Protection (NJDEP) secured the Unimatic property on all sides by installing a new cyclone fence which connected the rear of the western fence and ran along the northern and eastern property boundaries. The JCMUA property extends along the northern boundary of each Sherwood Lane property (21, 25 and 30 Sherwood). The new cyclone fence continues along the eastern property boundary of the Unimatic property separating it from 30 Sherwood Lane. The 30 Sherwood Lane property is a former large manufacturing facility (General Hose) which is surrounded by a large paved parking lot. The building has been refurbished and is currently occupied by several businesses.

The existing storm drain located on the northern boundary of the JCMUA property (north of the Unimatic Property) was not installed until the development of the office park in 1970. Prior to this time, surface runoff appeared to flow to the north; while after construction, the storm drain captured and carried runoff 1,000 feet to the west. Both current and historic pathways eventually lead to Deepavaal Brook.

Two aquifers in sedimentary and igneous rock layers beneath the site serve as sources of drinking water for the area. Two residential drinking water wells are in use approximately 0.28 to 0.35 miles to the northeast of the site. Eleven public supply wells, serving more than 20,000 people, are located between 2 and 4 miles from the site. Due to the groundwater contamination in the area, nearly all groundwater in the vicinity of the site is classified as a classification exception zone (CEA). This classification restricts the use of groundwater to non- potable purposes (Figure 1-3). A more detailed review of the past and current use of groundwater near the Site will be included in the comprehensive groundwater RI/FS planned for the Site.

1.3 Site History

The Unimatic Manufacturing Corporation (Unimatic) operated an aluminum die casting manufacturing process from 1955 until 2001. In multiple documents, Unimatic has indicated that a lubricating oil used in the manufacturing processes at the site contained polychlorinated biphenyls (PCBs) from at least 1970 until 1979 (Friedman 2005). The lubricating oil was splattered throughout the shop area and covered the floor and walls to a height of approximately

8 feet. Unimatic washed the PCB oils from the floor and walls into floor trenches, which subsequently conveyed the PCB-contaminated wastewater to pipes that discharged outside the building (Friedman 2011). The wastewater pipes consisted of both cast concrete and corrugated steel that leaked contaminated wastewater into underlying soil and groundwater prior to the discharge point at the northeast corner of the Unimatic Property.

National Pollutant Discharge Elimination System (NPDES) permits indicate that Unimatic discharged large volumes of production waste and wastewater through the leaking wastewater pipes from 1980 until 1998. The U.S. Environmental Protection Agency (EPA) and the New Jersey Department of Environmental Protection (NJDEP) issued numerous non-compliance and violation notices to Unimatic beginning in 1982; however, Unimatic continued to discharge large volumes of contaminated water through more than 200 feet of leaking wastewater pipes until 1988 at which time, Unimatic installed a recirculating cooling system that reportedly eliminated discharges to the environment. In 2001, Unimatic ceased all operations, and the New Jersey Industrial Site Recovery Act (ISRA) process was initiated. The Unimatic Property was sold to Cardean, LLC in 2002. Figure 1-4 illustrates historical areas of concern (AOCs) on the Unimatic Property identified by NJDEP.

1.4 Site Investigations

The following sections summarize both the historical field activities and the most recent remedial investigation performed at the site.

1.4.1 Previous investigations

Since Unimatic Manufacturing, Inc. ceased operations in 2001, continual investigations and remediation have taken place at the site. GZA Environmental, Inc. (GZA), a Unimatic consultant, investigated the site under NJDEP oversight. Since approximately 2005, EPA's Toxic Substances Control Act (TSCA) program has been assisting NJDEP in its oversight of the site.

The following investigation and remediation activities were conducted by GZA.

- October 2001 – PCB concentrations from soil samples collected from test pits and hand auger locations were found to exceed the NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (1milligram/kilogram [mg/kg]).

- October 23, 2001 – GZA removed three above ground storage tanks (ASTs) and one underground storage tank (UST) from the site, which reportedly contained fuel oil and naphtha. GZA excavated approximately 96 tons of petroleum-contaminated soil, which were shipped for offsite disposal. Post-excavation samples results indicated the levels of PCBs were above the NRDCSCC.

- November 2001 – PCB concentration from four samples collected below the approximate location of the former UST excavation contained PCB concentrations above the NRDCSCC.

- December 2001 – An investigation around the wastewater pipe indicated the presence of PCB concentrations above the NRDCSSC that extended at least 21 feet below ground surface (bgs). The water table was encountered at 19 feet bgs. GZA removed the wastewater pipe and excavated the surrounding PCB-contaminated soils down to the water table and the property boundary with 30 Sherwood Lane and the northern property boundary with JCMUA (the end of the pipe). Post-excavation soil samples and additional delineation samples indicated PCB contamination extends below the water table and across the northern and eastern property boundaries.

- May 2003 – GZA conducted an investigation to determine the extent of contamination beneath the building and the vertical and horizontal extent of the PCB-contaminated soils beyond the building footprint. PCB concentrations in samples collected beneath the building ranged from 0.22 to 236 mg/kg. PCB concentrations in exterior samples ranged from 0.069 to 2,177 mg/kg.
- October and November 2003 – GZA excavated 2,100 tons of impacted soils in areas identified as the Former AST Area, the Former Main Wastewater Pipe, and the Downward Sloping Wedge North of the Building and shipped the soil for offsite disposal. These excavations extended between 9 and 22 feet bgs.
- February and March 2005 – GZA conducted a series of interior sampling activities, including chip, wipe, and concrete core sampling. Results indicated that PCB contamination was present in the building and had migrated downward in the concrete.
- May 2011 – GZA assessed the interior paint of the facility to evaluate its potential to release PCBs. Wipe samples collected indicated the PCB concentrations increased by two-fold after the removal of the paint. In addition, paint chip sample PCB concentrations analyzed for six locations ranged from 48 to 380 mg/kg.

The February 2011 remedial investigation report/remedial action work plan (RIR/RAWP) submitted to NJDEP by GZA indicated that widespread PCB contamination remained in the subsurface soil at the site, both beneath and outside the footprint of the building. Groundwater at the site remained contaminated with PCBs. The RIR/RAWP proposed a remedy of capping, institutional controls (ICs), and a CEA for the onsite volatile organic compound (VOC) contamination due to the effects of the other nearby contamination sites.

EPA Removal Site Evaluation

In response to a May 9, 2012 request from NJDEP, EPA initiated a removal site evaluation (RSE) to determine if a removal action was warranted at the site. EPA investigations included an extensive surficial soil sampling event and a building interior sampling event for PCBs, including sampling of air, concrete chip, building surfaces, dust, and materials from items within the facility. Results indicated a release of PCBs to the environment from the building at the site and confirmed that past cleanup efforts had not adequately addressed the PCBs in surface soils. The results of EPA's sampling depicted a building interior that is contaminated with PCBs.

On March 8, 2013, the New Jersey Department of Health (NJDOH) issued a letter to NJDEP categorizing the current and future use of the site as a public health hazard and recommended the relocation of the workers. In response to the NJDOH recommendation, Frameware, Inc., a tenant, moved its operation to a new facility in July 2013. Cardean, LLC, the current property owner, intends to maintain the electrical service and security of the building for the foreseeable future. However, the building interior space will not be reoccupied.

Data collected as part of the EPA RSE along with other historically obtained data by EPA were used to complete a hazard ranking system review of the site. The site was added to the National Priorities List on May 8, 2014. In April 2015, NJDEP installed a chain link fence to secure the property, and in June 2015, the current RI was initiated.

1.4.2 2015 Remedial Investigation

CDM Smith performed the initial RI field investigation between June 8, 2015 and July 29, 2015 to investigate the nature and extent of contaminated soil and contaminated building structures/materials. A supplemental soil investigation was performed at the adjacent 30 Sherwood Lane property between February 8 and February 18, 2016 (CDM Smith 2016). The major RI field activities are listed below.

- Completion of a topographic survey, a subsurface utilities survey, and a hazardous building materials survey
- Ecological characterization of the site
- Soil investigation phase 1 - Collection of 447 soil samples from 75 soil borings locations on a 30-foot by 30-foot grid (including area underlying the Unimatic building and two adjacent properties) for analysis of VOCs, semi-volatile organic compounds (SVOCs), metals, pesticides, PCBs (Aroclors), polychlorinated biphenyl congeners, and dioxin/furans
- Soil investigation phase 2 - Collection of 66 soil samples from 6 soil boring locations on the 30 Sherwood Lane property for PCB analysis
- Collection of 16 concrete floor cores inside the Unimatic building prior to advancing each of the 16 soil borings located below the slab of the facility, with collection of concrete samples for PCB analysis at the top and bottom of each concrete core
- Collection of 12 wipe samples located on a metal manufacturing press, 3 photovoltaic cabinets, and a solar panel cabinet for PCB analysis
- Collection of groundwater samples for analysis of VOCs, SVOCs, PCBs, pesticides, metals, and dioxins/furans from 11 onsite monitoring wells, including one well formerly thought to be abandoned but was discovered by CDM Smith personnel
- Collection of two rounds of synoptic water level measurements

In addition to the collection of concrete core and wipe samples in the building, a buildings material survey was completed. CDM Smith's building survey subcontractor, EnTech Engineering, P.C, performed a hazardous material building survey on the onsite building to determine the amount and type of hazardous materials present in the Unimatic building in order to help determine costs of potential demolition and disposal. Visual observations and portable X-ray fluorescence lead measurements indicated the presence of lead and PCB-containing materials within the building. Samples were collected for lead (in paint), asbestos (ceiling and floor tile), and PCBs (in grout and window caulk).

A brief summary of the RI sample results is presented in Section 1.6 discussion of nature and extent of contamination. Soil boring and monitoring well locations are shown on Figure 1-5.

1.5 Physical Setting

The following subsection presents the physical characteristics of the study area, including the topography and drainage, geology, and hydrogeology.

1.5.1 Topography and Drainage

The Unimatic Property sits at a higher elevation than surrounding properties, with topography generally sloping away from the facility in all directions. Elevations on the site range from approximately 190 feet above mean sea level (amsl) near the southern portion of the building to approximately 176 feet amsl in the northeastern corner of the site.

Stormwater runoff from the front of the facility and southern portion of the eastern parking lot flows south toward stormwater catch basins on Sherwood Lane. Runoff on the remainder of the property generally flows north, northwest, and northeast toward the adjacent properties at 21 and 30 Sherwood Lane and toward the JCMUA property, which is 6 to 8 feet lower in elevation than the Unimatic Property.

Runoff to the JCMUA property collects at the base of the slope from the Unimatic Property in a narrow vegetated area. During heavy rainfall conditions, runoff in the vegetated area drains to a stormwater basin adjacent to the parking lot north of the JCMUA property, which conveys stormwater runoff from the site and the adjacent parking lot to the west, discharging to one of the unnamed tributaries of Deepavaal Brook. The unnamed tributaries to Deepavaal Brook are located approximately 1,000 feet north of the site. Deepavaal Brook eventually drains into the Passaic River located approximately a half-mile northeast of the site.

1.5.2 Geology

The site is located within the Piedmont Physiographic Province, which is underlain by Triassic and Jurassic aged rocks overlain by glacial and alluvial deposits. The site lies in the Passaic River floodplain of northern New Jersey, just west of the highlands of the Watchung Mountains. The surficial geologic deposits encountered at the site were consistent with regional geology.

Soils at the site are made up of three distinct layers, with a total depth of approximately 30 to 40 feet. From oldest to youngest (bottom to top), the layers encountered include 10 to 12 feet of stratified coarse sands and gravels of glacial origin. Overlying the coarse glacial deposits on the northern half of the site is a 10- to 12-foot thick silty clay unit, which appears to pinch out at the northern edge of the Unimatic building. The youngest and most shallow deposits observed on the site consists of 15 to 20 feet of silty sands. Above the silty sand at the site, approximately 2 to 10 feet of sandy fill appears to have been used to level the surface of the property. In several areas, the fill is similar to native materials, likely a result of being reworked during site development. During previous remedial actions, the site underwent extensive excavation of PCB-contaminated soils and eventual backfill. Gravelly fill was reportedly brought to the site, but it is likely excavated soils were backfilled into the excavations as well. Underlying the unconsolidated sediments is the Preakness Mountain Basalt Formation, which was encountered between approximately 34 to 50 feet bgs (140 to 160 feet amsl).

1.5.3 Hydrogeology

In the site vicinity, groundwater occurs in both the overburden and the underlying Preakness Basalt bedrock. Groundwater in both aquifers is generally expected to move toward the north, eventually discharging to the Passaic River or its tributaries. The majority of site monitoring wells are screened in the overburden aquifer

During the RI, groundwater was encountered between 7 and 15 feet bgs within the unconsolidated sediments. No site-specific measurements of the hydraulic conductivity have been collected but based on the lithology, the various overburden lithologic zones are comparable to typical glacial and fluvial deposits. It is important to note that the site wells are clustered on the northern end of the property and do not consistently screen the same lithologic intervals, therefore, providing a limited snapshot of groundwater flow at the site. Water table elevations measured during the RI field investigation suggest a southerly groundwater flow direction, which is opposite of the general regional flow; this is likely caused by groundwater mounding in zones overlying the clay layer and is not necessarily representative of site-wide groundwater flow direction. Localized groundwater would be expected to flow radially away from the mounded areas, to underlying permeable zones of coarse sand and gravel. This is evidenced by groundwater elevations in wells south of the clay layer, which are approximately 15 feet bgs while groundwater levels in wells screened in and around the clay layer were higher, at 7 to 11 feet bgs.

Only one bedrock well is installed at the site, and when comparing the water levels to the wells installed in the overburden above the bedrock well, the bedrock zone appears to show a slight upward gradient. The boring log for the onsite bedrock well (MW-4B) shows water-bearing fractures encountered at depth intervals of 38 to 43 feet bgs (weathered bedrock surface) and 55 to 60 feet bgs (a fracture zone). The well is installed to screen the 55 to 60 feet bgs fracture interval, suggesting that the overlying less permeable bedrock may act to confine the lower zone.

1.6 Nature and Extent of Contamination

The characterization of site conditions emphasizes the spatial distribution of contaminants in site media. This section discusses the type and distribution of contamination at the site. The media investigation included building materials, surface and subsurface soils, and groundwater.

1.6.1 Screening Criteria

The RI screening criteria (Table 1-1) were selected to evaluate contaminants detected in study area media. Whenever possible, established regulatory criteria, known as chemical-specific ARARs, were used for the screening criteria values. In the absence of ARARs, guidance values, known as "to be considered" (TBC), were used. In general, the RI soil screening criteria were selected from the lowest of the NJDEP Non-Residential Direct Contact Soil Remediation Standards (NJNRDCSRS), EPA Regional Screening Levels (RSLs) for industrial soil, and various ecological screening levels. The soil screening criteria for dioxins and furans is the NJDEP proposed soil remediation standard for 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8- tetraclorodibenzodioxin [2,3,7,8-TCDD]). The groundwater screening criteria is the lowest of the NJDEP Groundwater Quality Standards New Jersey Administrative Code (N.J.A.C.) 7:9C, New Jersey maximum contaminant levels (MCLs), Federal Drinking Water Standards (EPA MCLs), the EPA RSL for

Tapwater (cancer risk = 1 x 10^{-6} [1 in 1 million]; noncancer hazard quotient [HQ] = 0.1). The screening criterion for total toxic equivalence quotient (TEQ) 2,3,7,8-TCDD is the practical quantitation limit listed in the NJDEP Groundwater Quality Standards N.J.A.C. 7:9C-1.7.

1.6.2 Summary of Nature and Extent of Contamination

Primary contaminants of concern at the site are PCBs and pesticides. PCBs were discharged during Unimatic manufacturing processes that spread lubricants onto the building floors and walls. The lubricants were reportedly then rinsed into floor trenches in the building or washed directly to soils out the back doors of the facility. Pesticides were detected at elevated concentrations and have a similar distribution to PCBs.

Presentation of PCB Data

All soil and groundwater PCB samples were analyzed for all PCB Aroclors, and a sub-set of the samples were analyzed for PCB congeners. No consistent relationship could be drawn between the concentrations detected for total Aroclors vs. total PCB congeners. However, in every case where concentrations exceeded 1 milligram per kilogram (µg/kg) for total Aroclors, the corresponding total PCB congener result also exceeded 1mg/kg. Of the 10 total PCB congener samples, 80 percent exceeded 1 mg/kg.

PCBs were detected at the site as both Aroclor 1248 and Aroclor 1254. Aroclor 1254 was only detected in 11 percent of the soil samples (in comparison to Aroclor 1248 in 78 percent of the soil samples) collected at the site. The focus of the data discussion in the FS report will be on total Aroclor, referred to as total PCBs.

<u>Building Materials</u>

EPA's 2012 sampling event revealed high concentrations of PCBs in building materials and on surfaces in areas where active manufacturing processes took place. Building material samples included concrete chip samples from building walls and floors, material samples from equipment, and wipe samples from walls, floors, and equipment. Mean concentrations of Aroclor 1248 and Aroclor 1260 in floor samples were 270 and 34 mg/kg, respectively. Wall chip samples contained Aroclor 1248 and Aroclor 1260 at concentrations ranging from 1.0 to 1,400 mg/kg and 0.33 to 760 mg/kg, respectively. Concrete and wipe sampling results from the 2015 RI confirmed high concentrations of PCBs remain within the building structure. Concrete core results indicated that PCBs have seeped through the concrete floor, generally decreasing in concentration with depth. High concentrations were observed in the bottom portions of the concrete foundation in the sorting/packing room, the pressing room, the former receiving room, and the former casting room, indicating that PCBs have seeped through the concrete and into the soil underneath.

The hazardous building materials survey indicated limited amounts of other hazardous building materials, including some asbestos in window putty glazing, some lead paints, and PCB-containing grouts. Results from the hazardous building materials survey were typical for a building of this age.

PCBs in Soil

Results from the EPA soil investigation in 2012 indicated that past cleanup efforts at the site did not adequately address the PCBs in surface soils. Additional sampling conducted by CDM Smith for the RI in 2015 found that in most areas (the northern two-thirds) of the Unimatic property, PCB concentrations in soil are above 1 mg/kg and generally decreased with depth. The highest concentrations of PCB contamination are generally confined to the Unimatic Property, but PCBs have migrated off of the Unimatic Property in all directions except south. PCBs migrated to the north and west via surficial runoff and to the west where contamination has been discharged from the former outfall pipe. PCB concentrations in soil only exceeded 1 mg/kg below the water table in areas related to the direct release of PCB-laden wastewater. RI sample locations are shown on Figure 1-5. These areas of PCB release are as follow:

- ***Soils Below the Unimatic Building*** – Total PCB concentrations exceeding 50 mg/kg were encountered in soils immediately below the concrete slab and throughout the soil column to depths just above the water table (18 feet bgs), primarily below the former receiving room and the former casting room of the Unimatic building. The highest concentrations in soils below the building were co-located with the highest concrete core sample concentrations, indicating that PCBs seeped through the concrete in these areas and impacted underlying soils to a higher degree.

- ***Soils Adjacent to Former Outfall Pipe*** – PCB laden rinse water leaked into the soils in the area around the former outfall pipe along the eastern side of the Unimatic Property. Soils in this area were more contaminated than in other portions of the site, as PCB concentrations consistently exceeded 50, mg/kg. Unlike the majority of the site where PCB concentrations decreased below the water table, in this area, soils with PCB concentrations exceeding 50 mg/kg were encountered below the water table down to 18 feet bgs and above 1mg/kg down to the bedrock surface.

- ***Other Surficial Discharge*** – Rinse water discharged to surface soils at the side and rear doors of the Unimatic building followed the topography, creating surface runoff pathways through which PCBs were deposited onto the surface soils. The water then infiltrated the soils, depositing PCBs into subsurface soils. The water then infiltrated the soils, depositing PCBs into subsurface soils. High levels of PCB contamination were found along the eastern and western side of the building near side doors and on the northern side of the building near the rear of the former receiving room and the shipping room. The highest total PCB concentrations likely attributed to the surface discharge pathway were found in D-11 (1,300 mg/kg and 1,200 mg/kg from 2 to 6 and 6 to 10 feet bgs, respectively).

PCBs have migrated off of the Unimatic Property to the north, east, and west via surficial runoff and discharge from the former outfall pipe. The following describes the extent of PCBs in soils found outside the boundaries of the Unimatic Property, which also characterizes the lateral extent of contamination at the Unimatic Site since nearly all the Unimatic Property is contaminated with PCBs:

- ***30 Sherwood Lane*** – PCB contamination was observed on 30 Sherwood Lane in the area of the former outfall pipe along the eastern property line of the Unimatic Property. PCB concentrations exceeding 50 mg/kg were observed above and below the water table in seven boring locations, with the highest observed at 180 mg/kg. Six additional borings have subsequently been installed and delineated the PCB contamination to generally less than 75 feet from the Unimatic property line.

- ***21 Sherwood Lane*** – Only one surficial soil sample on the property to the west of the Unimatic Property contained total PCB concentrations above 1 mg/kg. The sample found total PCBs at 10 mg/kg and was collected along a surficial runoff pathway. PCB contamination to the west of the Unimatic Property appears to be confined to the Unimatic Property line except for limited surficial contamination.
- ***JCMUA Area*** – The highest concentrations of total PCBs (up to 14 mg/kg) in the JCMUA area soils were encountered in the vicinity of the discharge from the former outfall pipe. PCB concentrations generally decreased with depth although samples were not collected below 6 feet bgs. The highest PCB concentration was 14 mg/kg. PCB contamination was not delineated to the north of the JCMUA area, but it is likely that surficial contamination may follow surficial runoff migration pathways leaving this area.

Pesticides in Soil

Aldrin and dieldrin were the two pesticides most frequently detected above the NJNRDCSRS criteria (200 µg/kg) throughout the site in surface soils and in a third of the samples from 2 to 6 feet bgs. Hotspots of these pesticides coincided with PCB hotspots, including below the northern portion of the building, the entire eastern side of the Unimatic Property, and north of the building, suggesting that the pesticides were deposited in a similar fashion as the PCBs. Other pesticides were also detected at high concentrations with a similar distribution (see Appendix B). Based on this data it is possible that pesticides were utilized and discharged from the Unimatic building.

Other Contaminants in Soil

Dioxin/furan concentrations did not exceed the NJDEP proposed soil remediation standard for 2,3,7,8-TCDD of 0.7 µg/kg. Detections of dioxins and furans correlate spatially with the distribution of PCBs sufficiently to suggest that it is likely that the dioxins/furans were generated from the aluminum die casting process at the Unimatic property.

The most frequently detected VOCs were various CVOCs, acetone, and toluene. None were detected above the NJNRDCSRS. Toluene was primarily found in shallow soils beneath the facility. The majority of CVOCs are detected below the water table, related to chlorinated groundwater contamination.

The most frequently detected SVOCs included several polycyclic aromatic hydrocarbons (PAHs) and bis(2-ethylhexyl) phthalate. Only three PAHs: benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene were detected above the NJNRDCSRS. Nearly all of the PAHs detected above the NJNRDCSRSs were found on either the 21 Sherwood Lane property or on the JCMUA right of way, which suggests that PAHs are not related to the Unimatic Property.

Only one detection of metal in soil, manganese, exceeded the NJNRDCSRS. This sample was collected on the eastern side of the Unimatic property (25 Sherwood Lane).

Contents in Groundwater

- PCBs in groundwater at the site are found throughout the saturated overburden and in the upper portion of the bedrock. The highest levels of PCBs in groundwater were found in the wells in the northeast portion of the property, specifically in the MW-4 cluster (as high as 270 micrograms per liter [µg/L]).

- Pesticides exceeding RI screening criteria included dieldrin, gamma-hexachlorocyclohexane (BHC), trans-chlordane, 4,4'-dichlorodiphenyldichloroethene (4,4'-DDE), and 4,4'-dichlorodiphenyltrichloroethane (4,4'-DDT). Dieldrin exceeded its criterion in eight samples, gamma-BHC and trans chlordane exceeded their criterion in two samples, and 4,4'-DDE and 4,4'-DDT only exceeded their criterion in one sample. The highest levels of pesticides were found in the northeast portion of the property, specifically in the monitoring well cluster MW-4.

- Chlorinated VOCs exceeding the RI screening criteria included trichloroethylene (TCE), vinyl chloride (VC), tetrachloroethylene, 1,1-dichloroethylene, cis-1,2-dichloroethene (cis-1,2-DCE), 1,1,1-trichloroethane (1,1,1-TCA), and 1,1-dichloroethane (1,1-DCA). TCE and VC exceeded RI screening criteria in seven samples each, with maximum concentrations of 2,600 and 67 µg/L, respectively, in the MW-4 monitoring well cluster.

- Aluminum, cobalt, iron, manganese, and sodium were the only metals to exceed the RI screening criteria in the majority of the 11 wells sampled for total metals analysis.

- Two samples collected from two wells, MW-4 and MW-4a, exceeded the RI screening criterion for dioxins/furans.

The preliminary groundwater investigation at the site was completed to evaluate the feasibility of remedial technologies and assist with estimation of dewatering and disposal costs of remedial alternatives. A comprehensive groundwater investigation is planned as OU2 to determine the full extent of the groundwater contamination found beneath the site.

Principal Threat Waste

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. EPA's August 1990 guidance, entitled: "A Guide on Remedial Actions at Superfund Sites with PCB Contamination", states that principal threats will include soils contaminated at industrial sites at concentrations greater than or equal to 500 ppm total PCBs. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element. For this site, the areas with the highest contamination are located under the Unimatic building and along the eastern side of the property, with the highest detected PCB concentration at 7,000 ppm, which is an order of magnitude above the principal threat waste threshold. This highly contaminated soil poses direct contact risks to human health (risks for current and future workers are greater than EPA's target cancer risk range under the RME scenario) and also acts as a continuous source of groundwater contamination (PCBs were detected in all groundwater samples except the most upgradient well, highest near MW-4 cluster). In accordance with the EPA guidance, treatment alternatives are considered for the principal threat wastes at the site. In instances where treatment is not implementable, other methods such as removal or containment that significantly reduce or eliminate the risks due to principal threat wastes are considered.

1.7 Conceptual Site Model

The CSM follows the movement of the primary contaminants of concern from the manufacturing process to the site media, including the building structure, overburden soil, and groundwater.

Sources of PCB Contamination

The aluminum die casting manufacturing process used by Unimatic is a high heat metal casting process that necessitated the use of a cooling/lubricating spray which, at the Unimatic Site, reportedly contained PCBs within naphtha or mineral spirits.

Possible contaminant sources, other than the manufacturing process, included ASTs, USTs, and an onsite septic tank. These areas were investigated during the initial New Jersey ISRA investigation and included the removal of all storage tanks, except for the septic tank. The areas where tanks were removed were included within the RI investigation grid though the RI results suggest most contamination that may have come from the tanks likely was removed during the early ISRA project work.

Sources of Pesticide Contamination

Pesticides were selected to be analyzed as part of the comprehensive RI sampling regime. The RI data showed elevated levels of several pesticides in the intervals sampled (0-2 feet bgs and 2-6 feet bgs) at many locations across the Site, consistent with areas of elevated PCB contamination. The highest concentrations of pesticides were detected in the same areas as high concentrations of PCBs, including below the Unimatic building and in the vicinity of the former discharge pipe. Based on this data it is possible that pesticides were utilized and discharged from the Unimatic building.

Pathways for Contaminant Release/Transport

The aluminum die casting manufacturing process used by Unimatic is a high heat metal casting process, which necessitates the use of a cooling/lubricating spray which, at the Unimatic Site, reportedly contained PCBs within naphtha or mineral spirits. The spraying process spread the contaminants on walls, floors, and possibly ceilings and throughout the manufacturing areas of the building through airborne particles.

Former Outfall Pipe – The manufacturing area floors were periodically washed down into floor trench drains. These drains were connected to underground piping that discharged this wastewater to the ground at the northeastern corner of the property. These pipes were discovered during the initial New Jersey ISRA investigation to have not been properly connected roughly midway along the pipe run, at a point 100 feet from the end of the pipe at a point approximately even with the end of the building. This leak in the drain pipe spread contaminants into the subsurface soil along and below the drain pipe.

Former USTs and ASTs - The lubricating oil, and/or components of the mixture were suspected to have been stored all or in part in USTs and ASTs that reportedly leaked to the subsurface. Even after removal by GZA, elevated concentrations of PCBs were detected in this area.

Other Contaminated Water Discharge – Historical documents discuss, and aerial photographs show, that occasionally the manufacturing floors were washed down and allowed to drain directly on to the surface of the property through doors on the sides and rear of the building. This procedure may account for some of the surficial and shallow contamination detected during past investigations and this RI.

Contamination Below the Unimatic Building – The integrity of the concrete floors, drain pipes, sumps, or other structures below the building floors is also a suspected pathway. Samples of the porous concrete floor indicate that some contamination spread to the soil via saturation through the floors.

Historical Releases –Historical aerial photographs revealed three stages of construction at 25 Sherwood Lane. This revealed that it is possible that some of the contamination found underneath the current existing building may have been present prior to construction. Essentially, the initial building was a small structure equivalent to the current front of the building with the lowest height. The manufacturing process and poor housekeeping practices, such as washing the floors onto the property surface soils, may have spread contaminants to surficial and shallow soils. Later, the building expanded to the north and then to the west and north in two stages, with completion around 1970. These expansions may have been built over areas that were already contaminated by earlier Unimatic activities. The construction activity itself may also have spread the contamination from construction excavations and site leveling.

Dust/Vapor Discharge – Further outlets that may have spread contamination throughout the building and outside included exhaust fans on the roof of the building, windows, and doorways. It is notable that more windows are present on the western side of the Unimatic building.

Based on the results of this RI as well as that of past investigations, the locations where higher concentrations of total PCBs were found are located along these known contaminant pathways. The manufacturing process resulted in contamination of building structure/materials such as walls, floors, and piping.

<u>Pathways for Transport of Contamination Off of the Unimatic Property</u>

Former Outfall Pipe – The process wastewater flowed from the floor trench drains to the drain pipe. The drain pipe discharged to the northeast property boundary onto the JCMUA property to the north.

Prior to the 1970s, a drainage ditch conveyed runoff to an unnamed tributary toward Deepavaal Brook to the north. After 1970, a stormwater drain was installed in the area where the former wastewater drain pipe discharged at the northeastern corner of the Unimatic Property. This stormwater pipe eventually discharges into the main branch of Deepavaal Brook, directly west of the site near New Dutch Lane (Rt. 662). An investigation of these sediments, along with a comprehensive groundwater investigation is planned for the site as Operable Unit 2 (OU2).

Runoff – Surficial runoff transported contaminants from localized areas of surface soil contamination to other areas of the Unimatic Property as well as to the properties adjacent to the 25 Sherwood property, including the 21 Sherwood Lane property to the west and the 30 Sherwood Lane property to the east. Contaminants can be transported in either a dissolved state in the organic solvents (naphtha or mineral spirits) or adsorbed to soil particles or organic matter.

Dust/Vapor Discharge – Finally, transport of fine spray, dust, and particulates in air through building vents, windows, and doorways likely contributed to the largely surficial soil contamination found in the adjacent property to the west and north of the Unimatic Property.

1.8 Risk Assessments

The site-specific human health risk assessment (HHRA) and screening level ecological assessment (SLERA) are summarized below.

1.8.1 Human Health Risk Assessment

The HHRA is developed to characterize potential human health risks associated with the site in the absence of any remedial action. The HHRA is conducted in accordance with the RI work plan and current EPA guidance outlined in *Risk Assessment Guidance for Superfund (RAGS)*, Parts A, D, E, and F and other EPA guidance pertinent to human health risk assessments.

Exposure Assessment

Potential exposure pathways at the site are defined based on potential source areas, release mechanisms, and current and potential future uses of the site. Potential current and future receptors evaluated in the risk assessment include:

- Workers
- Trespassers
- Construction/Utility Workers

Exposure pathways evaluated for soil include ingestion of and dermal contact with soil and inhalation of particulates from soil by workers, trespassers, and construction/utility workers. In addition, exposure pathways evaluated for workers include inhalation of vapor through vapor intrusion. Note that groundwater was not evaluated in the risk assessment. Although groundwater samples were collected to support development and costing of remedial alternatives for the FS, groundwater will be investigated as a separate operable unit.

Chemicals of potential concern (COPCs) are identified based on criteria outlined in RAGS, primarily through comparison to risk-based screening levels. One VOC, three SVOCs, two PCBs (Aroclor 1248 and Aroclor 1254), nine pesticides, and four metals are identified as COPCs for further evaluation in the HHRA. Exposure point concentrations (EPCs) for the COPCs are used in the exposure assessment calculations to estimate potential chemical intake. The EPC is the lower of the upper confidence limit of the mean or the maximum detected concentration.

Quantification of exposure includes evaluation of exposure parameters that describe the exposed population (e.g., contact rate, exposure frequency and duration, and body weight). Each exposure parameter in the equation has a range of values. Daily intakes are calculated based on the reasonable maximum exposure (RME) scenario (the highest exposure reasonably expected to occur at a site). The intent is to estimate a conservative exposure case that is still within the range of possible exposures.

Toxicity Assessment

COPCs are quantitatively evaluated on the basis of their noncancer and/or cancer potential. The reference dose and reference concentration are the toxicity values used to evaluate noncancer health hazards in humans. Inhalation unit risk and slope factor are the toxicity values used to evaluate cancer health effects in humans. These toxicity values are obtained from various sources following the hierarchy order specified by EPA.

Risk Characterization

Risk characterization integrates the exposure and toxicity assessments into quantitative expressions of risks/health effects. To characterize potential noncancer health effects, comparisons are made between estimated intakes of substances and toxicity thresholds. Potential cancer effects are evaluated by calculating probabilities that an individual will develop cancer over a lifetime exposure based on projected intakes and chemical specific dose-response information. In general, EPA recommends target risk values, i.e., cancer risk of 1×10^{-6} to 1×10^{-4} (1 in 10,000) or noncancer health hazard index (HI) of unity, as threshold values for potential human health impacts. These target values aid in determining whether additional remedial action is necessary at the site. Risks for all receptors are estimated using RME assumptions. Risks are also estimated using CTE assumptions when the RME assumptions resulted in risk estimates above EPA's thresholds.

For the current and future land-use scenario, the estimated cancer risks for trespassers and construction/utility workers are within EPA's target range of 1×10^{-6} to 1×10^{-4} under the RME scenario. Risks for current and future workers are greater than EPA's target cancer risk range due to Aroclor 1248 but at the upper end of the EPA's target cancer risk range for the CTE scenario. The total HIs for all current and future receptors under both RME and CTE scenarios are above the EPA's threshold of unity (1). The noncancer HIs for eyes, fingers, toenails, and immune system exceed the EPA threshold of unity due to exposure to Aroclor 1248.

Lead was evaluated separately and does not appear to be a concern for all receptors evaluated under both current and future land-use scenarios. Results of indoor air screening indicated that current and future workers could be exposed specifically to concentrations of Aroclor 1242 via inhalation of vapor emanating from within enclosed structures and into ambient air via vaporization.

1.8.2 Screening Level Ecological Risk Assessment Summary

A SLERA was conducted as part of the RI/FS and provides a preliminary evaluation of ecological risks from contaminants in soil to terrestrial environments present at the Site. The objective of this SLERA is to evaluate the potential for ecological receptors at the Site to be exposed to Site-related contaminants in surface soil (0 to 2 feet) and potentially suffer adverse effects from such exposures. Conservative assumptions are used to identify exposure pathways and, where possible, to quantify ecological risks. The SLERA was is prepared in accordance with EPA guidance (EPA 1997, 1998).

Ecological Investigations and Presence of Threatened and Endangered Species

An ecological reconnaissance was performed at the Site, focusing on areas that exhibited suitable/marginal habitat for ecological receptors. The property at 25 Sherwood Lane had limited habitat, with a neglected landscaped patch containing ornamental trees by the front of the building and sparse vegetation growing out of the gravel lot and in the cracks of the driveway. In addition, trees and sparse patches of invasive vines, grasses, and wildflowers grew around the fence lines in the area between the chain link fence line at 25 Sherwood Lane and the wooden fence line at 30 Sherwood Lane. No wildlife was observed, but three distinctly different types of animal droppings were observed; they may belong to deer or small mammals such as rabbits or rodents. The 21 Sherwood Lane property had well-manicured grass with ornamental landscape trees. Wildlife observed on the property included two northern mockingbirds (*Mimus polyglottos*). The JCMUA right of way consists of manicured fescue grasses intermixed with sparse patches of common weed species such as dandelion and crabgrass. Where the right of way transitions from the fescue grasses to an upgradient slope toward the property, the vegetative cover became denser. Tree species include eastern cottonwood (*Populus deltoids*) and American sycamore (*Platanus occidentalis*), with the understory consisting of dense patches of Japanese knotwood (*Polygonum cuspidatum*). Evidence of wildlife at the right of way included animal droppings similar to those observed at the property. The ecological reconnaissance conducted at the Site concluded that the Site has limited vegetation and wildlife and little to no viable habitat to support ecological receptors at the Site.

In addition, information regarding threatened and endangered species that may exist at or in the vicinity of the study area was requested from USFWS via EPA and NJDEP. USFWS reported that there is one endangered species, Indiana bat (*Myotis sodalist*), one threatened species, northern long-eared bat (*Myotis septentrionalis*), and no critical habitats within the project area. The NJDEP Natural Heritage Program reported that their records indicate that on or in the immediate vicinity (within ¼ mile) of the Site there is no occurrence of any threatened or special concern species except great blue heron (*Ardea Herodias*), which is a special concern species. Indiana bat, northern long-eared bat, and great blue heron were not observed during the ecological reconnaissance, and onsite habitat appeared unsuitable for these species.

Assessment and Measurement Endpoint

For this SLERA, the following assessment endpoint and measurement endpoint were selected to evaluate whether contaminants in surface soil (0 to 2 feet) pose a risk to ecological receptors:

- Assessment Endpoint 1: Viability (survival, growth, and reproduction) of terrestrial or soil-associated ecological receptors/communities
- Measurement Endpoint 1: Evaluate the toxicity of surface soil by comparing maximum-detected concentrations to chemical specific ecological screening levels (ESLs) for soil

Data Evaluated in the Screening Level Ecological Risk Assessment

The SLERA evaluated exposure to chemicals through direct contact with surface soil (0 to 2 feet). A total of 48 soil samples were collected and evaluated in this SLERA. All soil samples were analyzed for target compound list VOCs, SVOCs, pesticides, and PCBs and target analyte list inorganics, including mercury. PCB congeners, dioxins, and furans were also analyzed but were not included in the SLERA evaluation because analytical results of PCB congeners, dioxins, and furans were not available when this report was prepared. The maximum detected concentration of each chemical serves as the exposure concentration for this SLERA. Maximum concentrations are compared to screening level ESLs to derive a screening level hazard quotient (HQ). If resultant HQs are greater than unity (1), risk is implied. An HQ less than 1 suggests there is a high degree of confidence that minimal risk exists and, therefore, are considered insignificant.

Summary and Conclusions

Based on a comparison of maximum detected concentrations of chemicals in site surface soil (0 to 2 feet) to conservatively derived ESLs, the potential for ecological risk may occur. Specifically, HQs greater than 1 indicate potential risk from exposure to the following chemicals in soil:

- VOCs: Acetone

Acetone was detected in 11 of 48 samples with an HQ of 1.9. There is no historical information to indicate that acetone is a Site-related contaminant. Thus, acetone is not retained as a chemical of potential concern (COPC).

- SVOCs: benzo(a)anthracene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, chrysene, fluoranthene, and pyrene

These 6 SVOCs were detected frequently (35 or more out of 48 samples). The maximum concentrations of all 6 of these SVOCs, except bis(2-ethylhexyl)phthalate, were qualified as "J+" indicating these concentrations are not only estimated but also biased high. HQs of these 6 SVOCs range from 2 (benzo[a]anthracene and chrysene) to 9 (pyrene). Similar to acetone, there is no historical information to indicate that SVOCs are site-related. Thus, these 6 SVOCs are not retained as COPCs.

- Pesticides: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aldrin, alpha-chlordane, gamma-chlordane, dieldrin, endosulfan I, endrin, endrin aldehyde, gamma-BHC, heptachlor, and heptachlor epoxide

Thirteen out of 18 detected pesticides had HQs above 1. Aldrin, dieldrin, and heptachlor had the highest HQs (6,325, 4,082 and 3,177, respectively); 4,4'-DDE, 4,4'-DDT, and endrin had HQs above 100, ranging from 198 (endrin) to 410 (4,4'-DDE). The remaining 7 pesticides had HQs below 100, ranging from 2 (4,4'-DDD) to 80 (gamma-BHC). There is no historical information to indicate that the pesticides are site -elated, as well as no records to determine the sources of pesticides detected at the site. However, pesticides detected are found to be co-located with PCBs at the site (CDM Smith 2016).

- PCBs: Aroclor 1248 and Aroclor 1254

Aroclor 1248 and Aroclor 1254 had HQs of 6,199 and 15, respectively. Aroclor 1248 was detected in 44 of 48 samples, with the maximum detected concentration of 2,300 milligrams per kilogram (mg/kg). Aroclor 1254 was detected in 11 of 48 samples, with the maximum detected concentration of 5.6 mg/kg. Both Aroclors are Site-related contaminants.

- Inorganics: antimony, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, vanadium, and zinc

All 12 of these metals, except antimony and silver, were detected in more than 50 percent of the samples collected. HQs of these 12 metals ranged from 1.5 (cobalt) to 294 (mercury). There is no information to indicate that metals are site-related. Thus, these 12 metals are not retained as COPCs.

Chemicals detected with no corresponding ESLs are listed below:

- VOCs: cis-1,2-dichloroethene (cis-1,2-DCE), cyclohexane, and isopropylbenzene

These three VOCs were detected in 1 (cis-1,2-DCE and cyclohexane) or 2 (isopropylbenzene) out of 48 samples. There is no information to indicate that VOCs are Site-related. Thus, these three VOCs were not retained as COPCs.

- SVOCs: benzo(b)fluoranthene, caprolactam, carbazole, and dibenzofuran

Benzo(b)fluoranthene was detected most frequently (42 out of 48 samples), having an estimated and biased high maximum concentration of 3,500 J+ micrograms per kilogram (µg/kg). The remaining 3 SVOCs were detected in 9 or fewer samples, with the maximum concentrations ranging from 180 (dibenzofuran) to 790 (carbazole) µg/kg. Again, there is no information to indicate that SVOCs are site-related.

- Pesticides: endrin ketone

Endrin ketone was detected in 5 of 48 samples, with an estimated maximum concentration of 240 µg/kg. There is no historical information to indicate that the pesticides are Site -related, as well as no records to determine the sources of pesticides detected at the Site.

- Inorganics: aluminum, calcium, iron, magnesium, potassium, and sodium

Aluminum and iron are commonly occurring elements and major components of almost all inorganic soil particles. The maximum concentrations of aluminum and iron in soil were well within the range of expected natural concentrations. Thus, iron and aluminum are not considered COPCs. The remaining four metals (calcium, magnesium, potassium, and sodium) are not retained as COPCs because they are ubiquitous, occur naturally in high concentrations, and are unlikely to pose risk. Additionally, they are not Site-related contaminants. Thus, these four metals are also not retained as COPCs.

In conclusion, the COPCs retained via a comparison of the maximum detected concentrations of chemicals to their respective soil ESLs include PCBs, SVOCs, pesticides, and metals. PCBs are site-related. There is no historical information to indicate that SVOCs, pesticides, and metals are site-related. However, the highest concentrations of pesticides were detected in the same areas as high concentrations of PCBs, including below the Unimatic building and in the vicinity of the former discharge pipe. Based on this data, it is possible that pesticides were utilized and discharged from the Unimatic building. Thirteen detected pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aldrin, alpha-chlordane, gamma-chlordane, dieldrin, endosulfan I, endrin, endrin aldehyde, gamma-BHC, heptachlor, and heptachlor epoxide) had HQs ranging from 2 to 6,325; and two PCBs (Aroclor 1248 and Aroclor 1254) had HQs ranging from 15 to 6,199.

The high HQs indicate potential risks exist at the site to ecological receptors from exposure to contaminants in soil. However, the site is an industrial site and based on observations made during the ecological reconnaissance, the site has limited vegetation and wildlife, and little to no viable habitat to support ecological receptors. Furthermore, no threatened and endangered species were observed on site. All of these findings indicate that ecological threats at the site are negligible. Thus, despite the high HQs from PCBs and pesticides, it is recommended that no further ecological investigation is warranted to evaluate the potential for risks to ecological receptors from exposure to contaminants at the site.

1.9 Data Gaps

Although the RI data are considered sufficient to develop and evaluate remedial alternatives for contaminated building materials and soils at the site, additional data would be needed to fully develop a remedial design and costs. The following categories of data would need to be collected:

- The extent of soil contamination, both vertically and horizontally, for PCBs and pesticides. PCB contamination was defined sufficiently at the Unimatic Property for the FS report but was not fully delineated for the neighboring properties. The RI data indicate that the PCB contamination due to leakage from the former outfall pipe is not confined to the eastern boundary of the Unimatic property, but has generally been delineated on the adjacent 30 Sherwood property to less than 75 feet from the Unimatic property line. The western extent of PCB contamination above 1 mg/kg is confined to the Unimatic property, with the exception of the one surface soil sample and the possibility of surface contamination present in additional areas along the NW drainage pathways on the 21 Sherwood Lane property. In addition, analysis for pesticides was limited to surface and near surface soils (i.e., soil samples collected from 0 to 6 feet bgs). As a result, the vertical extent of pesticide contamination is not defined.

- The extent of building material contamination. Concrete core samples were collected from the most contaminated areas of the building. The contamination in other areas will need to be defined for waste disposal/recycling purposes.
- Waste characterization. Waste characterization samples will need to be collected in order to determine if any of the pesticide contaminated soil will exceed the toxicity limits to become a characteristic waste, which will affect the disposal and treatment options for the contaminated soil.
- Site-specific hydraulic conductivity measurements. No site-specific measurements of the hydraulic conductivity have been collected, although based on the lithology, the various overburden lithologic zones are comparable to typical glacial and fluvial deposits.

Section 2

Development of Remedial Action Objectives and Screening of Technologies

RAOs are media-specific goals for protecting human health and the environment. They serve as the basis for the development of remedial action alternatives and specify what the cleanup action will accomplish. The process of identifying the RAOs follows the identification of affected media and contaminant characteristics and the evaluation of exposure pathways, contaminant migration pathways, and exposure limits to receptors. The RAOs are based on regulatory requirements and risk-based evaluation, which may apply to the various remedial activities being considered for the site. This section reviews the affected media and contaminant exposure pathways and identifies federal, state, and local regulations that may affect remedial actions.

Preliminary remediation goals (PRGs) were developed based on federal- or state-promulgated ARARs, risk-based levels (human health and ecological), and background concentrations, with consideration also given to other requirements such as analytical detection limits and guidance values. These PRGs were then used as benchmarks in the technology screening, alternative development and screening, and detailed evaluation of alternatives presented in the subsequent sections of the FS report.

Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended, requires that, at a minimum, any remedial action must achieve overall protection of human health and the environment and comply with ARARs. Other criteria that do not meet the definition of an ARAR are known as to be considered (TBC) criteria, which may also be used to develop RAOs and be considered during evaluation of remedial alternatives.

The remedial action alternatives developed in subsequent sections of this FS are required to attain applicable federal, State of New Jersey, and local environmental requirements. Technical requirements of ARARs must be met by the remedial action alternatives. However, 40 Code of Federal Regulations (CFR) 121(d)(4) allows selection of remedies that will not attain all ARARs provided one of the following conditions is satisfied:

- The remedial action is an interim measure where the final remedy will attain the ARAR upon completion.
- Compliance with all ARARs will result in greater risk to human health and the environment than other options.
- Compliance is technically impracticable.
- The remedial action will attain the equivalent of the ARAR.
- For state requirements, the state has not consistently applied the requirement in similar circumstances.

- Compliance with the ARAR will not provide a balance between protecting public health, welfare, and the environment at the site and the availability of funding for response at other facilities (fund balancing).

ARARs apply to actions or conditions located on site and off site. Onsite actions implemented under CERCLA are exempt from administrative requirements of federal and state regulations (such as permits) as long as the substantive requirements of the ARARs are met. Offsite actions are subject to the full requirements of the applicable standards or regulations (including all administrative and procedural requirements).

Based on the CERCLA statutory requirements, the remedial actions developed in this FS would be analyzed for compliance with federal and state environmental regulations. This process involves the initial identification of potential requirements, the evaluation of the potential requirements for applicability or relevance and appropriateness, and finally, a determination of the ability of the remedial alternatives to achieve the ARARs.

2.1 Development of Remedial Action Objectives

The process for developing RAOs follows the identification of contaminants of concern (COCs) for each media, identification of potentially applicable or relevant and appropriate federal and state regulations and other guidance, development of human health and ecological risk-based cleanup levels, and finally, selection of the PRGs based on the ARARs, guidance values, risk-based values, or background concentrations. Generally, where a chemical-specific ARAR exists, it provides the basis for the corresponding PRG; if more than one applicable chemical-specific ARAR exists, the most stringent applicable requirements are generally applied first. The selected PRGs are levels of COCs that will be protective of human health and the environment and provide the basis for the evaluation of remedial technologies. A detailed discussion of the contaminants and media of concern and development of RAOs is provided below.

2.1.1 Contaminants and Media of Concern

Defining the media and COCs at the site is a necessary prerequisite to developing site-specific RAOs and GRAs. RAOs often target specific media for cleanup in order to protect human health and the environment. In addition, ARARs and TBC information are generally specified based on media and COCs. For example, identifying soil as a medium of concern would require that state and federal soil regulations be considered as ARARs.

2.1.1.1 Selection of Contaminants of Concern

As noted in Section 1, soil, concrete core, wipe and groundwater samples were collected and analyzed as part of the RI. The RI detected VOCs, SVOCs, pesticides, PCBs, and metal contaminations in site soils. Concrete and wipe sampling results from the RI confirmed high concentrations of PCBs remain within the building structure. The hazardous building materials survey indicated limited amounts of other hazardous building materials, including some asbestos in window putty glazing, some lead paints, and PCB-containing grouts. PCBs in groundwater at the site were found throughout the saturated overburden and in the upper portion of the bedrock. The highest levels of PCBs in groundwater were found in the wells in the northeast portion of the Unimatic property, specifically in the MW-4 cluster. As part of OU2, a comprehensive groundwater investigation will be conducted to evaluate and determine the full nature and extent of the groundwater contamination found beneath the site.

The site-specific HHRA evaluated risks posed to human health for the detected contaminants. Soil samples were screened against benchmark levels as part of the HHRA and SLERA, and chemicals of potential concern (COPCs) were identified. The HHRA identified the following chemicals as COPCs in soils:

- Trichloroethene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- 4,4'-DDE
- 4,4'-DDT
- Aldrin
- Alpha-chlordane
- Aroclor-1248
- Aroclor-1254
- Delta-BHC
- Dieldrin
- Gamma-chlordane
- Heptachlor
- Heptachlor epoxide
- Arsenic
- Chromium
- Iron
- Manganese

Of the listed COPCs, only the PCBs were identified as human health risk drivers; however, pesticides also were detected at high concentrations and for the most part were co-located with PCB detections. Several of the pesticides were found in soils at concentrations exceeding the NJNRDCSRS and New Jersey Impact to Groundwater (IGW) default screening levels. The remaining COPCs were not, or only sporadically, detected above NJNRDCSRS or ambient soil concentrations for urban Piedmont province soils (Sanders 2003).

The HHRA included an evaluation of dioxin/furan results and noted that the maximum concentration of total TCDD TEQ (88.451 nanogram per kilogram [ng/kg]) exceeded 22 ng/kg, the EPA RSL based on a target risk range of 10^{-6} and an HI of 0.1 for industrial soil. However, the maximum concentration did not exceed the NJDEP proposed soil remediation standard for 2,3,7,8-TCDD of 700 ng/kg. The HHRA also noted that detections of dioxins and furans correlate spatially with the distribution of PCBs that will be remediated. Because concentrations of dioxins and furans did not exceed the NJDEP proposed soil remediation standard, they are not included on the list of proposed site COCs.

While the SLERA indicates potential risks exist at the site to ecological receptors from exposure to contaminants, it also notes that based on observations made during the ecological reconnaissance, there is limited vegetation and wildlife and little to no viable habitat to support ecological receptors.

Based on the RI data, the results of the HHRA and SLERA, and available promulgated remediation standards, the following COPCs are considered soil COCs for the completion of the FS:

- 4,4’-DDE
- 4,4’-DDT
- Aldrin
- Alpha- and gamma-chlordane
- Dieldrin
- Heptachlor
- Heptachlor epoxide
- Lindane
- Total PCBs

Lindane is also considered a site COC and was added to the list above, based on its co-location with other detected pesticides and exceedance of NJDEP groundwater quality standard and the remediation standard for the impact to groundwater pathway.

2.1.1.2 Media of Concern

This operable unit (OU) focuses on remediating the contaminated soil and the building at the site. In addition to the Unimatic facility at 25 Sherwood Lane, the site includes contamination that has extended to properties at 21 Sherwood, 30 Sherwood, and the JCMUA. Indoor air screening results, as presented in the HHRA, indicate that current and future workers at 25 Sherwood Lane may be exposed to PCB vapor via the ambient air in the building via vaporization, which was detected in the walls and floors of the building. The FS will focus on directly addressing the contamination found in and beneath Unimatic building and on the properties of the JCMUA, 21, 25, and 30 Sherwood Lane. Migration of contaminants from soil to groundwater and surface water/sediment will be considered in the development of RAOs and PRGs for soils.

As discussed in Section 1.6.2, EPA's August 1990 guidance, entitled: "A Guide on Remedial Actions at Superfund Sites with PCB Contamination", states that principal threats will include soils contaminated at industrial sites at concentrations greater than or equal to 500 ppm total PCBs. For this site, the areas with the highest contamination are located under the Unimatic building and along the eastern side of the property, with the highest detected PCB concentration at 7,000 ppm, which is an order of magnitude above the principal threat waste threshold. This highly contaminated soil poses direct contact risks to human health and also acts as a continuous source of groundwater contamination. Therefore, in accordance with the EPA guidance, treatment alternatives will be considered for the principal threat wastes at the site and in instances where treatment is not implementable, other methods such as removal or containment that significantly reduce or eliminate the risks due to principal threat wastes will be considered.

2.1.2 Remedial Action Objectives

RAOs for the site are based on the results from the risk assessment and regulatory requirements and were developed in consultation with the EPA/USACE. According to the National Contingency Plan (NCP) and RI/FS Guidance, RAOs should include COCs, exposure routes, and receptors.

The site is currently zoned for industrial use. It is assumed that the zoning of the site will remain unchanged for industrial use. RAOs and proposed remedial alternatives will focus on addressing PCB and other COC contamination in soils and within the building as discussed in Section 2.1.1.1. Groundwater contamination will be addressed in a separate operable unit.

The following RAOs have been proposed to mitigate the potential present and/or future risks associated with exposure to contamination in the site building and soils.

- Building
  - Reduce or eliminate human exposure via inhalation, incidental ingestion, and dermal absorption to contamination present within the site building.
- Soil
  - Reduce or eliminate the human exposure threat via inhalation, incidental ingestion, and dermal adsorption to contaminated site soils to levels protective of current land and anticipated future use.
  - Prevent/minimize the migration of site contaminants off site through surface runoff and storm sewer discharge.
  - Prevent/minimize the migration of contamination in soil to groundwater and surface water/sediment.

2.2 Potential ARARs, Guidelines, and Other Criteria

CERCLA requires that onsite remedial actions attain or waive federal environmental ARARs, or more stringent state environmental ARARs, upon completion of the remedial actions. Along with the protection of human health, attainment of ARARs is considered threshold criteria under CERCLA. The purpose of ARARs is to define the minimum level of protection that must be provided by a remedy selected and implemented. Additional protection may be required, if necessary, to protect human health and the environment.

2.2.1 Definition of ARARs

ARARs are designated as either "applicable" or "relevant and appropriate," according to the NCP. A requirement under CERCLA, as amended, may be either "applicable" or "relevant and appropriate" to a site-specific remedial action, but not both. The distinction is critical to understanding the constraints imposed on remedial alternatives by environmental regulations other than CERCLA.

If a state or federal environmental law is determined to be either applicable or relevant and appropriate, compliance with the substantive requirements of that ARAR are mandatory under CERCLA and the NCP. Compliance with ARARs is a threshold criterion that any selected remedy must meet unless a legal waiver as provided by CERCLA Section 121(d) (4) is invoked.

2.2.1.1 Applicable Requirements

Applicable requirements pertain to those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable. Applicable requirements are defined in the NCP, at 40 CFR 300.5 – Definitions.

2.2.1.2 Relevant and Appropriate Requirements

Relevant and appropriate requirements pertain to those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site per se, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate. Relevant and appropriate requirements are defined in the NCP, at 40 CFR 300.5 – Definitions.

The determination that a requirement is relevant and appropriate is a two-step process that includes: (1) the determination if a requirement is relevant and (2) the determination if a requirement is appropriate. In general, this involves a comparison of a number of site-specific factors, including an examination of the purpose of the requirement and the purpose of the proposed CERCLA action, the medium and substances regulated by the requirement and the proposed requirement, the actions or activities regulated by the requirement and the remedial action, and the potential use of resources addressed in the requirement and the remedial action. When the analysis results in a determination that a requirement is both relevant and appropriate, such a requirement must be complied with to the same degree as if it were applicable (EPA 1988).

2.2.1.3 Other Requirements to Be Considered

These requirements pertain to federal and state criteria, advisories, guidelines, or proposed standards that are not generally enforceable but are advisory and that do not have the status of potential ARARs. Guidance documents or advisories "to be considered" (TBCs) in determining the necessary level of remediation for protection of human health or the environment may be used where no specific ARARs exist for a chemical or situation or where such ARARs are not sufficient to be protective.

2.2.1.4 Classifications of ARARs

Three classifications of requirements are defined by EPA in the ARAR determination process. An ARAR can be one or a combination of all the following three types of ARARs:

- Chemical-specific
- Location-specific
- Action-specific

Chemical-specific ARARs include those laws and regulations governing the release of materials possessing certain chemical or physical characteristics or containing specified chemical compounds. These ARARs and TBCs usually are numerical values that are health- or risk-based values or methodologies. They establish acceptable amounts or concentration of chemicals that may be found in, or discharged to, the ambient environment. They also may define acceptable exposure levels for a specific contaminant in an environmental medium. They may be actual concentration-based cleanup levels, or they may provide the basis for calculating such levels. Examples of chemical-specific ARARs are PCB cleanup criteria for soils under TSCA or MCLs specified for public drinking water that are applicable to groundwater aquifers used for drinking water.

Location-specific ARARs are design requirements or activity restrictions based on the geographical or physical positions of the site and its surrounding area. Location-specific requirements set restrictions on the types of remedial activities that can be performed based on site-specific characteristics or location. Examples include areas in a floodplain, a wetland, or a historic site. Location-specific criteria can generally be established early in the RI/FS process since they are not affected by the type of contaminant or the type of remedial action implemented.

Action-specific ARARs are technology-based, establishing performance, design, or other similar action-specific controls or regulations for the activities related to the management of hazardous substances or pollutants. Selection of a particular remedial action at a site will invoke the appropriate action-specific ARARs, which specify performance standards or technologies, as well as specific environmental levels for discharged or residual chemicals. An example includes transportation of hazardous waste regulations.

Additionally, TBC criteria are also evaluated. TBC criteria are not federally enforceable standards but may be technically or otherwise appropriate to consider in developing site- or media-specific PRGs. Each of these groups of ARARs and TBCs is described below.

2.2.2 Chemical-specific ARARs and TBCs

Chemical-specific ARARs are health-based or technology-based numerical values that establish concentration or discharge limits for specific chemicals or classes of chemicals. If more than one requirement applies to a contaminant, compliance with the more stringent applicable ARAR is required. In the absence of ARARs and TBC criteria, guidance values are considered. Table 2-1 outlines the chemical-specific criteria applicable to the site.

2.2.2.1 Federal Standards and Guidelines

The federal standards that are considered as chemical-specific ARARs during the FS are listed below. A brief synopsis of the requirement that each ARAR entails, the status of each ARAR (i.e., whether the ARAR is applicable, relevant, appropriate) or TBC, and a brief discussion of the ARAR's consideration in this FS are provided in Table 2-1.

Federal Soil Regulation

TSCA 40 CFR Part 761.61 – PCB Remediation Waste. This section provides cleanup and disposal options for PCB remediation waste. Any person cleaning up and disposing of PCBs managed under this section shall do so based on the concentration at which the PCBs are found (i.e., no person may avoid any provision specifying a PCB concentration by diluting the PCBs unless otherwise specifically provided). Because EPA comes to a site under the CERCLA after the pollution has already occurred, and is acting under statutory mandate to select a proper cleanup level, EPA is not subject to the anti-dilution provision at CERCLA sites when it selects a remedy. However, EPA may not further dilute the PCB waste in order to avoid the TSCA PCB disposal requirements as part of a CERLCA cleanup.

2.2.2.2 New Jersey Standards and Guidelines

The state standards that are considered as chemical-specific ARARs during the FS are listed below. A brief synopsis of the requirement that each ARAR entails, the status of each ARAR (i.e., whether the ARAR is applicable, relevant, appropriate) or TBC, and a brief discussion of the ARAR's consideration in this FS are provided in Table 2-1.

Soil Standards

- Soil Remediation Standards (N.J.A.C. 7:26D). Non-residential direct contact are applicable requirements in the development of cleanup levels. Impact to groundwater criteria are "to be considered" requirements.

Groundwater

- New Jersey Ground Water Quality Standards (NJGQS) Class IIA (N.J.A.C. 7:9C), December 30, 2015 – Groundwater will be a separate operable unit for this site. However, the NJGQS will be used to calculate the impact to groundwater levels for soil contaminants.

2.2.3 Location-Specific ARARs

Location-specific ARARs are those that are applicable or relevant and appropriate due to the location of the site or area to be remediated. The site is not located within wetlands or floodplain areas, and the site has no wildlife habitat area. Possible applicable regulations at the site are historical places, archaeological significance, and endangered species.

Prior to the construction of the original building in 1955, historical aerial imagery shows that the site was undeveloped. Based solely on historical aerial photographs, the former land use appears to have been either agricultural or wooded in nature. The remaining aerial images from 1963 and 1970 display the expansion of the original building, including what appears to be the construction of the final loading dock and warehouse area in the northern or back of the structure. A cultural resources survey/archeological evaluation (i.e., archival investigation/walkthrough at the property) to determine if archeological or historical resources are present at the site has not been conducted to date.

The United States Fish and Wildlife Service (USFWS) reported one endangered species, Indiana bat (Myotis sodalist), one threatened species, northern long-eared bat (Myotis septentrionalis), and no critical habitats within the project area. Indiana bat and northern long-eared bat were not observed, and no viable habitat for these species was identified during the ecological reconnaissance conducted on August 6, 2015.

The records of NJDEP Natural Heritage Program indicate no occurrence of any threatened or special concern species except great blue heron (Ardea Herodias), a special concern species, on or in the immediate vicinity (within ¼ mile) of the site. Great blue heron was not observed, and no viable habitat for great blue heron was identified during the ecological reconnaissance conducted on August 6, 2015.

Table 2-2 outlines the location-specific criteria applicable to the site.

2.2.3.1 Federal Standards and Guidelines

The federal standards that are considered as location-specific ARARs during the FS are listed below. A brief synopsis of the requirement that each ARAR entails, the status of each ARAR (i.e., whether the ARAR is applicable, relevant, appropriate) or TBC, and a brief discussion of the ARAR's consideration in this FS are provided in Table 2-2.

<u>Wildlife Habitat Protection Standards and Regulations</u>

- Endangered Species Act (16 United States Code [U.S.C.] 1531 et seq.; 40 CFR 400)
- Fish and Wildlife Conservation Act (16 U.S.C. 2901 et seq.)
- Fish and Wildlife Coordination Act (16 U.S.C. 661)
- Migratory Bird Treaty Act (MBTA, 16 U.S.C. 703 et seq.)

<u>Cultural Resources, Historic Preservation Standards, and Regulations</u>

- National Historic Preservation Act (16 U.S.C. 470) Section 106 et seq. (36 CFR 800)

2.2.3.2 New Jersey Standards and Guidelines

The state standards that are considered as location-specific ARARs during the FS are listed below. A brief synopsis of the requirement that each ARAR entails, the status of each ARAR (i.e., whether the ARAR is applicable, relevant, appropriate) or TBC, and a brief discussion of the ARAR's consideration in this FS are provided in Table 2-2.

Wildlife Habitat Protection Standards and Regulations

- Endangered and Nongame Species Conservation Act (New Jersey Statutes Annotated [N.J.S.A.] 23:2A-1 - 15)

- Endangered Plant Species List Act (N.J.A.C. 7:5B).

2.2.4 Action-specific ARARs and TBCs

Action-specific ARARs are requirements THAT set controls and restrictions to particular remedial actions, technologies, or process options. These regulations do not define site cleanup levels but do affect the implementation of specific remedial technologies. For example, although outdoor air has not been identified in the RI report as a contaminated medium of concern, air quality ARARs are listed below because some potential remedial actions may result in temporary inhalation hazards due to toxic or hazardous substances caused by dust particles in air. Another example is that the treatment, storage, and disposal of waste will need to meet the requirements of Land Disposal Restrictions (LDRs) under the Resource Conservation and Recovery Act (RCRA). These action-specific ARARs are considered in the screening and evaluation of various technologies and process options in subsequent sections of this report. Table 2-3 outlines the action-specific criteria applicable to the site.

2.2.4.1 Federal Standards and Guidelines

The federal standards that are considered as action-specific ARARs during the FS are listed below. A brief synopsis of the requirement that each ARAR entails, the status of each ARAR (i.e., whether the ARAR is applicable, relevant, appropriate) or TBC, and a brief discussion of the ARAR's consideration in this FS are provided in Table 2-3.

General – Site Remediation

- Occupational Safety and Health Administration (OSHA) Worker Protection (29 CFR 1904, 1910, 1926)

- OSHA Construction Industry standards (29 CFR 1926)

- RCRA: Identification and Listing of Hazardous Waste (40 CFR 261); Standards Applicable to Generators of Hazardous Waste (40 CFR 262); Standards for Owners/Operators of Permitted Hazardous Waste Facilities (40 CFR 264.10-164.18); Preparedness and Prevention (40 CFR.30-264.31); Contingency Plan and Emergency Procedures (40 CFR 264.50-264.56)

- Transportation of Hazardous Waste

- Department of Transportation (DOT) Rules for Hazardous Materials Transportation Regulations (49 CFR 107, 171, 172, 177, and 179)

- RCRA Standards Applicable to Transporters of Hazardous Waste (40 CFR 263)
- Disposal of Hazardous Waste
- TSCA Disposal of PCB Bulk Product Waste (40 CFR Part 761.62)
- RCRA Land Disposal Restrictions (40 CFR 268)
- RCRA Alternative Soil Treatment Standards (40 CFR 268.49)
- RCRA Hazardous Waste Permit Program (40 CFR 270)
- Area of Contamination (55 Federal Register 8758-8760, March 8, 1990)
- Corrective Action Management Units (Subpart S of 40 CFR 264.552)

Off-Gas Management

- Clean Air Act (CAA) – National Primary and Secondary Ambient Air Quality Standards (NAAQs) (40 CFR 50)
- Standards of Performance for New Stationary Sources (40 CFR 60)
- National Emission Standards for Hazardous Air Pollutants (40 CFR 61)

2.2.4.2 New Jersey Standards and Guidelines

The state standards that are considered as action-specific ARARs during the FS are listed below. A brief synopsis of the requirement that each ARAR entails, the status of each ARAR (i.e., whether the ARAR is applicable, relevant, appropriate) or TBC, and a brief discussion of the ARAR's consideration in this FS are provided in Table 2-3.

General Site Remediation

- Technical Requirements for Site Remediation (N.J.A.C. 7:26E)
- Uniform Construction Code (N.J.A.C. 5:23)
- Hazardous Waste Regulations - Identification and Listing of Hazardous Waste (N.J.A.C. 7:26G-5)
- Soil Erosion and Sediment Control Act (N.J.A.C. 2:90)
- Hudson Essex Passaic Soil Conservation District Soil Erosion and Sediment Control
- Bureau of Water Allocation Temporary Dewatering Permit Equivalency (N.J.A.C. 7:19)
- Noise Control (N.J.A.C. 7:29)

Transportation of Hazardous Waste

- Transportation of Hazardous Materials (N.J.A.C. 16:49)

Disposal of Hazardous Waste

- Land Disposal Restrictions (N.J.A.C. 7:26G-11)
- Hazardous Waste (N.J.A.C. 7:26C)

Discharge of Water

- New Jersey Pollutant Discharge Elimination System (N.J.A.C. 7:14A)

Off-Gas Management

- Air Pollution Control Act, Standards for Hazardous Air Pollutants (N.J.A.C. 7:27)
- Ambient Air Quality Standards (N.J.A.C. 7:27-13)

2.2.5 PCB Management under TSCA, NJDEP Site Remediation Program, and RCRA Land Disposal Restrictions

TSCA provides federal PCB remediation policy. The TSCA regulations dealing with the remediation of soil as "bulk remediation waste" are primarily found in 40 CFR 761.61(a - c). TSCA does not regulate PCBs at concentrations less than 1 part per million (ppm). Above 1 ppm PCBs, TSCA stipulates a range of cleanup levels based upon high and low occupancy scenarios that are identified in 40 CFR 761.61(a)4:

- High Occupancy Areas (average more than 6.7 hours/week for exposure to soil) – The cleanup level for bulk PCB remediation waste in high occupancy areas is ≤1 ppm without further conditions. High occupancy areas where bulk PCB remediation waste remains at concentrations >1 and ≤10 ppm shall be covered with a cap (a minimum of 10 inches of soil).
- Low Occupancy Areas (average less than 6.7 hours/week for exposure to soil) – The cleanup level for bulk PCB remediation waste in low occupancy areas is ≤25 ppm unless otherwise specified. Bulk PCB remediation wastes may remain at a cleanup site at concentrations >25 and ≤100 ppm if the site is covered with a cap.

NJDEP Site Remediation Program policy does not require remediation for PCBs detected below 0.2 ppm. In a non-residential or restricted use scenario, PCBs found above 0.2 ppm require a deed notice and when above 1 ppm, require a deed notice and cap. NJDEP policy allows for contaminants with appropriate institutional and engineering controls to be non-permanently remediated as long as the remedy is found to be protective of human health and the environment. However, NJDEP does not routinely allow capping for the remediation of the IGW pathway.

PCB remediation wastes must be disposed of using one (or a combination, if appropriate) of the approved disposal options. Non-liquid cleanup waste (e.g., non-liquid cleaning materials, personal equipment) at any concentration and bulk PCB remediation wastes at concentrations <50 ppm may be disposed of at an approved PCB disposal facility; or when disposed pursuant to Section 761 .61(a) or (c), a permitted municipal solid waste or non-municipal non-hazardous waste facility; or a RCRA Section 3004 or Section 3006 permitted hazardous waste landfill. Bulk PCB remediation waste at concentrations ≥50 ppm must be disposed of in a RCRA Section 3004 or 3006 permitted hazardous waste landfill or an approved PCB disposal facility (e.g., incinerator, chemical waste landfill; via an approved alternate disposal method (EPA 2005).

PCBs alone are not considered hazardous under RCRA since they are addressed under the TSCA regulations; however, land disposal restrictions do address PCBs when mixed with a waste that is considered hazardous under RCRA. Some onsite soil contains both elevated levels of PCBs and pesticides, in particular heptachlor, heptachlor epoxide, and chlordane. Although a composite soil sample for waste characterization collected during the RI for management of investigation-derived waste was found to be nonhazardous, the presence of elevated concentrations of heptachlor, heptachlor epoxide, and chlordane may make the contaminated soil exceed the toxicity characteristic leaching procedure (TCLP) limits for these compounds. As a result, the soil could be classified as characteristic waste (D031). Treatment requirements for D031 waste containing heptachlor and heptachlor epoxide are stipulated under 40 CFR Part 268.40. The treatment requirements also include treatment of any underlying hazardous constituents (UHCs), including PCBs, to meet the Universal Treatment Standards (40 CFR 268.48).

For contaminated soil and debris, RCRA LDRs provide alternate treatment standards under 40 CFR 268.45 for contaminated debris and 40 CFR 268.49 for contaminated soil as described below:

- Debris (40 CFR 268.45 Table 1) – The alternate standards range from removing all contaminants with high pressure washing to encapsulating the debris in order to prevent hazardous constituents from leaching. Debris treated with these alternate treatment standards meets the LDR requirements and, in many cases, can be disposed of as nonhazardous waste.

- Soil (40 CFR 268.49) – The alternate soil treatment standards mandate reduction of hazardous constituents in the soil by 90 percent or 10 times the universal treatment standards (UTS), whichever is higher. Removal of the characteristic is also required if the soil is ignitable, corrosive, or reactive. Treatment is required for each UHC. Generators can reasonably apply knowledge of the likely contaminants present and use that knowledge to select appropriate UHCs or classes of constituents for monitoring.

For disposal purposes, the following categories of wastes will need to be considered during remedial action at the Unimatic site:

- PCB contaminated wastes (soil or debris) that also exceed the TCLP limits (i.e., a characteristic waste) – The soil must be treated, including all UHCs, to meet 40 CFR 268.49 requirements prior to disposal in a Subtitle C or D landfill. The debris must be treated following 40 CFR 268.45 requirements prior to disposal in a Subtitle C or D landfill.

- PCB contaminated wastes (soil or debris) that are non-hazardous waste:

    - Building debris with PCB concentrations greater than or equal to 50 mg/kg – The debris will need to be disposed of in a chemical waste (i.e., TSCA) landfill.

    - Building debris with PCB concentrations less than 50 mg/kg – The debris can be disposed of in a Subtitle D landfill, an industrial waste landfill, and/or a municipal waste landfill, depending on the landfill permit PCB limitations.

- Contaminated soil with PCB concentrations greater than or equal to 50 mg/kg – The soil will need to be disposed of in a chemical waste (i.e., TSCA) landfill.
- Contaminated soil with PCB concentrations less than 50 mg/kg – The soil can be disposed of in a Subtitle D landfill, an industrial waste landfill, and/or a municipal waste landfill, depending on the landfill permit PCB limitations.

Figure 2-2 provides a summary of the disposal options for PCB remediation waste.

2.2.6 Waste Management Considerations Using Areas of Contamination and Corrective Action Management Units

To help implement a remedial action at a site, EPA's Area of Contamination (AOC) Policy and Corrective Management Unit (CAMU) rule can be used. According to the Area of Contamination Policy (EPA 1998), EPA interprets RCRA to allow certain discrete areas of generally dispersed contamination to be considered RCRA units (usually landfills). Because an area of contamination is equated to a RCRA land-based unit, consolidation and in situ treatment of hazardous waste within the area of contamination do not create a new point of hazardous waste generation for the purposes of RCRA. This RCRA Area of Contamination policy is also applicable to Superfund sites and is referred to as Superfund Area of Contamination policy or Superfund Area of Contamination rules in this report. This interpretation allows wastes (e.g., contaminated soil) to be consolidated or treated in situ within an area of contamination without triggering land disposal restrictions or minimum technology requirements. NJDEP has similar requirements under the Technical Requirements for Site Remediation (Technical Rules), N.J.A.C. 7:26E.

EPA has also created a CAMU rule, which is specially intended for treatment, storage and disposal of hazardous remediation waste. Under the CAMU rule, EPA and authorized states (e.g., NJ) may develop and impose site-specific design, operating, closure, and post closure requirements for CAMUs in lieu of the minimum technology requirements for land-based units. Although there is a strong preference for use of CAMUs to facilitate treatment, remediation waste placed in approved CAMUs does not have to meet LDR treatment standards. NJDEP Technical Rules also allow backfill of treated wastes that may still exceed the remediation standards or criteria.

The main differences between CAMU and AOC policy are that, when a CAMU is used, waste may be treated ex situ and then placed in a CAMU; CAMUs may be located in uncontaminated areas at a facility, and wastes may be consolidated into CAMUs from areas that are not contiguously contaminated. CAMUs must be approved by EPA as an ARAR during a CERCLA cleanup using a Record of Decision.

2.3 Preliminary Remediation Goals

PRGs are developed for the list of COCs identified in Section 2.1.1.1 to aid in defining the extent of contaminated media requiring remedial action. PRGs are generally chemical-specific remediation goals for each medium and/or exposure route that are established to protect human health and the environment. They can be derived from ARARs, risk-based levels (human health and ecological), and from comparison to background concentrations, where available. Consideration can also be given to analytical detection limits, guidance values, and other pertinent information. Development of PRGs for the Site is presented below.

PCBs were identified as the risk driver in the HHRA. TSCA provides Federal PCB remediation policy. The TSCA regulates PCBs at concentrations greater than 1 ppm. Above 1 ppm PCBs, TSCA stipulates a range of cleanup levels based upon future high and low occupancy scenarios that are defined in 40 CFR 761.61(a)4. For the Unimatic Site, cleanup levels based on high occupancy area with unrestricted use designation (1 ppm) will be considered. For a high occupancy area, TSCA allows up to 10 ppm of PCBs to remain on site if the contaminated area is capped and a deed notice is filed.

The applicable promulgated State ARAR for soil PRG development is New Jersey Administrative Code, Title 7, Chapter 26D, which establishes the minimum non-residential direct contact soil remediation standards. The IGW pathway is part of the Soil Standards Rule and must be addressed whenever a discharge or potential discharge of a contaminant has occurred in the unsaturated zone. The regulation notes that these rules do not establish the minimum impact to groundwater soil remediation standards; those standards are to be developed by the NJDEP on a site-by-site basis, pursuant to the Department's authority under N.J.S.A. 58:10B-12a. NJDEP further clarifies that the IGW pathway does not apply below the water table.

Generally, PCB soil cleanup levels based on direct contact assumptions will provide sufficient protection of groundwater (EPA 1990). However, if groundwater is very shallow, oily compounds are or were present, or the unsaturated zone has a very low organic carbon content, an additional evaluation of the residual concentration that will not exceed levels found to be protective for groundwater should be made (EPA 1990). Because the RI data indicate that PCB contamination has migrated below the water table and impacted groundwater quality at the site, site-specific Impact to Groundwater Soil Remediation Standards (IGWSRS) for total PCBs has been developed. CDM Smith calculated IGWSRS for total PCBs and pesticides by using the soil partition equation included in *Development of Impact to Groundwater Soil Remediation Standards using the Soil-Water Partition Equation, Version 2.0 – November 2013* (NJDEP 2013). Calculations of the site-specific IGWSRS are included in Appendix A.

In addition to PCBs, several additional chemicals were frequently detected in soils located on the Unimatic property at concentrations exceeding NJNRDCSRS and/or calculated IGW remediation standards. These include 4,4'-DDE, 4,4'-DDT, aldrin, alpha-chlordane, dieldrin, gamma-chlordane, heptachlor, heptachlor epoxide, and lindane. Therefore, PRGs have also been established for these additional COCs.

Other potential site COCs either have no ARAR cleanup standards (delta-BHC and iron), were most frequently found on site at concentrations below remediation standards (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, arsenic), or were below associated ambient concentrations found in urban Piedmont soils (chromium, manganese). No PRGs have been proposed for these chemicals.

Site COCs and their respective PRGs are listed in Table 2-4.

2.4 Identification of Remediation Target Area

The remediation target area includes portions of the site where site COCs exceed their PRGs.

Figure 2-1 shows the areal extent of soils with PCB and pesticide concentrations exceeding their PRGs. Additional figures depicting the extent of PCB and pesticide concentrations on which Figure 2-1 is based are included in Appendix B. Based on Figure 2-1, the PCB cleanup area encompasses the pesticide cleanup area.

Because pesticide sample analysis was limited to the 0 to 2 foot (ft) and 2 to 6 ft depth intervals, the vertical extent of the remediation target area is based on PCB PRG exceedances in subsurface soils. Table 2-5 summarizes the estimated volume of contaminated soil associated with the remediation target area. Additional information regarding the calculation of the estimated volume of soil and building material is provided in Appendix B. As indicated on Table 2-5, approximately 26,000 cubic yards (cy) of soils exceed PRGs. Based on a consideration of the RI soil data against PRGs, the contaminated soil occurs across the four properties that compose the site in approximately the following volumes:

- 25 Sherwood Lane (Unimatic property): 22,000 cy
- 21 Sherwood Lane: 90 cy
- 30 Sherwood Lane: 3,000 cy
- JCMUA pipeline easement: 400 cy

Note that the exact areas and volumes of contaminated soil would be refined during the remedial design phase by conducting a pre-design investigation and filling the data gaps noted in Section 1.9. For the purpose of the FS, it is assumed that the soils at 21, 25 (Unimatic) and 30 Sherwood Lane would be addressed in the same manner as a part of the overall approach developed for each alternative. However, due to the unique sensitivities associated with working in close proximity to the JCMUA water pipes, the approach to the JCMUA pipeline easement contamination would be applied as a common element across all alternatives.

2.5 General Response Actions

GRAs are initial broad remedial actions that may satisfy the RAOs and which characterize the range of remedial responses appropriate for the contaminated media at the site. Following the development of GRAs, one or more remedial technologies and process options are identified for each GRA category. Although an individual response action may alone be capable of satisfying the RAOs, combinations of GRAs are usually required to adequately address site contamination. The following sections present the GRAs that may be applicable to address soil and building contamination at the site and detail the subsequent technology screening process. The technologies and process options remaining after screening have been assembled into alternatives that are discussed in Section 3.

2.5.1 No Action

The NCP requires the evaluation of a no action/no further action alternative as a basis for comparison with other remedial alternatives. Under the no action response, no remedial actions are implemented, the current status of the site remains unchanged, and no further action would be taken to reduce the potential for exposure to contamination. While the No Action response action may include environmental monitoring to track the contamination, it does not include any actions (e.g., institutional controls) to protect human health or the environment.

2.5.2 Institutional/Engineering Controls

EPA defines ICs as non-engineered instruments, such as administrative and legal controls (e.g., deed notice) that help to minimize the potential for exposure to contamination and/or protect the integrity of a response action. ICs typically are designed to work by limiting land and/or resource use or by providing information that helps modify or guide human behavior at a site. Engineering controls (ECs) are restrictions intended to minimize access (e.g., fencing) or other measures to reduce exposure (e.g., warning signs). These limited measures are implemented to provide some protection of human health and the environment from exposure to site contaminants. ICs/ECs are generally used in conjunction with other remedial technologies; alone, they are not effective in preventing contaminant migration or reducing contamination.

2.5.3 Inspection, Maintenance, and Monitoring

Monitoring activities include activities, such as sampling and analysis, in order to track the fate and transport of the contaminants (e.g., long-term monitoring). Inspections and maintenance activities are performed to assess and maintain the integrity of a remedy and assess changes in site conditions that pose risks of exposure. These measures do not alter the location or concentrations of contaminants, but they assist in delineating the nature and extent of contamination over time. Hence, they are generally used in conjunction with other GRAs and are not effective alone in achieving the RAOs for the contaminants by themselves.

2.5.4 Containment

Containment technologies consist of actions that physically isolate contaminants from their potential receptors by eliminating routes of exposure or reducing the rate of migration. Containment technologies may reduce contaminant movement but do not involve treatment to reduce the toxicity, mobility, and volume of the contaminants at the site. These technologies will require long-term monitoring and inspection to determine whether containment measures are performing successfully. These technologies will also require some type of IC to ensure the integrity of the containment remedy over the long term. These measures will not permanently and significantly reduce the toxicity and volume of contaminants without treatment.

2.5.6 Removal

Removal response actions refer to methods typically used to excavate and handle soil, sediment, waste, and/or solid materials. Excavation technologies provide no treatment of wastes but may be used prior to treatment or disposal to remove wastes from designated areas. It merely transfers the contaminants to be managed under another response action. Hence, removal technologies would be considered in conjunction with technologies for treatment and disposal response actions.

2.5.7 Disposal

Disposal technologies for soil, waste, or water typically include onsite or offsite disposal to a facility permitted for the specific waste type. Pretreatment of the material may be necessary before an offsite facility will accept the waste or in order to meet RCRA LDRs before disposal. These measures will not permanently and significantly reduce the toxicity or volume of contaminants without treatment.

2.5.8 Treatment

Treatment involves the destruction of contaminants in the affected media, transfer of contaminants from one medium to another, or transformation of the contaminants to a less mobile form, resulting in the permanent and significant reduction of the T/M/V of the contaminants and achieving a higher degree of protection of human health and the environment. Treatment technologies vary among environmental media and contaminants and may consist of chemical, physical, thermal, and/or biological processes. Treatment can be implemented either in situ or ex situ. The use of treatment technologies to achieve RAOs is favored by CERCLA, unless site conditions limit their application.

2.6 Identification and Screening of Remedial Technologies and Process Options

Remedial technology types and process options that are capable of addressing PCB and pesticide contaminated materials are identified and organized under each GRA listed in the previous section.

For each GRA, various remedial technologies and their associated process options are considered for the response action. The term technology refers to general categories of remediation methods. Each technology may have several process options, which refer to the specific material, equipment, or method used to implement a technology. These technologies describe broad categories used in remedial action alternatives but do not address details, such as performance data, associated with specific process options.

The preliminary technology/process option screening is typically very broad in considering the suitability of a technology for addressing contaminated materials. To streamline the process, EPA guidance documents (Guidance on Remedial Actions for Superfund Sites with PCB Contamination, EPA/540/G-90/007, EPA 1990 and Technology Alternatives for the Remediation of PCB Contaminated Soils and Sediments, PCB-EPA_600-S-13-079, EPA 2013) were used to identify and evaluate technologies for the remediation of contaminated soil and building materials as many of these technologies are also applicable to pesticide contamination. Only the treatment and disposal technologies that are determined to be effective and implementable for treatment of contaminated soil and building materials in these two guidance documents will be considered in this FS report. The identification of technologies from these guidance documents serves as a screen for technical implementability. Potentially viable remedial technologies and associated process options identified for the contaminated materials are presented in Figure 2-3.

Specific technology types and process options under each GRA category were then evaluated against the three criteria: effectiveness, implementability, and relative cost, specified in the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA 1988). Among these three criteria, the effectiveness criterion outweighs the implementability and relative cost criteria. Brief definitions of the criteria, as they apply to the screening process, are provided below.

Effectiveness: This evaluation criterion focuses on the effectiveness of process options to provide long-term protection and to meet the RAOs and PRGs. It also evaluates the potential impacts to human health and the environment during construction and implementation and considers how proven and reliable the process is with respect to site-specific conditions. Technologies and process options that are not effective are eliminated using this criterion.

Implementability: This evaluation criterion encompasses both the technical and administrative feasibility of the technology or process option. It includes an evaluation of pretreatment requirements, remedial construction requirements, residuals management, the relative ease or difficulty of operation and maintenance (O&M), the availability of treatment, storage, and disposal services (including capacity), and the availability of necessary equipment and skilled workers to implement the technology. Technologies and process options that are clearly not implementable at the site are eliminated using this criterion.

Relative Cost: Relative cost plays a limited role in the screening process. Both relative capital and relative O&M costs are considered. The relative cost analysis is based on engineering judgment, and each process is evaluated as to whether costs are low, medium, or high relative to the other options within the same GRA category.

Based on the three evaluation criteria described, technologies and process options were screened from further consideration. Documentation of the identification and screening process is provided below.

Only those technologies and process options that have been retained are considered for the development of alternatives. The retained technologies and process options are those that are expected to achieve the remedial action objectives for the site, either alone or in combination with other technologies and process options. Combinations of these technologies and process options are considered to constitute the reasonable alternatives required by the NCP.

2.6.1 No Action

The No Action alternative is developed from this GRA, as required by the NCP, and evaluated to establish a baseline for comparison with other remedial alternatives. A five-year review (FYR) would be conducted for the site to assess the performance and resulting protectiveness of the remedy. If necessary, appropriate action would be considered at that time.

Effectiveness – The No Action Alternative would not be effective in terms of protecting human health or the environment from contaminants in soil. It would not be in compliance with chemical-specific ARARS, and it would not alter the location of contaminants or reduce T/M/V of contaminants through treatment. Because no action would be taken, long-term effectiveness and permanence criteria would not be met.

Implementability – No Action is easy to implement from a technical perspective, and no significant administrative difficulties are expected.

Relative Cost – There is no cost for this response action.

Conclusion – No Action is retained as a baseline for comparison to other alternatives, as required by the NCP.

2.6.2 Institutional/Engineering Controls

ICs are non-engineered instruments, such as administrative and/or legal controls, that minimize the potential for human exposure to contamination by limiting land or resource use. ICs are generally used in conjunction with engineering measures, such as waste treatment or containment and can be used during all stages of the cleanup process, to accomplish various cleanup-related objectives. There are four categories of ICs: proprietary controls, governmental controls, enforcement and permit tools, and informational devices.

- Proprietary Controls: These controls include easements and covenants and are created pursuant to state and tribal laws to prohibit activities that may compromise the effectiveness of the response action or to restrict activities or future resource use that may result in unacceptable risk to human health or the environment.
- Governmental Controls: These controls use the authority of a government entity to impose restrictions on land or resource use. Types of governmental controls include zoning, building codes, groundwater use regulations, and commercial fishing bans and fishing limits.
- Enforcement and Permit Tools with Institutional Control Components: These are legal tools, such as administrative orders and permits, that limit site activities or require certain site activities.
- Informational Devices: Informational devices provide information or notification, often as recorded notice in property records or as advisories to local communities, tourists, recreational users, or other interested persons, that residual contamination remains on the site. As such, informational devices generally do not provide enforceable restrictions. Typical informational devices include state registries of contaminated sites, notices in deeds, tracking systems, and fish/shellfish consumption advisories.

In addition, community information and education programs would be undertaken to enhance awareness of potential hazards and remediation processes to the local community.

ECs could restrict access to the site with fencing and signs to prohibit access to areas that could disturb the selected remedy after it has been installed or pose a risk to human health.

Effectiveness – ICs/ECs could effectively restrict or eliminate exposure to contaminated soil, thereby reducing human health risks. The effectiveness of ICs/ECs would depend on proper enforcement. ICs/ECs would not reduce the environmental impact of the contaminants' migration from soils in contaminated areas.

Implementability – IC implementability would highly depend on the local government and its enforcement system. There should be no difficulties with implementation of ECs.

Relative Cost – The implementation cost is low. Some administrative, long-term inspection and periodic assessment costs would be required.

Conclusion – ICs/ECs are retained for further evaluation.

2.6.3 Inspection, Maintenance, and Monitoring

An inspection, maintenance, and maintenance program includes inspection of engineering control systems, and performance of repairs, as necessary. Monitoring is a proven and reliable process for tracking the migration of contamination during and after response actions are completed. Therefore, inspection, maintenance, and monitoring would not be implemented as a standalone response action but would be used in conjunction with other proposed alternatives to evaluate and monitor remediation progress. Monitoring activities can occur during the construction phase of work as well as part of post- construction operation and maintenance as a long-term monitoring program.

Effectiveness – Inspection, maintenance, and monitoring alone would not be effective in reducing contamination levels. It would not alter the risk to human health or the effect on the environment. However, regular inspection would be effective in providing information on site conditions to decision makers.

Implementability – Inspection, maintenance, and monitoring are proven, reliable processes and can be easily implemented. However, the reliability of long-term implementation relies on resource availability.

Relative Cost – Low capital and medium O&M costs.

Conclusion – Retained for further consideration.

2.6.4 Containment (Capping)

This process option is for contaminated media left in place with or without excavation and consolidation. There are two basic cap designs: multi-layered and single-layered. Multi-layered caps are mostly used for covering RCRA hazardous wastes that may leach contaminants to groundwater. Single-layered caps are used most commonly to prevent direct contact risks. Caps can be constructed from a variety of materials, including soil, asphalt, concrete, and geosynthetic material.

Containment can also address control of surface water and groundwater (e.g., hydraulic control for dewatering of excavations).

Effectiveness – Construction of a cap protects receptors by eliminating surface exposure of contaminants. A cap would also prevent contaminated soil erosion and transport by air and water. A multi-layer cap would be most effective in reducing migration of soil contamination to groundwater.

Implementability – Capping can be implemented using available construction resources and materials. It may need to be combined with institutional and engineered controls and will require maintenance for long-term protectiveness. Capping is permitted under TSCA for PCB concentrations up to 10 ppm. NJDEP does not routinely allow capping for the remediation of the IGW pathway, except where technically impractical.

Relative Cost – Moderate to high capital and O&M costs.

Conclusion – Retained for further consideration.

2.6.5 Removal (Excavation)

Removal (excavation) is generally implemented with treatment or disposal technologies.

Excavation can be performed manually, hydraulically, pneumatically, or by mechanical means. In general, heavy machinery is utilized for mechanical removal of large quantities of soil, waste, or sediment. A variety of equipment, such as hydraulic excavators, backhoes, and front-end loaders, can be used to perform excavation activities. Hydraulic excavation utilizes pressurized water to break up soil and underlying aggregate, whereas pneumatic excavation utilizes compressed air. Manual excavation is only useful for removal of small amounts of soil or when heavy machinery cannot be used in certain areas that are hard to access or where structural integrity is uncertain.

Effectiveness – Excavation could result in increased contaminant exposure potential to workers and community during construction. Reduces risk to receptors by minimizing future exposure to contaminated materials and migration of contaminants. Must be combined with containment, transport, disposal, and/or treatment technologies.

Implementability – Easily implemented with standard earth moving equipment and/or hand tools. Staged excavation and dewatering likely will be required. Air monitoring also will be required.

Relative Cost – Moderate to high capital costs.

Conclusion – Retained for further consideration.

2.6.6 Landfill Disposal

Landfill disposal is one of the most common methods for disposal of PCB-contaminated media (EPA 2013). Landfill disposal is used to cover waste materials to prevent contact with the environment and to effectively manage the human and ecological risks associated with those wastes. Landfill disposal of PCB-contaminated soil and building materials is relatively inexpensive compared to other available treatment technologies. Landfill disposal costs are mostly those of transportation and disposal rather than treatment. PCB wastes with a PCB concentration ≥ 50 ppm must be disposed of in a TSCA chemical waste landfill, while PCB concentrations < 50 ppm must be disposed of in a responsible manner; that is, they may be disposed of in a municipal waste landfill or equivalent. PCBs alone are not considered hazardous under RCRA since they are addressed under the TSCA regulations. However, if the waste is hazardous under RCRA, LDRs become applicable, and treatment or a treatment variance may be needed in order to meet Subtitle C or D disposal requirements. Subtitle D disposal involves disposing contaminated material that is non-hazardous at an off-site non-hazardous waste (RCRA Subtitle D) disposal facility. If the contaminated waste material is TCLP hazardous, it must be disposed in a RCRA Subtitle C landfill. Offsite landfills are commercially owned, permitted facilities that minimize potential environmental impacts of disposal waste. Landfilling is considered a non-treatment alternative and less acceptable than treatment alternatives according to CERCLA. The final determination on whether the material is hazardous or non-hazardous would be based on its TCLP results.

Effectiveness – Offsite landfill disposal will prevent direct contact risk to receptors; however, landfill disposal of contaminated soil and building materials does not provide waste reduction or destruction, only containment. Persistent substances like PCB wastes will remain in landfills for long periods of time with little degradation.

Implementability – TSCA landfills capable of accepting more than or equal to 50 mg/kg PCB soil/building materials have yearly tonnage acceptance limits. These limits are determined by the state in which they are located and are specified in the landfill's operating permit. For disposal in municipal/industrial or TSCA landfills, it is necessary that no free liquid is present in the disposal materials; typically, material must pass the RCRA paint filter test to be accepted.

Relative Cost – High capital costs/negligible O&M costs.

Conclusion – Retained for further consideration.

2.6.7 Incineration

Incineration treats PCB contaminated solids and liquids by subjecting them to temperatures typically greater than 760°C (1,400°F) in the presence of oxygen, which causes volatilization, combustion, and destruction of the compounds (EPA 2013). Incinerators must be designed and operated to meet the 99.9999 percent Destruction and Removal Efficiency required for PCBs (EPA 2013). However, TSCA does not require incineration of PCB-contaminated soil or building materials prior to disposal.

When soil with pesticide contamination exceeds the TCLP limits, the contaminated soil is classified as characteristic waste and will require treatment to meet LDR requirements prior to landfill disposal.

Effectiveness – PCB-contaminated soil does not require incineration prior to disposal. Incineration in a RCRA facility is one of the acceptable treatment methods to meet the LDR and UHC requirements for contaminated soil that exceeds TCLP limits. The treatment will need to meet 40 CFR 268.49 requirements.

Implementability – There are commercially available permitted RCRA facilities available to treat characteristic waste to meet 40 CFR 268.49 requirements prior to disposal in a landfill.

Relative Cost – Very high capital/high O&M costs.

Conclusion – Offsite incineration is retained for consideration as a potential element that may be needed for materials that fail the TCLP test that require treatment prior to landfill disposal.

2.6.8 Thermal Desorption

Thermal desorption, which can be implemented either in situ or ex situ, physically separates PCBs and pesticides from soils by heating the contaminated soils at a temperature high enough to volatilize PCBs and pesticides. A vacuum is applied simultaneously to capture the contaminant vapor. Based on the operating temperature, thermal desorption processes are categorized into two groups: high temperature thermal desorption in which wastes are heated to 316°C (600°F) to 538°C (1,000°F) and low temperature thermal desorption (LTTD) in which wastes are heated to 93°C (200°F) to 316°C (600°F) (EPA 2013). Unless heated to the higher end of the LTTD temperature range, organic components in the soil are not damaged in the LTTD process; this enables treated soil to retain the ability to be used and support biological activity (EPA 2013).

Effectiveness – Ex situ thermal desorption technologies have been selected as the remedial action for at least 16 Superfund sites with PCB-contaminated soils or sediments (EPA 2013). Ex situ thermal desorption has successfully reduced PCB concentrations in contaminated soil or sediment from 300 to 41,000 mg/kg down to around 1 to 2 mg/kg (EPA 2013).

Implementability – Implementable. This technology has been used since early 1990s. During the thermal desorption of PCBs, dioxin/furan formation may occur, which needs to be monitored and properly handled. There may be resistance from the public for onsite thermal treatment.

Relative Cost – High capital costs (no O&M cost after PRG achieved).

Conclusion – Retained for further consideration.

2.6.9 Chemical Dehalogenation

Chemical dehalogenation refers to the use of chemical reagents and reduction processes to destroy or chemically change the PCB congeners to a less toxic form. It is an ex situ treatment technology. Chemical dehalogenation processes include base catalyzed decomposition (BCD), which mixes PCB-contaminated soils or sediments with sodium bicarbonate and initially treats it by a thermal desorption process to completely dechlorinate the soil or sediment. The PCB contaminated vapor condensate is collected in an air treatment system and transferred to a heated stirred tank reactor where proprietary catalyst reagents are mixed with high boiling point hydrocarbon oil and sodium hydroxide.

Other innovative, chemical dehalogenation processes include the use of zero valent iron (ZVI) particles to dechlorinate PCBs; SET™, which uses a solution of ammonia and an "active" metal, such as metallic sodium or potassium to create a reducing agent (free electrons) that can break the chlorine-carbon bond, thus, chemically reducing toxic contaminants, such as PCBs, into relatively benign substances; and Eco Logic's Gas Phase Chemical Reduction (GPCR™) technology, which involves gas phase chemical reduction of organic compounds by hydrogen at a temperature of 850°C (1,562°F) or higher to chemically reduce PCBs to methane and hydrogen chloride. Contaminated soil is first processed in a thermal reduction batch processor and heated in an oxygen-free atmosphere, then the volatilized contaminants, such as PCBs, are swept into the GPCR™ reactor for complete reduction.

Effectiveness – At two Superfund sites, BCD dechlorination reduced PCB concentrations from up to 830 mg/kg to 1 mg/kg (EPA 2013).

Implementability – When the two stage BCD process is used to treat solids or sediments with thermal desorption, the capture and treatment of residuals must be considered, especially when the soil contains high levels of fines and moisture. When the BCD process is used with solvent extraction, the capture, treatment, recycling, and disposal of large amounts of liquids will also be necessary (EPA 2013). The chemical dehalogenation processes using ZVI, SET™, and GPCR™ are innovative and have not been documented for full scale implementation for soil remediation.

Relative Cost – High capital/O&M costs (no O&M after PRG achieved).

Conclusion – Eliminated from further consideration due to limited availability and implementability issues.

2.6.10 Soil Washing

Soil washing is an ex situ, water-based remedial technology that mechanically mixes, washes, and rinses soil to remove contaminants and is generally considered a media transfer technology (i.e., it does not destroy PCBs).

Effectiveness – Hydrophobic contaminants, such as PCBs, can be difficult to separate from soil particles into the aqueous washing fluid. Contaminants with a high partition coefficients log-K_{ow} (e.g., PCB >10,000) are more difficult to wash off soil than a contaminant with a lower partition coefficient (e.g., TCE = 3) (EPA 2013). Soil washing has been selected for use at only one Superfund site for PCB contamination (EPA 2013).

Implementability – Soil washing is sensitive to media particle size, clay content, and/or pH. Additives, such as surfactants, can be used to improve removal efficiencies. However, larger volumes of washing fluid may be needed when additives are used. A high surfactant concentration in the washing fluid can cause foaming problems, which can inhibit the ability to effectively remove contaminants from the soil (EPA 2013).

Relative Cost – High capital/moderate O&M costs (no O&M after PRG is achieved).

Conclusion – Soil washing does not destroy PCBs. Based on its limited effectiveness in separating PCBs from soil particles and its limited use at other PCB Superfund sites, soil washing is eliminated from further consideration.

2.6.11 Solvent Extraction

Solvent extraction is an ex situ physical process that uses chemical solvents under controlled pressure and temperature conditions to separate contaminants from soil and sediment. Solvent extraction is different from soil washing in that it uses an extracting chemical instead of water containing additives to separate out contaminants. Solvent extraction can be operated in either batch or continuous mode and consists of four basic steps: extraction, separation, desorption, and solvent recovery. Residual solids are processed with additional solvent washes until cleanup goals are met. The extract from this process contains concentrated contaminants into a smaller volume, which would require further treatment such as incineration, dehalogenation, and/or thermal desorption. The treated solids may need to be dewatered, which generates both a dry solid and a water stream, both of which would need to be analyzed and potentially further treated due to the presence of solvent.

Effectiveness – Solvent extraction technologies have been selected as the remedial action for PCB-contaminated soils or sediments for at least four Superfund sites, and technology vendors reported more than 90 to 98 percent contaminant removal (EPA 2013).

Implementability – Performance may require a high number of extraction stages (6 to 8), especially at higher initial concentrations. Moisture content, the amount of clays, percentage of fines (>15 percent), and the amount of naturally occurring organic carbon may each affect the performance of a solvent extraction process of system design and operation, and many extraction processes can only handle a small particle size, usually less than ¼ inch. (EPA 2013). The waste may need to be made pumpable by adding solvents or water while other systems may require reduction of the moisture content (<20 percent moisture) to effectively treat contaminated media (EPA 2013).

Relative Cost – High capital/O&M costs (no O&M after PRG is achieved).

Conclusion – Solvent extraction is eliminated from further consideration due to the complicated nature of the chemical process and the uncertainty in extraction efficiency.

2.6.12 Solidification/Stabilization

Solidification refers to techniques where additional materials are mixed into the contaminated materials or wastes. The additives affect the physical condition of the contaminated materials or wastes and typically encapsulate the waste, forming a more solid material that is less permeable and has a higher strength. Solidification does not necessarily involve a chemical interaction between the contaminants and the solidifying additives. Stabilization refers to techniques where the additives are mixed into the contaminated materials or wastes affecting the chemical condition of the stabilized materials; the process chemically reduces the hazard potential of the contaminated material by converting the contaminants into less leachable, soluble, mobile, or toxic forms.

The goal of solidification and stabilization is to treat the contaminated soil, resulting in a material that meets performance criteria associated with the following properties:

- Hydraulic Conductivity: To manage water exposure and isolate the solidified/stabilized contaminated soils from groundwater, surface water, or rain water infiltration
- Leachability: To retain contaminants in the solidified/stabilized materials, resulting in concentrations below regulatory criteria in any leachate generated from water contact
- Strength: To withstand overlying loads on the solidified/stabilized materials

Solidification/Stabilization (S/S) are fundamentally different from other PCB treatment technologies in that they reduce the mobility of the contaminants but do not concentrate or destroy them. S/S can be implemented either as an in situ or ex situ process, but only in situ S/S will be considered for this site. In situ S/S can be completed in both the vadose and saturated zones. The objective of S/S at this site is to modify the hydraulic property of the saturated zone soil to eliminate groundwater flowing through the treatment area such that leaching of PCBs and pesticides into groundwater is eliminated.

Effectiveness – S/S is applicable to remediation of inorganic wastes and has also been shown to be reliable when treating non-volatile organics such as PCBs and pesticides. S/S technologies have been selected as the remedial action for PCB-contaminated soils or sediments for at least 35 Superfund sites (EPA 2013). Under normal operating conditions, neither ex situ nor in situ S/S technologies generates significant quantities of contaminated liquids, solid waste, or off gas.

In addition, because groundwater is contaminated with VOCs and is likely to remain contaminated, the potential long-term impact of that groundwater on the stabilized materials would need to be assessed as part of the development of the S/S mix. Although the hydraulic conductivity of the S/S treated material would keep the groundwater from moving into and through the S/S treated material and therefore minimize contact and leaching, leachability testing and modeling of predicted concentrations with time may be required to fully assess effectiveness.

Implementability – Environmental conditions must be considered in determining whether and when to implement an S/S technology. Temperature and precipitation extremes can adversely affect S/S applications and long-term immobilization. Certain S/S applications may require treatment of the off gas. A wide range of performance tests may need to be performed in conjunction with S/S treatability studies to determine the effectiveness of the process on site soils. For example, high concentrations of PCBs and other organics may impede the setting of cement, pozzolan, or organic polymer S/S materials.

Relative Cost – Moderate to high capital/moderate O&M costs.

Conclusion – Retained for further consideration.

2.6.13 Vitrification

Vitrification processes are solidification methods that use heat of up to 1205°C (2,200°F) to melt and convert waste material into glasslike crystalline products (EPA 2013). The destruction mechanism is either pyrolysis (in an oxygen poor environment) or oxidation (in an oxygen rich environment). The volume of the vitrified product is typically 20 to 45 percent less than the volume of the untreated soil or sediment. Vitrification can either be performed in situ or ex situ.

Effectiveness – Vitrification would be effective across a wide range of soil characteristics; however, high moisture content adversely affects treatment and costs. Effectiveness is highly dependent on the nature of the subsurface; heterogeneity of the material and a variable depth to bedrock also would impact effectiveness. Vitrification has been selected as the remedial action for PCB-contaminated soils or sediments at only two Superfund sites (EPA 2013).

Implementability – The technology requires a significant, reliable source of electrical power. Ex situ technology is mainly dependent on the electrical conductivity of the materials to be treated and produces other residuals that must be treated and/or disposed.

Relative Cost – High capital/O&M costs.

Conclusion – Based on power requirements, reliance on electrical conductivity of the materials to be treated and the production of residuals that will need to be treated or disposed, vitrification is eliminated from further consideration.

2.6.14 Bioremediation

Biodegradation of PCBs and other organic contaminants involves the ability of soil microorganisms to use organic contaminants as an energy source by creating a favorable environment for microorganisms to proliferate (EPA 2013). The microorganisms can be indigenous to the impacted soil or consist of laboratory cultured strains specifically adapted for the degradation of the contaminants found at a site. In either case, the objective of bioremediation is to degrade (i.e., break down) organic compounds to simpler innocuous forms, including carbon dioxide and water. Bioremediation can be applied in situ or ex situ.

An additional type of bioremediation technology that offers potential application for treating PCB contamination is phytoremediation. Several investigations have shown that PCBs can be translocated from soil to various parts of the plants and can accumulate in particular tissues in higher concentrations than in others.

Effectiveness – Bioremediation has shown some degree of success in laboratory and pilot-scale applications; however, comprehensive field scale research is needed to advance bioremediation technology. Similarly, while there is a large extent of bench- and pilot-scale research on the use of phytoremediation for PCB, much work is necessary to understand the benefits of using plants for full scale remediation (EPA 2013).

Implementability – Relatively easy to implement using readily available equipment; however, there is limited information available regarding full scale implementation. May require a relatively long timeframe for remediation if high concentrations of contaminants are present. Bioremediation technologies have been selected as the remedial action for PCB-contaminated soils or sediments at only two Superfund sites (EPA 2013).

Relative Cost – Moderate capital/O&M costs.

Conclusion – Based on limited field scale research data, bioremediation is eliminated from further consideration.

2.6.15 Advanced Oxidative Processes

Advanced oxidative processes (AOPs) involve the use of oxygen (O_2), hydrogen peroxide, titanium dioxide, ultraviolet light, electrons, iron, or other oxidizing compounds to degrade PCBs (EPA 2013). AOPs use these oxidizing agents to produce free radicals, which indiscriminately destroy organic matter. Electrochemical peroxidation is an advanced oxidative process that uses electricity, steel electrodes, and hydrogen peroxide to degrade PCBs and VOCs (EPA 2013). The dominant mechanism for the process is Fenton's Reagent enhanced by the input of an electrical current.

Effectiveness – A research study evaluating the use of catalyzed hydrogen peroxide to treat PCB contaminated soil samples collected from two Superfund sites in New England. Using the highest hydrogen peroxide concentrations appropriate for in situ treatment in each soil, PCB destruction was 94 percent in one but only 48 percent in the second. However, 98 percent PCB destruction was achieved in the second soil using conditions more applicable to ex situ treatment (EPA 2013).

Implementability – Relatively easy to implement using readily available equipment although delivery can be challenging in heterogeneous formations, and there is limited information regarding full scale implementation at PCB sites. Administrative requirements include the need to meet substantive requirements of injection permits for reagents. Short life of oxidants would likely require frequent injections to treat high concentrations of contaminants.

Relative Cost – Moderate to high capital/O&M costs.

Conclusion – Based on limited full scale implementation, AOPs are eliminated from further consideration.

Section 3

Development and Screening of Remedial Action Alternatives

The objectives of this section is to develop a range of remedial action alternatives to remediate the site contamination. To address the site-specific RAOs, alternatives were developed by combining the technologies and process options retained in Section 2.

3.1 Development of Remedial Action Alternatives

Several technologies and process options were retained for contaminated materials based on the screening in Section 2. The retained technologies were combined to develop remedial action alternatives.

The retained technologies are summarized below.

- No action
- Institutional and engineering controls
- Inspection, maintenance, and monitoring
- Capping
- Excavation
- Landfill disposal
- Solidification and stabilization
- Incineration
- Thermal desorption

To develop remedial alternatives for the site, representative process options were selected from the same groups of remedial technologies, as appropriate. However, other technologies may still be applicable and should be considered during the remedial design stage of the project. The retained technologies were combined into six alternatives.

The six alternatives developed for the site are listed below.

Alternative 1 – No Action

Alternative 2 – Excavation of Soils above 10 ppm PCBs to Water Table and Offsite Disposal, and In Situ Solidification/Stabilization and Capping of Remaining Soils above PRGs

Alternative 3 – In Situ Solidification/Stabilization and Capping of Soils above PRGs

Alternative 4 – Excavation of Soils above PRGs, and Offsite Disposal

Alternative 5 – Excavation and Onsite Treatment of Soils above PRGs, and Backfill of Treated Material

Alternative 6 – Targeted Excavation, and Offsite Disposal

3.1.1 Common Elements

The common elements included as part of Alternatives 2 through 6 are described here. Note that this FS describes a conceptual approach for the remedial action. Many assumptions are made for order of magnitude cost estimating purpose. For example, it is assumed that in addition to 25 Sherwood Lane (Unimatic), portions of 21 Sherwood Lane and 30 Sherwood Lane properties would be used for consolidation and/or staging purposes. The final approach for remedial action would be determined during the remedial design.

For the purpose of the FS, it is also assumed that for each alternative, the soils at 21, 25 (Unimatic) and 30 Sherwood Lane all would be addressed in the same manner. However, due to the unique sensitivities associated with working in close proximity to the JCMUA water pipes, the approach to the JCMUA pipeline easement contamination would be applied as a common element across all alternatives (except the no action alternative).

In addition, it is assumed that the Unimatic building at 25 Sherwood Lane would need to be demolished and debris disposed offsite. The Unimatic building is unusable due to the presence of PCBs inside the building and the risks of inhalation by future workers or other occupants. Although the building is not occupied, there is a threat of release to the environment posed by the uncontrolled PCBs inside the building due to fire or other outside causes. Left unattended the building will deteriorate and fall into disrepair increasing the likelihood of a release to the environment. In addition, the Unimatic building covers approximately 40% of the 1.23-acre 25 Sherwood Avenue property. A significant portion of the soils contamination including principal threat waste is located underneath the building and could not be remediated without demolition of the building. In addition, the lack of space on the Unimatic property without demolition of the building would make implementation of any of the potential remedial alternatives very difficult or impossible. In order to mitigate these risks, address the contamination including the principal threat waste beneath the building, and meet RAOs identified for the Unimatic Site, it will be necessary to demolish the building. Demolition of the building will prevent human exposure to building contaminants and will prevent the migration of contamination sources to the environment through off-site disposal of the contaminated building materials

Other assumptions made for costing the FS alternatives include the use of ICs such as deed notices.

3.1.1.1 Building Demolition and Offsite Disposal of Debris

As noted above, the Unimatic building at 25 Sherwood Lane would be demolished, including the building slab and foundation. The debris would be segregated based on the level of PCB contamination. Building materials with PCB concentrations > 50 ppm would be disposed of in a TSCA landfill; building materials with PCB concentrations < 50 ppm would be disposed of in a non-hazardous waste landfill, an industrial landfill, or a municipal landfill. For this FS, it is assumed that all building materials are contaminated with PCBs at different levels.

3.1.1.2 Excavation and Soil Cap within JCMUA Pipeline Easement

Soil contamination with PCBs and pesticides were detected within the JCMUA pipeline easement as shown on Figures 2-1 through 2-3. Contaminated soil exceeding the PRGs would be removed to eliminate the direct contact risks, and the excavated area would be backfilled with imported clean fill. Removal of surface soil contamination within the JCMUA pipeline easement would also prevent contaminant migration through surface runoff to the stormwater inlet. Approximately 400 cy of soil would be excavated from the JCMUA pipeline easement.

3.1.1.3 Deed Notice

A deed notice would be recorded for each of the four properties which would limit each property to non-residential use only and provide a description of contamination remaining on site, the use restrictions, and a map to show the area for restricted use if a cap is installed on site.

The deed notice for the JCMUA pipeline easement would also set the procedures if intrusive work is needed for pipeline maintenance.

3.1.2 Alternative 1 – No Action

No work would be conducted under the No Action alternative. The No Action alternative was retained in accordance with the NCP to serve as a baseline for comparison with the other alternatives.

3.1.3 Alternative 2 – Excavation of Soils above 10 ppm PCBs to Water Table and Offsite Disposal, and In Situ Solidification/Stabilization and Capping of Remaining Soils above PRGs

This alternative consists of the following components:

- Building demolition at 25 Sherwood Lane and offsite disposal of debris
- Excavation and soil cap within JCMUA pipeline easement
- Excavation of the PCB-contaminated soils exceeding 10 mg/kg to water table at 21 Sherwood Lane, 25 Sherwood Lane (Unimatic property) and 30 Sherwood Lane
- Offsite disposal of excavated soils
- Consolidation of the remaining soil exceeding the PRGs (PCBs between 1 and 10 mg/kg) above water table into the excavated areas
- Post-excavation sampling
- In situ solidification and stabilization (ISS) of remaining contaminated soil exceeding the PRGs
- Cap the ISS-treated soil with imported clean fill

- Construction, inspection, monitoring, and maintenance of the cap (all properties where ISS-treated soil remains)
- Deed notice (all properties)
- Five-year reviews

Building demolition, excavation and soil cap within JCMUA pipeline easement, and deed notice are described in Section 3.1.1 under common elements.

This alternative includes excavation of vadose zone contaminated soils. The contaminated soils exceeding 10 mg/kg of PCBs would be excavated to the water table (15 feet bgs). Due to the limited space and that excavation would be conducted to neighboring property at depth, sheet pile would be used to support excavation as necessary.

The excavated soils would be segregated into three categories for proper offsite disposal: hazardous waste due to failing the TCLP test (characteristic wastes), PCBs exceeding 50 mg/kg but did not fail TCLP, and non-hazardous waste with PCB concentrations between 1 and 50 mg/kg. For FS cost estimating purposes and based on RI data, it is assumed that approximately 1,000 cubic yards (cy) or 1,400 tons of the excavated soils would be considered hazardous waste.

The remaining contaminated soil exceeding the PRGs (PCB concentrations between 1 and 10 mg/kg and pesticides exceeding the PRGs) would be consolidated into the excavation areas to level the excavated areas and prepare the areas for ISS. Based on the volume estimates in Table 2-5, approximately 10,000 cy of contaminated soil would be excavated for offsite disposal, and approximately 8,000 cy of contaminated soil would be consolidated into the excavated areas. As a result, the excavated/consolidated areas would be a few or several feet below grade prior to the ISS treatment. After consolidation, post excavation samples would be collected as necessary to verify that the PRGs have been met for areas that would not be treated with ISS.

All soil contaminated with PCBs and pesticides exceeding the PRGs above and below the water table would be treated using ISS technology. The primary objectives of ISS at the site are to modify the hydraulic conductivity of the saturated zone soil to isolate solidified/stabilized contaminated soils from groundwater, surface water, or rain water infiltration and to minimize leaching of contaminants into the aquifer by retaining contaminants in the solidified/stabilized materials. An additional objective is to provide sufficient strength to withstand overlying loads on the solidified/stabilized material. Cement-based ISS has been used for treating PCBs at Superfund sites (EPA 2013). Kiln dust, fly ash, and bentonite are other additives that may be used to treat the contaminated soil. A bench scale treatability study would be conducted to determine the composition and additives to be used for ISS treatment. A field pilot study would also be conducted to demonstrate the effectiveness of in situ ISS on site. The reduction in leachability and mobility depends upon how the material is tested. Test parameters may include freeze-thaw resistance, compressive strength, permeability, synthetic precipitation leaching procedure, and/or semi-dynamic tank leaching testing (EPA Method 1315) to determine if the ISS-treated soils meet the design requirements. In addition to leaching criteria, criteria for strength (typically unconfined compressive strength of > 50 pounds per square inch) and hydraulic conductivity ($<1x10^{-6}$ centimeters per second) also would be set.

In addition, the impact of existing groundwater contamination at the site would need to be assessed. Because groundwater is contaminated with VOCs and is likely to remain contaminated, the potential long-term impact of that groundwater on the stabilized materials would need to be assessed as part of the development of the ISS mix. Although the hydraulic conductivity of the S/S treated material would keep the groundwater from moving into and through the S/S treated material and therefore minimize contact and leaching, leachability testing and modeling of predicted concentrations with time may be required to fully assess effectiveness of ISS treatment at the site.

ISS can be implemented through soil mixing with an auger or jet grouting. The soil mixing is usually performed by a crane mounted drill attachment that turns a single shaft large diameter auger head with mixing blades, which creates treated soil columns typically 6 to 12 feet in diameter. The stabilized soil columns would be overlapped to ensure complete mixing treatment. To operate the in situ soil mixing equipment, a relatively leveled and stable surface of compacted earth is needed. Soil volume would increase after in situ soil mixing treatment; therefore, the area for in situ soil mixing would be constructed to be lower than the original grade to accommodate the increase of soil volume after ISS treatment.

After completion of ISS treatment, the treated area would be covered with imported clean fill and graded for positive drainage. The soil cap would be installed to prevent direct contact risks and to minimize infiltration and leaching of contaminants into groundwater or through surface water runoff. A demarcation layer would be placed between the ISS treated soil and the clean fill. A long-term inspection and maintenance program would be implemented to ensure the effectiveness of the cap in eliminating potential human risks. Groundwater samples would also be collected periodically to monitor any potential impact to groundwater quality after the ISS treatment. Periodic review would be conducted by EPA to monitor and evaluate continued protection of human health and the environment.

Due to the limited space at the site, excavation and segregation of soils for offsite disposal, ISS of remaining soils, and backfill would need to be sequenced in several phases in order to excavate and remove all soils with PCB concentrations above 10 mg/kg and treat remaining soils with COC concentrations above PRGs.

3.1.4 Alternative 3 – In Situ Solidification/Stabilization and Capping of Soils above PRGs

This alternative consists of the following components:

- Building demolition at 25 Sherwood Lane and offsite disposal of debris
- Excavation and soil cap within JCMUA pipeline easement
- ISS of contaminated soils exceeding the PRGs
- Construction, inspection, monitoring, and maintenance of soil cap (all properties)
- Deed notice (all properties)
- Five-year reviews

Building demolition, excavation and soil cap within JCMUA pipeline easement, and deed notice are described in Section 3.1.1 under common elements.

Under this alternative, ISS would be conducted from ground surface to target treatment depths. The operation of ISS would be as described under Alternative 2. After completion of ISS, a one-foot compacted soil cap would be placed on top of the ISS treated area to eliminate the direct contact risks. It should be noted that after ISS treatment, the soil volume would increase, and the final grade at the treated area would be higher than the original grade. The site would be graded for positive drainage to avoid standing water over treated portions of the site and to generally follow and maintain existing drainage patterns at the site. Due to the limited space, ISS treatment of soils would need to be sequenced in several phases in order to treat all the soils with COC concentrations above PRGs.

Annual inspection of the soil cap would be performed to ensure continued protection of human health from direct contact risks. The soil cap would be maintained as necessary. Groundwater samples would be collected from monitoring wells periodically to monitor if contaminants would leach over time.

3.1.5 Alternative 4 – Excavation of Soils above PRGs, and Offsite Disposal

This alternative consists of the following components:

- Building demolition at 25 Sherwood Lane and offsite disposal of debris
- Excavation and soil cap within JCMUA pipeline easement
- Excavation of contaminated soils exceeding the PRGs
- Post excavation sampling
- Backfill with imported clean fill
- Offsite disposal
- Deed notice (all properties)

Building demolition, excavation and soil cap within JCMUA pipeline easement, and deed notice are described in Section 3.1.1 under common elements.

Under this alternative, contaminated soils exceeding the PRGs would be excavated. Dewatering would be necessary for excavation below the water table; sheet piling would be used for deep excavation support. Water generated from dewatering of excavation areas would be treated on site in a temporary water treatment facility and discharged to the stormwater system. An NJDEP pollution discharge elimination system/discharge to surface water permit would be obtained. Sufficient space would be required to carry out all of the following activities: excavation, dewatering, water treatment, segregation of wastes into appropriate categories for offsite disposal, and backfill. Due to the limited space at the site, remediation activities would need to be sequenced in several phases in order to remove all the soils with COC concentrations above PRGs.

Post excavation samples would be collected as necessary to verify that the cleanup standards are met. The excavated area would be backfilled with imported clean fill. The ground surface would be restored to the original grade consistent with the surrounding areas.

The excavated soil would be segregated in accordance with waste characteristics and properly treated to meet LDR requirements and disposed at offsite landfills (i.e., TSCA landfills, RCRA Subtitle C landfills, RCRA Subtitle D landfills, municipal landfills).

3.1.6 Alternative 5 – Excavation and Onsite Treatment of Soils above PRGs, and Backfill of Treated Material

This alternative consists of the following components:

- Building demolition at 25 Sherwood Lane and offsite disposal of debris
- Excavation and soil cap within JCMUA pipeline easement
- Excavation of the contaminated soil exceeding the PRGs
- Post excavation sampling
- Treatment of excavated soils via thermal desorption
- Backfill with treated soils and imported clean fill (if needed)
- Deed notice (all properties)

Building demolition, excavation and soil cap within JCMUA pipeline easement, and deed notice are described in Section 3.1.1 under common elements.

Implementation of this alternative would be similar to Alternative 4 except that excavated soils would be treated on site using low temperature thermal desorption systems. The treatment is expected to reduce contamination concentrations to meet the PRGs. A by-product of thermally treating PCBs can be the formation of dioxin/furan in the off gas while operating under certain conditions. While the generation of dioxin would not be expected as an issue related to the controlled combustion process employed in Alternative 5, air monitoring would be used to monitoring the air quality during thermal treatment of the soil.

Following treatment, soils would be backfilled on site in accordance with EPA CAMU policy and NJDEP site remediation regulations and fill material guidance for Site Remediation Program (SRP) sites (NJDEP 2015).

Additional imported clean fill would be brought on site to complete the remedial action as necessary. Due to the limited space, excavation, thermal desorption, and backfill would need to be sequenced in several phases in order to treat all the soils above the PRGs.

For the operation of the onsite low thermal desorption units, permits for air emission and for liquid waste disposal would be obtained as necessary.

3.1.7 Alternative 6 – Targeted Excavation and Offsite Disposal

This alternative consists of the following components:

- Building demolition at 25 Sherwood Lane and offsite disposal of debris
- Excavation and soil cap within JCMUA pipeline easement
- Excavation of contaminated soils above the water table exceeding the PRGs
- Excavation of contaminated soils below the water table exceeding 10 times the PRGs
- Post excavation sampling
- Backfill with imported clean fill
- Offsite disposal
- Deed notice (all properties)
- Five-year-reviews

Building demolition, excavation and soil cap within JCMUA pipeline easement, and deed notice are described in Section 3.1.1 under common elements.

This alternative is very similar to Alternative 4 except that excavation of contaminated soils below the water table would only be targeted to 10 times the PRGs.

Under this alternative, contaminated soils above the water table that exceed the PRGs would be excavated. Below the water table, excavation would be limited to those soils with COC concentrations exceeding 10 times the PRGs. Dewatering would be necessary for excavation below the water table; sheet piling would be used for deep excavation support. Water generated from dewatering of excavation areas would be treated on site and discharged to the stormwater system. An NJDEP pollution discharge elimination system/discharge to surface water permit would be obtained. Due to the limited space, excavation, dewatering, water treatment, segregation of wastes into appropriate categories for offsite disposal, and backfill would need to be sequenced in several phases in order to remove all the soils above the PRGs above the water table and above 10 times the PRGs below the water table.

Post excavation samples would be collected as necessary to verify that the cleanup standards are met. The excavated area would be backfilled with imported clean fill. The ground surface would be restored to the original grade consistent with the surrounding areas.

The excavated soil would be segregated in accordance with waste characteristics and treated in accordance with LDR requirements and disposed at offsite landfills (i.e., TSCA landfills, RCRA Subtitle C landfills, RCRA Subtitle D landfills, municipal landfills).

3.2 Alternative Screening

Since only a limited number of remedial alternatives were developed, screening of remedial action alternatives is not performed. All the alternatives are carried forward through the detailed description and evaluation.

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Section 4

Detailed Analysis of Remedial Action Alternatives

The six remedial alternatives presented in Section 3 are analyzed using nine evaluation criteria. During detailed analysis, each alternative is assessed using the two threshold criteria and five balancing criteria as described in Section 4.1; the two modifying criteria are assessed after the FS, as discussed in Section 4.1. The results of the detailed analysis for each remedial alternative are then arrayed to perform a comparative analysis of the six alternatives and to identify the key tradeoffs between them.

4.1 Definition of Criteria Used in the Detailed Analysis of Retained Alternatives

The nine evaluation criteria were developed to address statutory requirements and considerations for remedial actions in accordance with the NCP and additional technical and policy considerations that have proven to be important for selecting among remedial alternatives (EPA 1988). This subsection describes the nine evaluation criteria as used in the detailed analysis of remedial alternatives and the priority in which the criteria are considered.

4.1.1 Overall Protection of Human Health and the Environment

Each alternative is assessed to determine whether it can provide adequate protection of human health and the environment (short- and long-term) from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site. Evaluation of this criterion focuses on how site risks are eliminated, reduced, or controlled through treatment, engineered controls, or institutional controls and whether an alternative poses any unacceptable cross-media impacts. This criterion also includes a discussion of whether the alternative meets the RAOs established for the site.

4.1.2 Compliance with ARARs

Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), the NCP, 40 CFR Part 300 (1990), and guidance and policy issued by EPA require that remedial actions under CERCLA comply with substantive provisions of ARARs from the state and federal environmental laws during and at the completion of the remedial action. Preliminary chemical-specific, location-specific, and action-specific ARARs for the site are presented in Tables 2-1 through 2-3 for review and consideration in the development of final ARARs for the ROD. For this criterion, each alternative is evaluated to determine how chemical-specific, location-specific, and action-specific ARARs identified in this FS report will be met. If the assessment indicates that an ARAR will not be met, then the basis for justifying one of the six ARAR waivers allowed under CERCLA is discussed.

4.1.3 Long-Term Effectiveness and Permanence

Long-term effectiveness evaluates the likelihood that the remedy will be successful and the permanence that it affords. Factors to be considered, as appropriate, include the following:

- The magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals are considered to the degree that they remain hazardous, taking into account their toxicity, mobility, or volume and propensity to bioaccumulate.
- The adequacy and reliability of controls that are used to manage treatment residuals and untreated waste remaining at the site. This factor includes an assessment of containment systems and institutional controls to determine if they are sufficient to ensure that any exposure to human and ecological receptors is within protective levels. This factor also addresses the long-term reliability of management controls for providing continued protection from residuals, the assessment of the potential need to replace technical components of the alternative, and the potential exposure pathways and risks posed should the remedial action need replacement.

4.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Each alternative is assessed for the degree to which it employs technology to permanently and significantly reduce toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site. Factors to be considered, as appropriate, include the following:

- The treatment processes the alternatives use and the materials they will treat
- The amount of hazardous substances, pollutants, or contaminants that will be destroyed or treated, including how the principal threat(s) will be addressed
- The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment
- The degree to which the treatment is irreversible
- The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate such hazardous substances and their constituents
- Whether the alternative would satisfy the statutory preference for treatment as a principal element of the remedial action

4.1.5 Short-Term Effectiveness

This criterion reviews the effects of each alternative during the construction and implementation phase of the remedial action until remedial response objectives are met. The short-term impacts of each alternative are assessed, considering the following factors, as appropriate:

- Short-term risks that might be posed to the community during implementation of an alternative
- Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures

- Potential adverse environmental impacts resulting from construction and implementation of an alternative and the reliability of the available mitigation measures during implementation in preventing or reducing the potential impacts
- Time until protection is achieved

4.1.6 Implementability

The technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation are evaluated under this criterion. The ease or difficulty of implementing each alternative will be assessed by considering the following factors, as appropriate:

- Technical feasibility will be assessed based on the following factors: technical difficulties and unknowns (associated with the construction and operation of a technology); reliability of the technology (focusing on technical problems that will lead to schedule delays); ease of undertaking additional remedial actions (including what, if any, future remedial actions would be needed and the difficulty to implement additional remedial actions); and ability to monitor the effectiveness of the remedy (including an evaluation of risks of exposure should monitoring be insufficient to detect a system failure).
- Administrative feasibility will be assessed, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for offsite actions).
- Availability of services and materials will be assessed based on the following factors; availability of adequate services for offsite treatment, storage capacity, and disposal capacity; availability of necessary equipment and specialists (includes provisions to ensure any necessary additional resources); availability of services and materials (includes the potential for obtaining competitive bids, which is particularly important for innovative technologies); and availability of prospective technologies.

4.1.7 Cost

The types of costs that are assessed for each alternative include the following:

- Capital costs
- Annual O&M costs
- Periodic costs
- Present value of capital, annual O&M, and periodic costs

Cost estimates are developed according to "A Guide to Developing and Documenting Cost Estimates during the Feasibility Study" (EPA 2000). Flexibility is incorporated into each alternative for the location of remedial facilities, the selection of cleanup levels, and the period in which remedial action will be completed. Assumptions of the project scope and duration are defined for each alternative to provide cost estimates for the various remedial alternatives. Important assumptions specific to each alternative are summarized in the description of the alternative. Additional assumptions are included in the detailed analysis cost estimates for each retained alternative in Appendix C.

For the detailed analysis of alternatives presented in Section 4, detailed cost estimates are developed and used to compare alternatives and support remedy selection. Detailed cost estimates presented in Section 4 are expected to achieve an accuracy range of –30 percent to +50 percent (EPA 2000). The detailed analysis level accuracy range of –30 percent to +50 percent means that, for an estimate of $100,000, the actual cost of an alternative is expected to be between $70,000 and $150,000 (EPA 2000). The detailed cost estimates presented in Section 4 are generally used for presenting remedial alternatives in the Proposed Plan and during remedy selection and include the following components:

- Capital costs are those expenditures that are required to construct a remedial action. They are exclusive of costs required to operate or maintain the action throughout its lifetime. Capital costs consist primarily of expenditures initially incurred to build or install the remedial action (e.g., construction of a water treatment system and related site work). Capital costs include all labor, equipment, and material costs (including contractor markups such as overhead and profit) associated with activities such as mobilization/demobilization; monitoring site work; installation of extraction, containment, or treatment systems; and disposal. Capital costs also include expenditures for professional/technical services that are necessary to support construction of the remedial action.

- Annual O&M costs are those post-construction costs necessary to ensure or verify the continued effectiveness of a remedial action. These costs are estimated mostly on an annual basis. Annual O&M costs include all labor, equipment, and material costs (including contractor markups such as overhead and profit) associated with activities such as monitoring; operating and maintaining extraction, containment, or treatment systems; and disposal. Annual O&M costs also include expenditures for professional/technical services necessary to support O&M activities.

- Periodic costs are those costs that occur only once every few years (e.g., FYRs, equipment replacement) or expenditures that occur only once during the entire O&M period or remedial time frame (e.g., site closeout, remedy failure/replacement). These costs may be either capital or O&M costs, but because of their periodic nature, it may be more practical to consider them separately from other capital or O&M costs in the estimating process.

- The present value of each alternative provides the basis for the detailed cost comparison. The present value cost estimate represents the amount of money that, if invested in the initial year of the remedial action at a given rate of return, would provide the funds required to make future payments to cover all costs associated with the remedial action over its planned life. Future O&M and periodic costs are included and reduced by the appropriate present value discount rate as outlined in "A Guide to Developing and Documenting Cost Estimates during the Feasibility Study" (EPA 2000). Per the guidance, the present value analysis was performed on remedial alternatives using a 7 percent real discount (interest) rate over the period of evaluation for each alternative. Per the guidance, inflation and depreciation were not considered in preparing the present value costs.

4.1.8 State Acceptance

This criterion evaluates the technical and administrative issues and concerns the state may have regarding each of the alternatives. Assessment of state concerns will be completed after comments on the FS and proposed plan have been received by EPA and are addressed in the ROD. Thus, state acceptance is not considered in the detailed evaluation of alternatives presented in this stage of the FS process.

4.1.9 Community Acceptance

EPA's assessment of concerns from the public will be completed after public comments on the FS and proposed plan have been received by EPA and are addressed in the ROD. Thus, community acceptance is not considered in the detailed evaluation of alternatives presented in this stage of the FS process.

4.1.10 Criteria Priorities

The nine evaluation criteria are separated into three groups as shown below to establish priority among these criteria during detailed evaluation of the remedial alternatives. The two threshold criteria must be satisfied by the remedial alternative being considered as the preferred remedy. The five balancing criteria consist of the technical criteria evaluated among those alternatives that satisfy the threshold criteria.

Group	Criteria	Definition
Threshold Criteria	• Overall Protection of Human Health and the Environment • Compliance with ARARs	Must be satisfied by the remedial alternative being considered as the preferred remedy
Balancing Criteria	• Long-Term Effectiveness and • Permanence • Reduction of Toxicity, Mobility, or Volume through Treatment • Short-Term Effectiveness • Implementability • Cost	Technical criteria evaluated among those alternatives satisfying the threshold criteria
Modifying Criteria	• State Acceptance • Community Acceptance	Not evaluated in this FS report; these criteria will be evaluated after comments are received on the FS and the proposed plan

4.2 Detailed Analysis of Alternatives

In this sub-section, remedial alternatives presented in Section 3 undergo detailed analysis. During detailed analysis, each alternative is assessed using the two threshold criteria and five balancing criteria presented in Section 4.1.

As noted in Section 3.1.1, many assumptions are made in the FS for alternative development and cost estimating purposes. The alternatives and their anticipated durations and estimated costs reflect basic assumptions made for site use in the future; dimensions of the remediation zone;

availability of resources such as technology vendors, landfill capacity, and acceptable backfill; and stable energy costs. The FS also assumes that a consideration of relevant elements of EPA Region 2 Clean and Green Policy and a climate change vulnerability assessment will be incorporated in the RD phase in the development of a remedial design. Site conditions and resource availability that are found to be substantially different than those assumed for the development of the alternatives presented in this section would have an impact on estimate schedule and cost and could require a re-evaluation of one or more of the alternatives. The final approach for remedial action would be determined during the remedial design.

4.2.1 Alternative 1: No Action

4.2.1.1 Remedial Alternative Component Descriptions

The No Action alternative is required by the NCP to provide an environmental baseline against which impacts of the various remedial alternatives can be compared. As indicated in Section 3.1.2, no action would be taken under Alternative 1.

4.2.1.2 Overall Protection of Human Health and the Environment

Alternative 1 is not protective of human health and the environment. Contaminated soil and contamination in the building would be left unaddressed and would remain on the site. Alternative 1 would allow continued release of contamination from soil to groundwater and offsite surface water bodies. Contaminated soil would represent a potential direct contact exposure risk to human receptors. PCB contamination in the building also would continue to present an exposure risk to human receptors. Alternative 1 would not include the implementation of any ICs, such as proprietary controls or future monitoring, and therefore, would not address RAOs.

The No Action alternative fails to meet the threshold criterion of protectiveness.

4.2.1.3 Compliance with ARARs

ARARs for the site are included in Tables 2-1 through 2-3. Because no action would be taken, the presence of unaddressed contaminated soil would not meet chemical-specific ARARs, and the presence of PCB contamination in the building would not meet TSCA requirements for re-using the building.

The No Action Alternative fails to meet the threshold criterion of compliance with ARARs. Action- and location-specific ARARs are not applicable since no action would be taken.

4.2.1.4 Long-Term Effectiveness and Permanence

Because the No Action Alternative would not remove, treat, or contain the contaminated soils and contaminated building materials, the contamination left in place would continue to migrate, and the magnitude of risk from untreated waste would not change. Additionally, no controls would be implemented at the site to prevent future exposure. Thus, this alternative would have no long-term effectiveness and permanence.

4.2.1.5 Reduction of Toxicity, Mobility, or Volume through Treatment

No remedial action would be taken under Alternative 1; thus, there would be no reduction in toxicity, mobility, or volume of contaminated soil. The statutory preference for treatment as a principal element of the remedial action would not be met.

4.2.1.6 Short-Term Effectiveness

Protection would not be achieved for the site under this alternative. No action would be taken for the No Action Alternative; thus, there would be no short-term impacts or risks to workers, the community, and the environment from remedial action implementation activities. This alternative would neither minimize nor increase greenhouse gas emissions, air pollutants, energy consumption, or water use because no action would be taken.

4.2.1.7 Implementability

Alternative 1 would not involve any administrative or technical implementation issues because no remedial action or ICs would be implemented.

4.2.1.8 Cost

There are no capital or O&M costs associated with this alternative.

4.2.2 Alternative 2 – Excavation of Soils above 10 ppm PCBs to Water Table and Offsite Disposal, and In Situ Solidification/Stabilization and Capping of Remaining Soils above PRGs

4.2.2.1 Remedial Alternative Component Descriptions

Alternative 2 includes the components, including several elements that would be common to all the remedial alternatives, presented in Section 3.1.3.

<u>**Building Demolition at 25 Sherwood Lane and Offsite Disposal of Debris**</u>

As indicated in Section 3.1.1.2, the building at the 25 Sherwood Lane property will be demolished to reduce the potential for exposure to contaminants present in the building and to allow access to the soil underneath the building in order to complete remedial action on the contaminated soils at the site. Prior to physical demolition of the building, the following activities would be conducted:

- Asbestos abatement
- Lead-based paint management
- Universal waste removal
- Additional delineation of PCBs and other constituents, as required
- Nonstructural component removal (including solar panels and remaining equipment)
- Decontamination of metals, pipes, and similar components
- Demarcation of impacted concrete for demolition

- Utility abandonment
- Establishment of dust control measures
- Establishment of water management measures (for dust suppression and surface runoff)
- Establishment of stockpile locations

Stockpiles of debris would be tarped, and dust suppression techniques would be employed. A backhoe would be used to segregate the materials into piles of contaminated (PCB concentrations above 50 mg/kg), non-contaminated (PCB concentrations below 50 mg/kg), characteristic hazardous waste, and where present, recyclable debris. Debris would be transported for disposal at appropriate offsite disposal facilities, based on delineation results, and recyclable materials would be transported for reclamation, and the non-contaminated debris will be used for restoration of the property. Based on data collected during the RI, it is anticipated that significant asbestos and lead-based paint are not present in the Unimatic building.

Excavation and Soil Cap within JCMUA Pipeline Easement

As noted in Section 3.1.1.3, soil contamination (PCBs and pesticides) was detected within the JCMUA pipeline easement. Although access to this area for remediation is uncertain, it is assumed for the FS that the area can be accessed and would be addressed in conjunction with remedial work conducted at other portions of the site.

Contaminated soil exceeding the PRGs within the JCMUA pipeline easement would be removed, consolidated, and stockpiled with soils excavated from other portions of the site. Given the age and function of the JCMUA pipeline, additional precautions would need to be considered during excavation adjacent to the two 100-year-old steel pipes within the pipeline easement. These methods could include the use of digging methods such as: hand digging, soft digging, vacuum excavation methods and pneumatic hand tools to complete excavation of soils near the pipes. The excavated area would be backfilled with imported clean fill

Excavation of the PCB Contaminated Soils Exceeding 10 mg/kg to Water Table with Offsite Disposal

As described in Section 3.1.3, Alternative 2 includes the excavation of vadose zone contaminated soils. Excavation would be performed primarily via mechanical methods and would target contaminated soils exceeding 10 mg/kg of PCBs that are present above the water table (15 feet bgs). As shown on Figure B-1 in Appendix B, the excavation would encompass a majority of the northern and eastern portions of the property at 25 Sherwood Lane and extend beyond the property boundaries in those directions. Because a large extent of pesticide contamination above PRGs is co-located with the PCBs, excavation and offsite disposal of these soils also would include the hazardous soils that may fail TCLP and address a significant portion of pesticide contaminants exceeding their PRGs.

The excavated soils would be segregated into three categories for proper offsite disposal: hazardous waste due to failing the TCLP test (characteristic wastes), PCBs exceeding 50 mg/kg but did not fail TCLP, and non-hazardous waste with PCB concentrations between 10 mg/kg and

50 mg/kg. Based on the volume estimates in Table 2-5, approximately 10,000 cy of contaminated soil would be excavated for offsite disposal. For FS cost estimating purposes and based on RI data, it is assumed that approximately 1,000 cy or 1,400 tons of the excavated soils would be considered hazardous waste. Additional information regarding soil volumes is provided in Appendix B.

Consolidation of the Remaining Soil Exceeding PRGs into the Excavated Areas and Post-Excavation Sampling

After soils with PCB concentrations above 10 ppm are removed for offsite disposal, work would continue at the site by consolidating all remaining soils with COC concentrations exceeding PRGs into the excavation created by the excavation work described above. The purpose of the consolidation is to level the excavation area to prepare for the ISS of the remaining soil above the PRGs.

Based on the volume estimates in Table 2-5, approximately 8,000 cy of contaminated soil would be consolidated for treatment. Following completion of excavation work, samples would be collected as necessary to verify that the PRGs have been met for areas not treated with ISS.

ISS of Contaminated Soil Exceeding PRGs

As indicated in Section 2.6.12, S/S technologies have been selected as the remedial action for PCB-contaminated soils or sediments for at least 35 Superfund sites (EPA 2013). As previously described in Section 3.1.3, all remaining soils contaminated with PCBs and pesticides exceeding the PRGs above and below water table would be treated using ISS technology. Generic solidification/stabilization processes involve materials that are well known and readily available; however, commercial vendors have typically transformed generic processes into proprietary ones by adding special additives to provide better control of the solidification/stabilization process or to enhance specific chemical or physical properties of the treated waste (EPA 2013). The primary objectives of ISS at the site are to modify the hydraulic conductivity of the saturated zone soil in order to isolate solidified/stabilized contaminated soils from groundwater, surface water, or rain water infiltration and to minimize leaching of contaminants into the aquifer by retaining contaminants in the solidified/stabilized materials. The in situ mixing of reagents into the waste material can be achieved utilizing the following general types of equipment and procedures:

- Backhoe/Excavator
- Mixing injector
- Horizontal rotary mixer
- Vertical auger mixing
- Hydraulic shearing (jet grouting)

For the Unimatic site, a vertical augur mixing approach is assumed in order to reach the full range of depths requiring solidification/stabilization. Auger mixing involves using large soil augers to mix additives (e.g., cement, bentonite) into in situ soil. Additives are applied through nozzles at the bottom of the augers as they turn, mix and drill into the soil.

Augur mixing creates treated soil columns typically 6 to 12 feet in diameter. The stabilized soil columns would be overlapped (e.g., 20 percent overlap) to ensure complete mixing treatment. To operate the in situ soil mixing equipment, a relatively leveled and stable surface of compacted earth is needed. Soil volume would increase after in situ soil mixing treatment; therefore, the area for in situ soil mixing would be constructed to be lower than the original grade to accommodate the increase of soil volume after in ISS treatment. Volume increases associated with the addition of S/S agents to the waste are related primarily to the percent volume of solidification/stabilization reagent added to the waste. While volume increases of 61 percent have been reported by the EPA Superfund Innovative Technology Evaluation (SITE) Program, the majority of volume increases are 5 to 10 percent (EPA 2013).

Capping of Stabilized Soil with Imported Clean Fill

After completion of ISS treatment, the treated area and other portions of the site where excavations were completed in order to consolidate contaminated soils would be backfilled and covered with imported clean fill and graded for positive drainage. The soil cap would be installed to prevent direct contact risks with the solidified/stabilized contaminated soils and to minimize migration of solidified/stabilized contaminants through surface water runoff. Cover elements would include a demarcation layer placed between ISS-treated soil and the imported clean fill, a minimum of 1 foot of clean material, finished with topsoil and vegetation.

Deed Notices

As described in Section 3.1.1.4, deed notices would be recorded, which would limit the properties for non-residential use only and provide a description and a map to show the area for restricted use to avoid disturbance of the ISS-treated material and cap components.

Inspection, Monitoring, and Maintenance of the Cap

During the O&M phase of Alternative 2, visual inspections would be conducted on a quarterly basis and maintenance of the cap cover and stabilized areas would be carried out on an annual basis and as needed in response to significant weather events (e.g., hurricanes). Long-term monitoring of groundwater would also be included as part of O&M activities to confirm that soil RAOs continue to be met. For cost estimating purposes, it is assumed that the sampling program would be carried out annually for the first 4 years to prepare for the FYR and then once every FYR cycle thereafter. It is anticipated that the number of sample locations and requested analyses would likely decrease as the O&M period progresses, assuming that sample results demonstrate that the remedy continues to perform as designed. Following each FYR, plans for long-term monitoring would be re-assessed.

4.2.2.2 Overall Protection of Human Health and the Environment

Alternative 2 would provide protection to human health and the environment. The human health risks from direct contact of contaminated soils would be eliminated by a combination of removal and capping of contamination. Leaching of contaminants to groundwater or migration of contaminants via surface runoff would be minimized through a combination of removal/offsite disposal; in situ treatment and capping of treated contaminated soils coupled with a deed notice; and inspection, maintenance, and monitoring of the soil caps. Therefore, this alternative would meet the RAOs.

At the JCMUA portion of the site, exposure pathway to human health risks would be eliminated by the removal of contaminated soil above PRGs and placement of clean fill.

4.2.2.3 Compliance with ARARs

Chemical-specific ARARs identified in Table 2-1, specifically TSCA (40 CFR Part 761.61 – PCB Remediation Waste) and NJDEP Non-Residential Direct Contact and Impact to Groundwater Standards (N.J.A.C. 26D), would be met by the combination of removal and offsite disposal of building debris and soils with PCB concentrations greater than 10 mg/kg and ISS of remaining soils with COC concentrations exceeding PRGs.

Site activities and remedy would be designed to meet location- and action-specific ARARs identified in Tables 2-2 and 2-3. In particular, any soil consolidation (e.g., from any of the four properties into the excavations created with the removal and offsite disposal of soils contaminated with PCBs greater than 10 mg/kg) for in-situ treatment would be conducted in accordance with EPA AOC policy as described in Section 2.2.6. The EPA AOC policy also would be applicable to the consolidation of the excavated hazardous waste soils prior to offsite disposal.

4.2.2.4 Long-Term Effectiveness and Permanence

This alternative would provide long-term effectiveness and permanence by (1) removing building debris and the contaminated soils above 10 ppm PCBs above the water table from the 21, 25 and 30 Sherwood Lane properties for offsite disposal; (2) isolating solidified/stabilized contaminated soils from groundwater, surface water, or rain water infiltration and minimizing leaching of contaminants into the aquifer by retaining contaminants in the solidified/stabilized materials; and (3) implementation of ICs and maintenance of the cap.

Residual risks from exposure to the treated soil would be eliminated and minimized using the cap and a deed notice to minimize intrusive work that may result in direct contact with the treated soil.

The adequacy and reliability of this alternative in eliminating residual risks would be dependent on the effectiveness of ISS in immobilizing the organic COCs and the reliability of maintaining the cap and implementation of the deed notice. ISS has been used successfully to treat PCB-contaminated soils at many sites, thus, is considered a reliable technology to immobilize PCBs.

At the JCMUA portion of the site, residual risks from direct contact would be reduced and adequately and reliably controlled through the removal of contaminated soils above PRGs, and placement of clean fill.

Finally, inspection, maintenance, and monitoring would provide adequate and reliable controls to evaluate long-term effectiveness and would ensure that the remedy would remain protective of human health and the environment as designed.

4.2.2.5 Reduction of Toxicity, Mobility, or Volume through Treatment

For debris and soils removed for offsite disposal that are deemed hazardous, reduction of toxicity and mobility would occur through treatment at a RCRA-permitted treatment/disposal facility to meet UTS. For non-hazardous soils disposed of offsite, the T/M/V would be contained and controlled in landfills. For the remaining contaminated soils treated via ISS, toxicity would not change; however, the mobility of COCs in the treated soil would be greatly reduced. The volume of the ISS-treated soils would likely be greater than the pre-treated soils. The statutory preference for treatment as a principal element of the remedial action would be partially met for contaminated soil.

4.2.2.6 Short-Term Effectiveness

Building demolition and excavation of contaminated soil would provide an immediate reduction in the volume of contaminated material at the site; however, the potential for short-term risks to workers and the community due to airborne transport of contaminated materials would be increased during building demolition, excavation, and ISS construction activities. These short-term risks would be mitigated through the use of standard construction practices, such as dust suppression with water or chemicals, foam application, placing a structure over the excavation, or using a vacuum manifold to capture emissions, which also minimizes generation of dust and air pollutants.

Short-term impacts to workers and the community would also include increased truck traffic and noise levels associated with the use of heavy equipment, which could be mitigated effectively and reliably through safety measures and ECs such as defining specific travel routes to/from the site for waste transportation vehicles and coordinating shipments to avoid peak travel hours. Personal protective equipment (PPE) would be required to protect workers during onsite construction activities. Additional short-term risks posed to the community during implementation of the alternative would relate to trespassers within the exclusion zone. This and other potential impacts to workers would be mitigated through adherence to safety plans and standard operating procedures.

It is estimated that construction duration and time to achieve protection would be approximately 1 year.

4.2.2.7 Implementability

This alternative would be technically and administratively implementable. Construction could be completed using conventional heavy-construction equipment and services, which are readily available in the commercial market. For the excavation and offsite disposal component of the alternative, installation of sheet piles, excavation of contaminated soil, and backfill with clean soil could be easily conducted; however, seasonal conditions, such as significant rainfall, could impact construction in progress, and landfills (e.g., TSCA, hazardous waste, municipal) with sufficient capacity to accept the various categories of debris and soil waste that may be removed from the site will need to be identified. In addition, access agreements or permission for properties on which remedial action would be implemented may not be currently available and would need to be obtained. For the ISS component of the alternative, a wide range of performance tests may need to be performed in conjunction with S/S treatability studies to determine the effectiveness of the process on site soils; however, services and materials for this component of the alternative are also readily available.

4.2.2.8 Cost

A summary of the detailed analysis capital, O&M, and present value costs associated with Alternative 2 is listed below. Detailed analysis cost estimates are presented in Appendix C. Note that costs for pre-design and design work are considered separately and are not included in the totals below.

- Estimated Total Capital Costs: $13.9 million (M)
- Estimated Total Annual Costs: $360,000
- Estimated Total Periodic Costs: $308,000
- Present Value Total Estimated Costs: $14.3M (over 30 years)

4.2.3 Alternative 3 – Offsite Disposal, and In Situ Solidification/Stabilization and Capping of Soils above PRGs

4.2.3.1 Remedial Alternative Component Descriptions

Alternative 3 includes the components, together with several elements that would be common to all the remedial alternatives, presented in Section 3.1.4.

Building Demolition at 25 Sherwood Lane and Offsite Disposal of Debris

Building demolition and offsite disposal of debris would be conducted as described for Alternative 2 in Section 4.2.2.1.

Excavation and Soil Cap within JCMUA Pipeline Easement

Although access to this area for remediation is uncertain, it is assumed for the FS that the area can be accessed and would be addressed in conjunction with removal work conducted at other portions of the site. Excavation of contaminated soil and placement of clean soil backfill would be as described under Alternative 2.

ISS of Contaminated Soil Exceeding PRGs

Unlike Alternative 2, no soils would be excavated from the site for offsite disposal under Alternative 3. Instead, as previously described in Section 3.1.4, all soil with COC concentrations exceeding their PRGs would be treated using ISS technology. Different equipment may be used for ISS of soil to different depths. For cost estimating purpose, a vertical augur mixing approach is assumed in order to reach the full range of depths requiring solidification/stabilization. Auger mixing involves using large soil augers as described under Alternative 2.

Capping of Stabilized Soil with Imported Clean Fill

After completion of ISS treatment, the treated area would be covered with imported clean fill and graded for positive drainage. The soil cap would be installed to prevent direct contact risks and minimize migration of contaminants through surface water runoff. Cover elements would include a demarcation layer placed between ISS- treated soil and the imported clean fill, a minimum of 1 foot of clean material, finished with topsoil and vegetation.

Deed Notice

Deed notices would be recorded as described under Alternative 2.

Inspection, Monitoring, and Maintenance of the Cap

Inspection, monitoring, and maintenance would be as described under Alternative 2.

4.2.3.2 Overall Protection of Human Health and the Environment

This alternative would provide protection of human health and the environment. Human health risks would be eliminated by using soil caps, building demolition, and offsite disposal. Impact to groundwater and potential impact to surface water would be minimized by ISS treatment and capping.

RAOs would be addressed under Alternative 3 through building demolition and in situ treatment and capping of contaminated soil coupled with a deed restriction, inspection, maintenance, and monitoring.

At the JCMUA portion of the site, the exposure pathway to human health risks would be eliminated by the removal of contaminated soil above PRGs and placement of clean fill.

The stabilization and capping of soils with COC concentrations exceeding PRGs would eliminate exposure pathways and impact to groundwater by minimizing the availability of contaminants to the environment. A deed restriction and notice would ensure the continued short- and long-term protectiveness of the alternative.

4.2.3.3 Compliance with ARARs

Chemical-specific ARARs identified in Table 2-1, specifically TSCA (40 CFR Part 761.61 – PCB Remediation Waste) and NJDEP Non-Residential Direct Contact and Impact to Groundwater Standards (N.J.A.C. 26D), would be met by removing and disposing of building debris and treatment and capping of soils with COC concentrations exceeding PRGs.

Site activities and remedy would be designed to meet location- and action-specific ARARs identified in Tables 2-2 and 2-3. In particular, any soil consolidation (e.g., from the JCMUA property) for in-situ treatment would be conducted in accordance with EPA AOC policy as described in Section 2.2.6.

4.2.3.4 Long-Term Effectiveness and Permanence

This alternative would provide long-term effectiveness and permanence by removing building debris and immobilizing COCs in soils via ISS and capping the treated soil. The residual risks from exposure to treated soils is eliminated or minimized by capping. This alternative's long-term effectiveness and permanence in part would be dependent on the effectiveness of ISS in immobilizing the site organic COCs and the effective maintenance of the cap and proper enforcement of land-use controls. At the JCMUA portion of the site, residual risk would be reduced and adequately and reliably controlled through the removal of contaminated soils above PRGs and placement of clean fill.

Inspection, maintenance, and monitoring of caps would provide adequate and reliable controls to residual contamination; allow the evaluation of long-term effectiveness; and ensure that the remedy would remain protective of human health and the environment as designed.

4.2.3.5 Reduction of Toxicity, Mobility, or Volume through Treatment

For debris removed for offsite disposal that are deemed hazardous, reduction of toxicity and mobility would occur through treatment at a RCRA-permitted treatment/disposal facility to meet UTS. For debris to be disposed as non-hazardous in landfills, the toxicity, mobility, and volume are transferred from the site and controlled at the landfills. For contaminated soils treated via ISS, toxicity would not change; however, the mobility of COCs in the treated soil would be greatly reduced. The volume of the ISS-treated soils would likely be greater than the pre-treated soils. The statutory preference for treatment as a principal element of the remedial action would be met for contaminated soil.

4.2.3.6 Short-Term Effectiveness

Building demolition and offsite disposal of debris would provide an immediate reduction in the volume of contaminated material at the site; however, the potential for short-term risks to workers and the community due to airborne transport of contaminated materials would increase during demolition and ISS activities. These short-term risks would be mitigated through the use of standard construction practices, such as dust suppression with water or chemicals, foam application, or using a vacuum manifold to capture emissions, which also minimizes generation of dust and air pollutants.

Short-term impacts to workers and the community would also include increased truck traffic and noise levels associated with the use of heavy equipment, which could be mitigated effectively and reliably through safety measures and ECs. PPE would be required to protect workers during onsite activities. Additional short-term risks posed to the community during implementation of the alternative would relate to trespassers within the construction areas. Other potential impacts to workers would be mitigated through adherence to safety plans and standard operating procedures.

It is estimated that construction duration and time to achieve protection would be approximately 1 year.

4.2.3.7 Implementability

This alternative would be technically and administratively implementable. Construction could be completed using conventional heavy-construction equipment and services, which are readily available in the commercial market. For the building demolition and offsite disposal component of the alternative, landfills (e.g., TSCA, hazardous waste, municipal) with sufficient capacity to accept the various categories of debris will need to be identified. For the ISS component of the alternative, a wide range of performance tests may need to be performed in conjunction with S/S treatability studies to determine the effectiveness and confirm the reliability of the process on site soils; however, services and materials for this component of the alternative are also readily available.

4.2.3.8 Cost

A summary of the detailed analysis capital, O&M, and present value costs associated with Alternative 3 is listed below. Detailed analysis cost estimates are presented in Appendix C. Note that costs for pre-design and design work are considered separately and are not included in the totals below.

- Estimated Total Capital Costs: $6.1M
- Estimated Total Annual Costs: $360,000
- Estimated Total Periodic Costs: $308,000
- Present Value Total Estimated Costs: $6.4M (over 30 years)

4.2.4 Alternative 4 – Excavation of Soils above PRGs, and Offsite Disposal

4.2.4.1 Remedial Alternative Component Descriptions

Alternative 4 includes the components, together with several elements that would be common to all the remedial alternatives, presented in Section 3.1.5.

Building Demolition at 25 Sherwood Lane and Offsite Disposal of Debris

Building demolition and offsite disposal of debris would be conducted as described under Alternative 2 in Section 4.2.2.1.

Excavation and Soil Cap within JCMUA Pipeline Easement

As described for Alternative 2, contaminated soil exceeding the PRGs within the JCMUA pipeline easement would be removed, consolidated, and stockpiled on site for consolidation with onsite soils for offsite disposal. The excavated area would be backfilled with imported clean fill.

Excavation of Soils with COC Concentrations Exceeding PRGs with Offsite Disposal and Post-Excavation Sampling

As described in Section 3.1.5, Alternative 4 includes the excavation of all contaminated soils exceeding the PRGs. Excavation would be performed primarily via mechanical methods and would target soils with PRG exceedances both above and below the water table. Sheet piles would be installed for deep excavation support. Dewatering would be necessary for excavation below the water table. Water generated from dewatering of excavation areas would be treated on site and discharged to the stormwater system. An NJDEP pollution discharge elimination system/discharge to surface water permit would be obtained.

Post excavation samples would be collected as necessary to verify that the cleanup standards are met. The excavated area would be backfilled with imported clean fill. The ground surface would be restored to the original grade consistent with the surrounding areas.

The excavated soils would be segregated into three categories for proper offsite disposal: hazardous waste due to failing the TCLP test (characteristic wastes), PCBs exceeding 50 mg/kg but did not fail TCLP, and non-hazardous waste with PCB concentrations between 1 and 50 mg/kg. Based on the volume estimates in Table 2-5, approximately 26,000 cy of contaminated soil would be excavated for offsite disposal. For FS cost estimating purposes and based on RI data, it is assumed that approximately 1,000 cy or 1,400 tons of the excavated soils would be considered hazardous waste.

Following completion of excavation work, samples would be collected as necessary to verify that the PRGs are met (i.e., removal of soils with concentrations of COCs exceeding their PRGs). Excavated areas would then be backfilled with imported clean backfill and graded for positive drainage.

Deed Notices

Deed notices would be recorded to limit the properties to non-residential use only.

4.2.4.2 Overall Protection of Human Health and the Environment

This alternative would provide protection to human health and the environment. The human health risks and impact to groundwater and surface water would be eliminated through removal of contaminated soil and building materials for offsite disposal.

The RAOs would be addressed under Alternative 4 through removal and offsite disposal of contaminated soil and building debris.

At the JCMUA portion of the site, exposure pathway to human health risks would be eliminated by the removal of contaminated soil above PRGs and placement of clean fill.

4.2.4.3 Compliance with ARARs

Chemical-specific ARARs identified in Table 2-1, specifically TSCA (40 CFR Part 761.61 – PCB Remediation Waste) and NJDEP Non-Residential Direct Contact and Impact to Groundwater Standards (N.J.A.C. 26D), would be met by the removal and offsite disposal of building debris and soils with COC concentrations exceeding their PRGs.

Site activities and remedy would be designed to meet location- and action-specific ARARs identified in Tables 2-2 and 2-3. In particular, the EPA AOC policy as described in Section 2.2.6 would be applicable to the consolidation of the excavated hazardous waste soils prior to offsite disposal.

4.2.4.4 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence would be provided by removing building debris and contaminated soils for offsite disposal. Because no untreated waste above PRGs would remain on site, no residual risk would remain. Excavation and off-site disposal would be irreversible and reliable.

4.2.4.5 Reduction of Toxicity, Mobility, or Volume through Treatment

All waste materials above the PRGs would be removed from the site and disposed in landfills. For debris and soils removed for offsite disposal that are deemed hazardous, reduction of toxicity and mobility would occur through treatment at a RCRA-permitted treatment/disposal facility to meet UTS. The mobility for all other wastes would be reduced through disposal in permitted landfills. The statutory preference for treatment as a principal element of the remedial action would be partially met.

4.2.4.6 Short-Term Effectiveness

Building demolition and excavation of contaminated soil would provide an immediate reduction in the volume of contaminated material at the site; however, the potential for short-term risks to workers and the community due to airborne transport of contaminated materials would be increased during excavation activities. These short-term risks would be mitigated through the use of standard construction practices, such as dust suppression with water or chemicals, foam application, placing a structure over the excavation, or using a vacuum manifold to capture emissions, which also minimizes generation of dust and air pollutants.

Short-term impacts to workers and the community would also include increased truck traffic and noise levels associated with the use of heavy equipment, which could be effectively and reliably mitigated through safety measures and ECs such as defining specific travel routes to/from the site for waste transportation vehicles and coordinating shipments to avoid peak travel hours. PPE would be required to protect workers during onsite removal activities. Additional short-term risks posed to the community during implementation of the alternative would relate to trespassers within the construction zone. Other potential impacts to workers would be mitigated through adherence to safety plans and standard operating procedures.

It is estimated that construction duration and time to achieve protection would be approximately 1.5 years.

4.2.4.7 Implementability

This alternative would be technically and administratively implementable. Construction could be completed using conventional heavy-construction equipment and services, which are readily available in the commercial market. For the excavation and offsite disposal component of this alternative, excavation of contaminated soil and backfill with clean soil could be easily conducted. However, seasonal conditions, such as significant rainfall, could impact construction in progress, and landfills (e.g., TSCA, hazardous waste, municipal) with sufficient capacity to accept the various categories of debris and soil waste that may be removed from the site will need to be identified. Water generated from dewatering of excavation areas would be treated on site and discharged to the stormwater system. An NJDEP pollution discharge elimination system/discharge to surface water permit would be obtained. In addition, access agreements or permission for properties on which remedial action would be implemented may not be currently available and would need to be obtained.

4.2.4.8 Cost

A summary of the detailed analysis capital, O&M, and present value costs associated with Alternative 4 is listed below. Detailed analysis cost estimates are presented in Appendix C.

- Estimated Total Capital Costs: $18.1M
- Estimated Total Annual Costs: $0
- Estimated Total Periodic Costs: $0
- Present Value Total Estimated Costs: $18.1M

4.2.5 Alternative 5 – Excavation, Onsite Treatment of Soils above PRGs, and Backfill of Treated Material

4.2.5.1 Remedial Alternative Component Descriptions

Alternative 5 includes the components, together with several elements that would be common to all the remedial alternatives, presented in Section 3.1.6.

Implementation of this alternative would be similar to Alternative 4 except that excavated soils would be treated on site using low temperature thermal desorption systems.

Building Demolition at 25 Sherwood Lane and Offsite Disposal of Debris

Building demolition and offsite disposal of debris would be conducted as described under Alternative 2 in Section 4.2.2.1.

Excavation and Soil Cap within JCMUA Pipeline Easement

Although access to this area for remediation is uncertain, it is assumed for the FS that the area can be accessed and would be addressed in conjunction with removal work conducted at other portions of the site. Excavation of contaminated soil and placement of soil backfill would be as described under Alternative 2.

Excavation of Soils with COC Concentrations Exceeding PRGs and Post-Excavation Sampling

Excavation of soil and post-excavation sampling would be as described under Alternative 4.

Onsite Treatment and Backfill of Treated and Imported Fill Soils

Onsite treatment and backfill of treated soil would be implemented in accordance with EPA CAMU policy and NJDEP site remediation regulations and fill material guidance for SRP sites (NJDEP 2015).

Ex situ thermal desorption uses heat and vacuum extraction to mobilize and remove contaminants from soil. Excavated soil would be segregated and placed into stockpiles. Thermal conducting heating wells would be placed in a grid-like pattern within the soil stockpiles. Thermal conducting heating wells would heat the soil to the target temperature as measured by thermocouples placed throughout the stockpiles. At the target temperature, the contaminant's vapor pressure and diffusivity increase and viscosity decreases. As a result, the evaporation rate and mobility of the contaminant is increased, and contaminants and water contained in the soil are vaporized. Soil vapor extraction wells placed in the stockpile would be used to remove the soil vapor steam. The extracted off-gas and water would be treated through vapor and liquid treatment systems. If need be, the liquid waste can be contained, treated, and disposed of offsite.

Thermal treatment has high energy demands, which would require power be delivered to the site. Higher capacity electrical power lines would need to be provided to supply the electrical needs of the thermal treatment system.

Following treatment, soils would be backfilled on site. Additional imported clean fill would be brought on site to complete the remedial action as necessary.

Due to the limited onsite space, excavation, thermal desorption, and backfill would need to be implemented in phases.

For the operation of the onsite low thermal desorption units, permits for air emission and liquid waste disposal would be obtained as necessary.

Deeds Notice

Deed notices would be recorded to limit the properties to non-residential use only.

4.2.5.2 Overall Protection of Human Health and the Environment

Alternative 5 would provide short- and long-term protection of human health and the environment by treating the contaminated soil to meet the PRGs, thus, eliminating the contamination that would pose human health risks and reducing impact to groundwater. RAOs would be addressed under Alternative 5 through removal and offsite disposal of building debris and removal and onsite treatment of contaminated soils prior to backfilling.

At the JCMUA portion of the site, the exposure pathway to human health risks would be eliminated by the removal of contaminated soil above PRGs and placement of clean fill.

4.2.5.3 Compliance with ARARs

Chemical-specific ARARs identified in Table 2-1, specifically TSCA (40 CFR Part 761.61 – PCB Remediation Waste) and NJDEP Non-Residential Direct Contact and Impact to Groundwater Standards (N.J.A.C. 26D), would be met by the disposal of building debris and treatment of soils with COC concentrations exceeding their PRGs.

Site activities and remedy would be designed to meet location- and action-specific ARARs identified in Tables 2-2 and 2-3. In particular, soils would be backfilled on site in accordance with EPA CAMU policy and NJDEP site remediation regulations and fill material guidance for SRP sites (N.J.A.C. 26E)

4.2.5.4 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence would be provided by removing building debris for offsite disposal and treating contaminated soils via LTTD to remove contaminants meeting the PRGs prior to backfilling treated soils on the site. Because contaminant concentrations above PRGs would not remain on site, there would not be any residual risk. At the JCMUA portion of the site, residual risk would be reduced and adequately and reliably controlled through the removal of contaminated soils above PRGs and the placement of clean fill.

4.2.5.5 Reduction of Toxicity, Mobility, or Volume through Treatment

For debris removed for offsite disposal that are deemed hazardous, reduction of toxicity and mobility would occur through treatment at a RCRA-permitted treatment/disposal facility to meet UTS. The onsite treatment of soils through LTTD is an irreversible treatment process and would meet the PRGs, and the persistence, toxicity, mobility, and propensity of COCs to bioaccumulate would be minimal. In addition, the statutory preference for treatment as a principal element of the remedial action would be partially met for contaminated soil.

4.2.5.6 Short-Term Effectiveness

Building demolition and excavation/treatment of contaminated soil would provide an immediate reduction in the volume of contaminated material at the site; however, the potential for short-term risks to workers and the community due to airborne transport of contaminated materials would be increased during excavation activities. These short-term risks would be mitigated through the use of standard construction practices, such as dust suppression with water or chemicals, foam application, placing a structure over the excavation, or using a vacuum manifold to capture emissions, which also minimizes generation of dust and air pollutants.

Thermal desorption (LTTD) has high energy demands, which would require power or natural gas to be delivered to the site. Higher capacity electrical power lines may need to be provided to supply the electrical needs of the thermal treatment system and would pose short-term risk to workers. A by-product of thermally treating PCBs can be the formation of dioxin/furan in the off gas while operating under certain conditions. Factors promoting the formation of dioxins/furans include the existence of other chlorinated organic contaminants, addition of ferric chloride to sediments for dewatering, particulates and temperatures above 260°C (500°F) such as in a baghouse and long residence times at 650°C (1202°F) (EPA 2013). While the generation of dioxin would not be expected as an issue related to the controlled combustion process employed in Alternative 5, air monitoring would be used to monitoring the air quality during thermal treatment of the soil. Any short-term risks to the community during treatment of the contaminated soils related to the off-gas of the thermal treatment system would be mitigated through off-gas treatment. Due to the limited space, thermal desorption would need to be implemented in phases, which will result in longer period of onsite construction operation.

Additional short-term risks posed to the community during implementation of the alternative would relate to trespassers within the construction zone. Other potential impacts to workers would be mitigated through adherence to safety plans and standard operating procedures.

It is estimated that construction duration and time to achieve protection would be approximately 2 years.

4.2.5.7 Implementability

Alternative 5 would have significant implementability concerns at the site. Implementability issues are primarily due to the difficulties associated with excavating, treating, and backfilling a significant volume of material within the confines of a 1.5-acre site. The excavation and treatment may need to be conducted in phases due to space limitation. In addition, seasonal conditions, such as significant rainfall, could impact construction progress.

As noted under short-term effectiveness, LTTD has high energy demands, which would require power be delivered to the site. Higher capacity electrical power lines may need to be provided to supply the electrical needs of the thermal treatment system. In addition, if an issue occurs during thermal treatment that requires shut down for an extended period of time, the process would need to be started over again, losing gains made during the initial soil heating process. Alternative 5 would also need to meet substantive requirements of permitting related to assembly and construction of the treatment unit as well as permitting for the release of treated off-gas emissions.

Finally, access agreements or permission for properties on which remedial action would be implemented would need to be obtained.

4.2.5.8 Cost

A summary of the detailed analysis capital, O&M, and present value costs associated with Alternative 4 is listed below. Detailed analysis cost estimates are presented in Appendix C. Note that costs for pre-design and design work are considered separately and are not included in the totals below.

- Estimated Total Capital Costs: $15.1M
- Estimated Total Annual Costs: $0
- Estimated Total Periodic Costs: $0
- Present Value Total Estimated Costs: $15.1M

4.2.6 Alternative 6 – Targeted Excavation of Soils, and Offsite Disposal

4.2.6.1 Remedial Alternative Component Descriptions

Alternative 6 is the same as Alternative 4 except that below the water table, soil excavation would be limited to those soils where COC concentrations exceed 10 times the PRG concentration. Alternative 6 includes the components, together with several elements that would be common to all the remedial alternatives, presented in Section 3.1.7.

Building Demolition at 25 Sherwood Lane and Offsite Disposal of Debris

Building demolition and offsite disposal of debris would be conducted as described under Alternative 2 in Section 4.2.2.1.

Excavation and Soil Cap within JCMUA Pipeline Easement

As described for Alternative 2, contaminated soil exceeding the PRGs within the JCMUA pipeline easement would be removed, consolidated, and stockpiled onsite for consolidation with onsite soils for offsite disposal. The excavated area would be backfilled with imported clean fill.

Excavation of Soils with COC Concentrations Exceeding PRGs with Offsite Disposal and Post-Excavation Sampling

As described in Section 3.1.7, Alternative 6 includes the excavation of all contaminated soils above the water table exceeding the PRGs. Below the water table, soils with concentrations exceeding 10 times PRG concentrations would be excavated. Excavation would be performed primarily via mechanical methods with sheet piles for deep excavation support. Dewatering would be necessary for excavation below the water table. Water generated from dewatering of excavation areas would be treated on site and discharged to the stormwater system. An NJDEP pollution discharge elimination system/discharge to surface water permit would be obtained.

Post excavation samples would be collected as necessary to verify that the cleanup standards are met and also to document the level of soil contamination left in place. Demarcation marks would be installed between the remaining soil contamination with PCBs above 1 mg/kg but less than 10 mg/kg and the clean backfill. The excavated area would be backfilled with imported clean fill. The ground surface would be restored to the original grade, consistent with the surrounding areas. It should be noted that the clean backfill below the water table that is placed among the contaminated soils might be re-contaminated over time with low concentrations of pesticides and lower chlorinated PCBs due to migration of those constituents in groundwater from the surrounding soils.

The excavated soils would be segregated into three categories for proper offsite disposal: hazardous waste due to failing the TCLP test (characteristic wastes), PCBs exceeding 50 mg/kg but did not fail TCLP, and non-hazardous waste with PCB concentrations between 1 and 50 mg/kg. Based on the volume estimates in Table 2-5, approximately 21,000 cy of contaminated soil would be excavated for offsite disposal. For FS cost estimating purposes and based on RI data, it is assumed that approximately 1,000 cy or 1,400 tons of the excavated soils would be considered hazardous waste.

Deed Notice

Deed notices would be recorded to limit the properties to non-residential use only and provide a description and a map to show the areas for restricted use to avoid disturbance of soils with COC concentrations above PRGs that would remain on the site.

4.2.6.2 Overall Protection of Human Health and the Environment

This alternative would provide protection to human health through direct contact and the environment from surface runoff but would not be protective for impact to groundwater, as some soils exceeding PRG concentrations would remain below the water table. The removal and offsite disposal of contaminated soils exceeding the PRGs above the water table, removal of contaminated building materials, and backfill of clean fill would eliminate human health direct risks and impact to groundwater from vadose zone soils. The residual contaminated soil that is above the PRGs and below the water table would continue to impact the groundwater quality. As a result, this alternative would only partially meet the RAOs.

At the JCMUA portion of the site, the exposure pathway to human health risks would be eliminated by the removal of contaminated soil above PRGs and placement of soil backfill.

4.2.6.3 Compliance with ARARs

Chemical-specific ARARs identified in Table 2-1, specifically TSCA (40 CFR Part 761.61 – PCB Remediation Waste) and NJDEP Non-Residential Direct Contact (N.J.A.C. 26D), would be met by the removal and offsite disposal of building debris and soils above the water table with COC concentrations exceeding their PRGs. For soils with COC concentrations exceeding PRGs that remain below the water table, direct contact ARARS would be met by application of the approximate 15-foot layer of clean fill that will be use to replace the excavated soil from above the water table. The residual soil would not comply with the impact to groundwater PRGs and would continue to impact the groundwater quality.

Site activities and remedy would be designed to meet location- and action-specific ARARs identified in Tables 2-2 and 2-3. In particular, the EPA AOC policy as described in Section 2.2.6 would be applicable to the consolidation of the excavated hazardous waste soils prior to offsite disposal.

4.2.6.4 Long-Term Effectiveness and Permanence

Like Alternative 4, long-term effectiveness and permanence under Alternative 6 would be provided by removing building debris for offsite disposal and excavation of contaminated soil from the target treatment zone. Human health risks from direct contact would be eliminated. However, because untreated waste above PRGs would remain below the water table, some degree of residual risk and continuing impact to groundwater quality would remain as well. At the JCMUA portion of the site, residual risk would be reduced and adequately and reliably controlled through the placement of 2 feet of clean fill and the use of a deed notice.

4.2.6.5 Reduction of Toxicity, Mobility, or Volume through Treatment

For debris and soils removed for offsite disposal that are deemed hazardous, reduction of toxicity and mobility would occur through treatment at a RCRA-permitted treatment/disposal facility to meet UTS. The mobility for all other wastes would be reduced through disposal in permitted landfills. There would be no reduction in toxicity, mobility, or volume of the contaminated soils (i.e., soils with COC concentrations greater than the PRG and below 10x the PRG that remain below the water table).

4.2.6.6 Short-Term Effectiveness

As is the case for Alternative 4, building demolition and excavation of contaminated soil would provide an immediate reduction in the volume of contaminated material at the site; however, the potential for short-term risks to workers and the community due to airborne contaminated dust particles would be increased during excavation activities. Standard construction practices, such as dust suppression with water or chemicals, foam application, placing a structure over the excavation, or using a vacuum manifold to capture emissions, which also minimizes generation of dust and air pollutants can be used to mitigate short term risks.

Short-term impacts to workers and the community and corresponding mitigation practices described for Alternative 4 also apply to Alternative 6.

It is estimated that construction duration would be approximately 1 year, however this alternative would not achieve groundwater protection RAO.

4.2.6.7 Implementability

Implementability considerations for Alternative 6 are the same as for Alternative 4.

4.2.6.8 Cost

A summary of the detailed analysis capital, O&M, and present value costs associated with Alternative 6 is listed below. Detailed analysis cost estimates are presented in Appendix C. Note that costs for pre-design and design work are considered separately and are not included in the totals below.

- Estimated Total Capital Costs: $16.4M
- Estimated Total Annual Costs: $0
- Estimated Total Periodic Costs: $0
- Present Value Total Estimated Costs: $16.4M

4.3 Comparative Analysis of Retained Alternatives

Comparative analysis of the six remedial alternatives is presented in narrative form in the following subsections. The comparative analysis exercise evaluates the six retained alternatives in relation to one another for the two threshold and five balancing criteria. The purpose is to identify relative advantages and disadvantages of each alternative. Only significant comparative differences between alternatives are presented. A summary of the comparative analysis is presented in Table 4-1.

4.3.1 Overall Protection of Human Health and the Environment

All retained alternatives, except for Alternative 1 and Alternative 6, would address RAOs for the building and contaminated soils through removal and offsite disposal or treatment. Alternative 1 would not provide protection of human health and the environment. Alternative 6 would address direct contact and surface water runoff RAOs but would not address impact to groundwater RAO, as residual contaminated soil would continue to impact the groundwater quality.

Alternatives 2 to 5 would provide overall protection of human health and the environment. Alternatives 2, 3, and 4 would prevent further migration of COCs to groundwater and offsite surface water by minimizing the availability of contaminants to the environment through ISS or removal and offsite disposal. Alternative 5 would prevent further migration of COCs to groundwater and offsite surface water by removing contaminants from soil via LTTD, with additional treatment implemented to address contaminants in the off-gas. Residuals from off-gas treatment would be treated or disposed of at a permitted waste disposal facility.

4.3.2 Compliance with ARARs

Because no action would be taken under Alternative 1, the presence of unaddressed contaminated soil would not meet chemical-specific ARARs, and the presence of PCB contamination in the building would not meet TSCA requirements for re-using the building.

Alternatives 2, 3, and 4 would meet chemical-specific ARARs (TSCA [40 CFR Part 761.61 – PCB Remediation Waste] and NJDEP Non-Residential Direct Contact and Impact to Groundwater Standards [N.J.A.C. 26D]), which are "To be Considered" (TBC) at this site, through removal/offsite disposal and/or ISS of soils with COC concentrations exceeding PRGs. However, meeting the chemical-specific ARARs under Alternatives 2 and 3 would be dependent on developing an effective ISS mix for stabilizing the PCB and pesticide COCs during treatability testing.

Alternative 5 would meet the chemical-specific ARARs for soils through LTTD treatment of excavated soils prior to backfilling the treated material on site.

Under Alternative 6, some soils with COC concentrations exceeding PRGs would remain below the water table. Direct contact ARARS applicable to these soils would be met by application of the approximate 15-foot layer of clean fill that will be used to replace the excavated soil from above the water table. However, Alternative 6 would not meet the impact to groundwater RAO.

Site activities for Alternatives 2 through 6 would be designed to meet location- and action-specific ARARs identified in Tables 2-2 and 2-3.

4.3.3 Long-Term Effectiveness and Permanence

Alternative 1 would provide no long-term effectiveness and permanence because no action would be taken. Risks from the site contaminants would remain the same.

Alternative 4 would provide the highest degree of long-term protectiveness and permanence because contaminated building debris and soil above the PRGs, including the principal threat waste, would be removed from the site. Alternative 5 would also provide a high degree of long-term effectiveness and permanence through the irreversible treatment of contaminated soil, including the principal threat waste to meet the PRGs prior to backfilling the treated material on site.

Alternatives 2 and 3, which both involve ISS of contaminated soil, would respectively provide moderate and low to moderate long-term effectiveness and permanence. While ISS has been successfully implemented at many sites and is considered a reliable technology to immobilize organic COCs such as PCBs, toxicity would not be reduced and volume would increase. Alternative 3 would leave the largest amount of residual contamination, including the principal threat waste, behind; while Alternative 2 would leave the second largest amount of residual contamination behind, but all principal threat waste would be removed under Alternative 2. As a result, under Alternative 3, placement, long-term inspection, monitoring and maintenance of a soil cap to eliminate or minimize residual risks from the treated soil would be required as part of the alternatives.

Long-term effectiveness and permanence of Alternatives 2 and 3 also would be dependent on the development of an effective ISS mix to address both PCBs and pesticides. In addition, because groundwater is contaminated with VOCs and is likely to remain contaminated, the potential long-term impact of that groundwater on the stabilized materials would need to be assessed as part of the development of the ISS mix.

Alternative 6 would not provide long-term effectiveness and permanence because untreated soil above PRGs would remain below the water table. Further remedial action would be required to address the residual contaminated soil that would remain under Alternative 6.

4.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Because no action would be taken, Alternative 1 would not address this criterion.

Alternative 5 would be rated high for this criterion. Thermal desorption is an irreversible treatment process, and there would be high reductions in toxicity, mobility, and volume of contaminated soil treated thermally. Alternative 5 satisfies the statutory preference for treatment as a principal element of the remedial action and uses treatment to address soils exceeding PRGs, including those soils defined as principal threat waste as described in Section 1.6.2.

Alternatives 2, 3 and 4 would all be rated moderate for this criterion. Like Alternative 5, Alternative 3 satisfies the statutory preference for treatment as a principal element of the remedial action and uses treatment to address soils exceeding PRGs, including those soils defined as principal threat waste. Under Alternative 3, the mobility of COCs in the treated soil would be greatly reduced, however, toxicity would not change and the volume of the ISS-treated soils would likely be greater than the pre-treated soils due to the addition of the stabilization agent. In addition, the irreversibility of the ISS treatment process would be dependent on developing an effective ISS mix for stabilizing the COCs and withstanding the potential long-term impact of VOC-contaminated groundwater (if any) on the stabilized materials.

Alternative 2 uses ISS to treat those soils with PCB concentrations above 1 mg/kg that remain after excavation of soils above the water table with PCB concentrations greater than 10 mg/kg. Hence, relative to Alternatives 3 and 5, Alternative 2 would only partially meet the statutory preference for treatment. In addition, all the soils defined as principal threat waste would be addressed by excavation and offsite disposal, not treatment.

Under Alternative 4 for debris and soils removed for offsite disposal that are deemed hazardous under these alternatives, reduction of toxicity and mobility would occur through treatment at a RCRA-permitted treatment/disposal facility to meet UTS. However, it is anticipated only a small volume of contaminated soil would exceed the hazardous waste criterion; the majority of the wastes would be disposed in permitted landfills. This would reduce the mobility of the waste, including the soil defined as principal threat waste through containment. Toxicity and volume would not be changed.

Alternative 6 would not achieve the same level of reduction in mobility as Alternative 4 because it would leave approximately 5,000 CY of untreated contaminated soil behind at the site.

4.3.5 Short-Term Effectiveness

Alternative 1 would not have any impacts to the community and workers because no action would be taken. The remaining alternatives, to varying degrees, all would result in short-term risks to the community and potential impact on workers carrying out the remedial action. This is due in part not only to the nature of the activities that would be conducted for each alternative, but also because those activities are required in a very small footprint (approximately 1.2 acres) that would present significant implementation challenges. All alternatives, other than no action, would require the usage of space from neighboring properties for implementation of the alternatives.

Of the alternatives other than No Action, Alternative 5 would require the largest amount of space to effectively carry out all components of the alternative (i.e., excavation, dewatering operation, water treatment, staging, treatment and backfill operations). As a result, Alternative 5 would likely cause the greatest level of short-term risk to the community and potential impact to workers due to the need to safely manage and conduct significant excavation, dewatering, ex situ treatment, and backfill operations in a very small space. Heavy construction activities would require implementation of dust control measures and stormwater runoff control. Excavation below the water table would pose significant challenge because of dewatering requirements and water treatment operations. Vibration from installation of sheet piling to support deep excavation needs to be very carefully conducted so that there is no impact to the integrity of the nearby JCMUA pipelines, which provide drinking water supply to Jersey City. In addition, air monitoring would be required to reduce risks to workers and the community from fugitive emissions during construction and remediation. Potential risk to remediation workers associated with direct contact with contaminated material would be mitigated through the use of PPE and standard health and safety practices.

In addition to short-term risk to the community and potential impact to workers associated with construction activities, Alternative 5 also presents additional risks and impacts related to the use of thermal treatment. Thermal treatment has high energy demands, which would require power be delivered to the site. Higher capacity and high voltage electrical power lines would likely need to be installed to supply the electrical needs of the thermal treatment system and would pose a short-term risk to workers. Off-gas releases from thermal treatment system also could occur and would need to be mitigated through air treatment and monitoring to reduce risks to workers and the community.

Alternatives 2, 3, 4, and 6 would have risks and impacts associated with heavy construction activities associated with excavation, ISS treatment, and/or offsite disposal. All four alternatives would temporarily increase particulate emissions and would require the implementation of dust control measures, stormwater runoff control, and air monitoring to reduce risks to the community and workers.

Alternative 4 would have the second highest impact to the workers and community, followed by Alternative 6. To allow for segregation and staging of soils prior to offsite disposal, Alternatives 4 and 6 would have similar space requirements as Alternative 5, but more flexibility in phasing operations, which would result in less of a short-term impact of the community. Between Alternatives 4 and 6, Alternative 4 would require the largest amount of soils to be excavated and shipped off-site and therefore would have the bigger impact to the community because of heavy truck traffic associated with trucks hauling contaminated debris and soil away from the site and trucks hauling backfill material to the site. Because Alternative 6 would require the excavation of a smaller amount of contaminated soil than Alternative 4, it would be expected to pose slightly less of an impact to community and workers, however Alternative 6 leaves approximately 5,000 cy of contaminated soil in place. Like Alternative 5, both Alternatives 4 and 6 would require excavation below the water table, therefore add an additional waste stream to manage within the compact site footprint. Water generated from dewatering of excavation areas would need to be treated on site and discharged to the stormwater system. Vibration from installation of sheet piling to support deep excavation needs to be very carefully conducted so that there is no impact to the integrity of the nearby JCMUA pipelines, which provide drinking water supply to Jersey City.

Alternatives 2 and 3 would have slightly less short-term impacts to the workers and the community, when compared to Alternatives 4 and 6. Alternative 2 would require less excavation and offsite disposal than Alternatives 4, 5 and 6, however it includes an ISS component that would contribute to construction-related short-term risk. Alternative 3 would likely have the smallest impact to the community because all contaminated soils would be addressed on the site via ISS meaning minimal truck traffic-related concerns relative to the alternatives that include significant excavation components. However, Alternative 3 could still require some excavation (or an alternate more expensive and time-consuming jet grouting process) if, after building demolition, any subsurface structures (e.g., foundations, column piers, concrete/steel pipes, or other obstruction) remain and must be removed before ISS can proceed.

The durations estimated for the alternatives to achieve protection and RAOs are:

Alternative 1: would not achieve RAOs

Alternative 2: approximately 1 year

Alternative 3: approximately 1 year

Alternative 4: approximately 1.5 years

Alternative 5: approximately 2 years

Alternative 6: would not achieve groundwater protection RAO

4.3.6 Implementability

Alternative 1 would be the easiest to implement since it involves no action. The remaining alternatives, to varying degrees, all would have implementability issues. This is due in part not only to the nature of the activities that would be conducted for each alternative, but also because those activities are required in a very small footprint (approximately 1.2 acres) that itself presents significant implementation challenges.

Alternative 5 would be the most difficult alternative to implement. This is because it would require excavation (of approximately 26,000 cy of soil), ex-situ treatment, and backfilling of treated soil and additional clean fill to occur almost concurrently within a footprint of less than 1.2 acres. The construction activities may need to proceed in stages, but even in stages, excavation, treatment and backfilling all would be occurring within a particular stage. In addition, Alternative 5 would also need to meet substantive requirements of permitting related to assembly and construction of the thermal treatment unit as well as permitting for the release of treated off-gas emissions. Administrative challenges in obtaining the required thermal treatment air permit could be prohibitively difficult.

Alternatives 4 and 6 would require the excavation of 26,000 CY, and 21,000 CY, respectively, of contaminated soil for offsite disposal. While these alternatives do not include an on-site treatment component, they would require dewatering of soils excavated from below the water table and onsite treatment of the water before discharge to the stormwater system. In addition, the excavated soils would need to be sufficiently segregated based on characterization data into different stockpiles based on the ultimate disposition of the different categories of soil. The need to undertake all these components in the small site footprint could make Alternatives 4 and 6 only slightly less challenging then Alternative 5. However, the advantage offered by Alternatives 4 and 6 over Alternative 5 is that they could be implemented in phases, sequentially, in small portions of the site, without the need to consider excavation rates and locations relative to the input and output rates of the thermal treatment unit employed under Alternative 5. Therefore, Alternatives 4 and 6 are considered more implementable than Alternative 5.

Although excavation under Alternative 2 is limited to soils above the water table with PCB concentrations above 10 mg/kg, Alternative 2 would still require sufficient space to segregate excavated soils for appropriate offsite disposal based on characterization data. In addition, the ISS component of the alternative would require the completion of a wide range of performance tests in conjunction with S/S treatability studies to determine the effectiveness of the process on site soils and evaluate the potential long-term impact of VOC-contaminated groundwater (if any) on the stabilized materials. Nonetheless, Alternative 2 would be easier to implement than Alternatives 4 and 6.

The performance tests and S/S treatability studies also would be required for Alternative 3. Because Alternative 3 would use ISS to treat all soils with contaminant levels above PRGs, the impact of an increase in volume caused by the ISS treatment process would be greater under Alternative 3 than Alternative 2 and may cause an unacceptably large change to site elevations. Alternatives 3 and 2, respectively, would leave the largest and second largest amount of contaminants behind and the presence of the stabilized material, particularly for Alternative 3, would limit options for future re-use of the site. This may or may not be acceptable to the community. Both Alternatives 2 and 3 would require ongoing inspection, maintenance, and monitoring activities of the soil cap placed over the ISS-treated soils. These activities could be easily implemented using available materials, equipment, and labor resources.

4.3.7 Cost

Detailed cost estimates presented in Section 4 are expected to achieve an accuracy range of –30 percent to +50 percent (EPA 2000). The detailed analysis level accuracy range of –30 percent to +50 percent means that, for an estimate of $100,000, the actual cost of an alternative is expected to be between $70,000 and $150,000 (EPA 2000). A comparison of alternative costs is presented below.

Alternative	Estimated Capital Costs	Total Annual Cost	Total Periodic Cost	Total Present Worth
1	$0	$0	$0	$0
2	$13.9M	$360,000	$308,000	$14.3M
3	$6.1M	$360,000	$308,000	$6.4M
4	$18.1M	$0	$0	$18.1M
5	$15.1M	$0	$0	$15.1M
6	$16.4M	$0	$0	$16.4M

No costs are estimated for Alternative 1 as no action would be taken.

Alternative 4, which involves the excavation and offsite disposal of all contaminated soils exceeding PRGs, has the highest present value ($18.1M), but would result in the elimination of the principle threat waste. No annual or periodic costs would be incurred under Alternative 4.

Alternative 6, which involves a targeted excavation of soils below the water table but would not achieve the groundwater protection RAO, has the next highest present value ($16.4M). No annual or periodic costs would be incurred under Alternative 6.

Alternative 5, which includes excavation and thermal treatment of soils exceeding PRGs and would be the most difficult alternative to implement, has the third highest present value ($15.1M). No annual or periodic costs would be incurred under Alternative 5.

Alternative 2, which combines excavation and offsite disposal with ISS to address soil contamination, has the fourth highest present value ($14.3M). Total annual and periodic costs for Alternative 2 are, respectively, $360,000 for cap maintenance and $308,000 for long-term monitoring.

Alternative 3, which uses ISS to treat all soils with contaminant concentrations exceeding PRGs but leaves the largest amount of contamination behind and would limit options for site re-use, has the lowest present value ($6.4M). The total annual and periodic costs for Alternative 3 are, respectively, $360,000 for cap maintenance and $308,000 for long-term monitoring.

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Section 5

References

CDM Smith. 2016. Final Remedial Investigation Report. Unimatic Manufacturing Corporation Superfund Site, Fairfield, New Jersey. July.

Friedman, William J., Brach Eichler, LLC. 2011. Letter to Vickie Pane, EPA. Re: Documents Requested pertaining to PCB Remediation of Former Unimatic Manufacturing Corp. Site, 25 Sherwood Lane, Fairfield, New Jersey; with attached Exhibits. August 12, 2011. [88 pages].

Friedman, William J., WolfBlock Brach Eichler. 2005. Letter to Daniel Draft, EPA, Re: Information on PCBs at Former Unimatic Manufacturing Corp. Site, 25 Sherwood Lane, Fairfield, New Jersey; with attachments. January 21, 2005. [7 pages].

New Jersey Department of Environmental Protection (NJDEP). 2015. Fill Material Guidance for SRP Sites. Version 3.0. April.

NJDEP. 2013. Development of Impact to Ground Water Soil Remediation Standards Using the Soil-Water Partition Equation (Version 2.0) November.

NUS Corporation. 1986. Remedial Investigation, Caldwell Trucking Company Site, Town of Fairfield, New Jersey.

Sanders, P.F. 2003. Ambient Levels of Metals in New Jersey Soils, NJDEP, Division of Science Research and Technology, Environmental Assessment and Risk Analysis Element Research Project Summary. May.

U.S. Environmental Protection Agency (EPA). 2013. Engineering Issue: Technology Alternatives for the Remediation of PCB Contaminated Soils and Sediments. EPA/600/S-13/079. July

U.S. Environmental Protection Agency (EPA). 2005. Polychlorinated Biphenyl (PCB) Site Revitalization Guidance under the Toxic Substances Control Act (TSCA). November.

U.S. Environmental Protection Agency (EPA). 2000. A Guide to Developing and Documenting Cost Estimates during the Feasibility Study. EPA 540-R-00-002 Office of Solid Waste and Emergency Response (OSWER) 9355.0-75. July.

U.S. Environmental Protection Agency (EPA). 1990. Guidance on Remedial Actions for Superfund Sites with PCB Contamination. EPA/540/G-90/007. August.

U.S. Environmental Protection Agency (EPA). 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. Interim Final. October.

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Tables

Table 1-1
Remedial Investigation Screening Criteria
Unimatic Manufacturing Corporation Site
Fairfield, NJ

Chemical Name	RI Soil Screening Criteria -NJNRDCSRS (Non-Residential Direct Contact Soil Remediation Standard) (µg/kg)[1]	RI Groundwater Screening Criteria (ug/L)[2]
PCBs		
Aroclor-1016	1,000	0.14
Aroclor-1221	1,000	0.0046
Aroclor-1232	1,000	0.0046
Aroclor-1242	1,000	0.039
Aroclor-1248	1,000	0.039
Aroclor-1254	1,000	0.039
Aroclor-1260	1,000	0.039
Total PCB based on Aroclors	1,000	0.5
Total PCB based on Congeners*	1,000	0.5
Pesticides		
4,4'-DDD	13,000	0.1
4,4'-DDE	9,000	0.1
4,4'-DDT	8,000	0.1
Aldrin	200	0.002
alpha-BHC	500	0.006
alpha-Chlordane	1,000	NL
beta-BHC	2,000	0.02
delta-BHC	NL	NL
Dieldrin	200	0.002
Endosulfan I	6,800,000	40
Endosulfan II	6,800,000	40
Endosulfan sulfate	6,800,000	40
Endrin	340,000	2.0
Endrin aldehyde	340,000	NL
Endrin ketone	340,000	NL
gamma-BHC	2,000	0.03
gamma-Chlordane	1,000	0.01
Heptachlor	700	0.008
Heptachlor epoxide	300	0.004
Methoxychlor	5,700,000	40
Toxaphene	3,000	0.03
Volatile Organic Compounds		
1,1,1-Trichloroethane	4,200,000	30
1,1,2,2-Tetrachloroethane	3,000	3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	NL	5500
1,1,2-Trichloroethane	6,000	3
1,1-Dichloroethane	24,000	50
1,1-Dichloroethene	150,000	1.0
1,2,3-Trichlorobenzene	NL	0.7
1,2,4-Trichlorobenzene	820,000	9
1,2,4-Trimethylbenzene	NL	NL
1,2-Dibromo-3-chloropropane	200	0.02
1,2-Dibromoethane	40	0.05
1,2-Dichlorobenzene	59,000,000	600
1,2-Dichloroethane	3,000	2.0
1,2-Dichloropropane	5,000	1.0
1,3-Butadiene	NL	NL
1,3-Dichlorobenzene	59,000,000	600
1,3,5-Trimethylbenzene	NL	NL
1,4-Dichlorobenzene	13,000	75
1,4-Dioxane	NL	0.78
2-Butanone	44,000,000	300
2-Hexanone	NL	3.8
4-Ethyltoluene	NL	NL
4-Methyl-2-Pentanone	NL	120
Acetone	NL	6000
Benzene	5,000	1.0
Benzyl Chloride	NL	NL

Table 1-1
Remedial Investigation Screening Criteria
Unimatic Manufacturing Corporation Site
Fairfield, NJ

Chemical Name	RI Soil Screening Criteria -NJNRDCSRS (Non-Residential Direct Contact Soil Remediation Standard) (µg/kg)[1]	RI Groundwater Screening Criteria (ug/L)[2]
Bromochloromethane	NL	8.3
Bromodichloromethane	3,000	1.0
Bromoform	280,000	4.0
Bromomethane	59,000	10
Carbon Disulfide	110,000,000	700
Carbon Tetrachloride	2,000	1.0
Chlorobenzene	7,400,000	50
Chloroethane	1,100,000	NA
Chloroform	2,000	70
Chloromethane	12,000	19
cis-1,2-Dichloroethene	560,000	70
cis-1,3-Dichloropropene	7,000	1.0
Cyclohexane	NL	1300
Dibromochloromethane	8,000	1.0
Dichlorodifluoromethane	230,000,000	1000
Ethyl Acetate	NL	NL
Ethylbenzene	110,000,000	700
Hexane	NL	NL
Isopropylbenzene (Cumene)	NL	N/A
Methyl Acetate	NL	7000
Methyl Tert-Butyl Ether	320,000	70
Methylcyclohexane	NL	N/A
Methylene Chloride	97,000	3.0
Propene	NL	NL
Styrene	260,000	100
Tetrachloroethene	5,000	1.0
Tetrahydrofuran	NL	NL
Toluene	91,000,000	600
trans-1,2-Dichloroethene	720,000	100
trans-1,3-Dichloropropene	7,000	1.00
Trichloroethene	20,000	1.0
Trichlorofluoromethane	340,000,000	2000
Vinyl Acetate	NL	NL
Vinyl Chloride	2,000	0.08
Xylenes (total)	170,000,000	1000
m,p-Xylene	170,000,000	NL
o-Xylene	170,000,000	NL
Semi-Volatile Organic Compounds		
1,1'-Biphenyl	34,000,000	400
2,2'-oxybis(1-Chloropropane)	67,000	NL
2,3,4,6- Tetrachlorophenol	NL	200
2,4,5-Trichlorophenol	68,000,000	700
2,4,6-Trichlorophenol	74,000	20
2,4-Dichlorophenol	2,100,000	20
2,4-Dimethylphenol	14,000,000	100
2,4-Dinitrophenol	1,400,000	40
2,4-Dinitrotoluene	3,000	10
2,6-Dinitrotoluene	3,000	10
2-Chloronaphthalene	NL	600
2-Chlorophenol	2,200,000	40
2-Methylnaphthalene	2,400,000	30
2-Methylphenol	3,400,000	NL
2-Nitroaniline	23,000,000	19
2-Nitrophenol	NL	NL
3,3'-Dichlorobenzidine	4,000	30
3-Nitroaniline	NL	NL
4,6-Dinitro-2-methylphenol	68,000	NL
4-Bromophenyl-phenyl ether	NL	NL
4-Chloro-3-methylphenol	NL	NL

Table 1-1
Remedial Investigation Screening Criteria
Unimatic Manufacturing Corporation Site
Fairfield, NJ

Chemical Name	RI Soil Screening Criteria -NJNRDCSRS (Non-Residential Direct Contact Soil Remediation Standard) (µg/kg)[1]		RI Groundwater Screening Criteria (ug/L)[2]
4-Chloroaniline	NL		30
4-Methylphenol	340,000		NL
4-Nitroaniline	NL		3.8
4-Nitrophenol	NL		NL
Acenaphthene	37,000,000		400
Acenaphthylene	300,000,000		NL
Acetophenone	5,000		700
Anthracene	30,000,000		2000
Atrazine	2,400,000		3
Benzaldehyde	68,000,000		200
Benzo(a)anthracene	2,000		0.10
Benzo(a)pyrene	200		0.10
Benzo(b)fluoranthene	2,000		0.20
Benzo(g,h,i)perylene	30,000,000		NA
Benzo(k)fluoranthene	23,000		0.50
bis-(2-Chloroethoxy) methane	NL		NL
bis-(2-Chloroethyl)ether	2,000		7
bis-(2-Ethylhexyl) phthalate	140,000		3
Butylbenzyl phthalate	14,000,000		100
Caprolactam	340,000,000		990
Carbazole	96,000		NL
Chrysene	230,000		5
Dibenzo(a,h)anthracene	200		0.30
Dibenzofuran	NL		0.79
Diethylphthalate	550,000,000		6000
Dimethylphthalate	NL		NA
Di-n-butyl phthalate	68,000,000		700
Di-n-octylphthalate	27,000,000		100
Fluoranthene	24,000,000		300
Fluorene	24,000,000		300
Hexachlorobenzene	1,000		0.02
Hexachlorobutadiene	25,000		1.00
Hexachlorocyclopentadiene	110,000		40
Hexachloroethane	140,000		7.0
Indeno(1,2,3-cd)pyrene	2,000		0.20
Isophorone	2,000,000		40
Naphthalene	17,000		300
Nitrobenzene	340,000		6
N-Nitroso-di-n-propylamine	300		10
N-Nitroso-diphenylamine	390,000		10
Pentachlorophenol	10,000		0.30
Phenanthrene	300,000,000		NL
Phenol	210,000,000		2000
Pyrene	18,000,000		200
Inorganic Analytes			
Aluminum	NL		200
Antimony	450,000		6.0
Arsenic	19,000		3.0
Barium	59,000,000		200
Beryllium	140,000		1.0
Cadmium	78,000		4.0
Calcium	NL		NA
Chromium	NL		70
Chromium III	NL		NL
Chromium VI	20,000	****	NL
Cobalt	590,000		0.6
Copper	45,000,000		1300
Cyanide	23,000,000		NL
Iron	NL		300

Table 1-1
Remedial Investigation Screening Criteria
Unimatic Manufacturing Corporation Site
Fairfield, NJ

Chemical Name	RI Soil Screening Criteria -NJNRDCSRS (Non-Residential Direct Contact Soil Remediation Standard) (µg/kg)[1]	RI Groundwater Screening Criteria (ug/L)[2]
Lead	800,000	5.0
Magnesium	NL	NA
Manganese	5,900,000	50
Mercury	65,000	2.0
Nickel	23,000,000	100
Potassium	NL	NA
Selenium	5,700,000	40
Silver	5,700,000	40
Sodium	NL	50000
Thallium	79,000	2.0
Vanadium	1,100,000	10
Zinc	110,000,000	2000
Dioxins/Furans (presented in µg/kg in soil and pg/L in groundwater)		
Total Dioxin/Furan (TCDD TEQ)**	0.7 ***	10*****

Approach to selection of RI soil screening Criteria and Sources:

1. RI Soil screening criteria for soils is the New Jersey Department of Environmental Protection Non-Residential Direct Contact Soil Remediation Standards. The sources were as follows.

- Non-residential direct contact health based criteria and soil remediation standards http://www.nj.gov/dep/srp/regs/rs/, downloaded January 22, 2015. *Discussion of nature and extent of soil contamination was focused on these values.

*The total PCB screening level will be used for PCB congeners. All are screened as a total value and not individually.

** Total TCDD TEQ is calculated using Kaplan-Meier method per United States Environmental Protection Agency guidance

***NJDEP proposed soil remediation standard http://www.nj.gov/dep/workgroups/docs/srstandards-20140610-pres2.pdf

****NJDEP Chromium Interim Cleanup Level. Revised April 2010. http://www.nj.gov/dep/srp/guidance/rs/chrome_criteria.pdf

Approach to selection of RI groundwater screening Criteria and Sources:

2. The groundwater screening criteria for each contaminant is the lowest of the NJDEP Groundwater Quality Standards N.J.A.C. &:9C; NJ MCLs, Federal Drinking Water Standards (EPA MCLs), and USEPA Regional Screening Level (RSL) for Tapwater (Cancer Risk = 1x10-6; Non-Cancer Hazard = 0.1). RI Screening Citeria were applied in a hierarchical fashion beginning with the New Jersey values. The sources were as follows:

- New Jersey Ground Water Quality Standards Class IIA (NJAC 7:9C), July 22, 2010, readopted without change: March 4, 2014, downloaded April 30, 2015.
- New Jersey Interim Specific & Generic Groundwater Quality Criteria (http://www.nj.gov/dep/wms/bwqsa/gwqs_interim_criteria_table.htm)
- New Jersey Drinking Water Standards, February 10, 2009 (http://www.nj.gov/dep/standards/drinking%20water.pdf), downloaded April 30, 2015.
- EPA National Primary Drinking Water Regulations, EPA 816-F-03-016, May 2009, downloaded April 30, 2015.
- EPA Regional Screening Level (RSL) for Tapwater (Cancer Risk = 1x10-6; Non-Cancer Hazard = 0.1). May 2016, downloaded July 2016.

***** The RI Screening Criteria for Total TEQ 2,3,7,8-TCDD in groundwater is the practical quantitation limit listed in the NJDEP Administrative Code Groundwater Quality Standards (N.J.A.C. 7:9C-1.7)

Abbreviations:

EPA = U.S. Environmental Protection Agency
NJDEP = New Jersey Department of Environmental Protection
NJNRDCSRS - NJDEP Non-residential Direct Contact Soil Remediation Standard
NL = Not listed
PCB = Polychlorinated biphenyl
RI = Remedial Investigation
µg/kg = microgram per kilogram

Table 2-1
Chemical-Specific ARARs, Criteria, and Guidance
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Regulatory Level	ARAR	Status	Requirement Synopsis	Comments
Federal	Toxic Substance Control Act (TSCA) 40 CFR Part 761.61 – PCB Remediation Waste	Applicable	Establishes cleanup and disposal options for PCB remediation waste.	The regulation will be used to establish the cleanup levels for bulk PCB remediation waste.
State	NJDEP Residential Direct Contact and Non-residential Direct Contact Soil Remediation Standards (N.J.A.C. 7:26D)	Applicable	Establishes standards for soil cleanups. Nonresidential standards for site COCs: 4,4'-DDE 9 ppm 4,4'-DDT 8 ppm Aldrin 0.2 ppm Alpha- and gamma-Chlordane 1 ppm Total PCBs 1 ppm Dieldrin 0.2 ppm Heptachlor 0.7 ppm Heptachlor epoxide 0.3 ppm Lindane 2 ppm	The standards will be used to develop the PRGs.
State	NJDEP Impact to Groundwater Soil Remediation Criteria (N.J.A.C. 7:26D)	To Be Considered	Establishes criteria for soil cleanups.	The criteria will be considered in developing the PRGs.
State	New Jersey Ground Water Quality Standards (NJGQS) Class IIA (NJAC 7:9C)	Applicable	Establish the water quality standards for State's ground waters based on the type of groundwater use.	The standards will be used to develop the soil impact to groundwater values.

Table 2-2
Location-Specific ARARs, Criteria, and Guidance
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Regulatory Level	ARARs	Status	Requirement Synopsis	Comments
Wildlife Habitat Protection Standards and Regulations				
Federal	Endangered Species Act (16 U.S.C. 1531 et seq.; 40 CFR 400)	Applicable	This requirement establishes standards for the protection of threatened and endangered species.	USFWS reported one endangered species, Indiana bat (Myotis sodalist), one threatened species, northern long-eared bat (Myotis septentrionalis), and no critical habitats within the project area. Site activities and remedy would be designed and implemented in a manner that protects and conserves threatened or endangered species if they are observed on site.
Federal	Fish and Wildlife Conservation Act (16 U.S.C. 2901 et seq.)	To Be Considered	This act protects and conserves nongame fish and wildlife.	If the remedial action involves activities that affect wildlife and/or non-game fish, federal agencies must first consult with the USFWS and the relevant state agency with jurisdiction over wildlife resources.
Federal	Fish and Wildlife Coordination Act (16 U.S.C. 661)	To Be Considered	This act maintains and coordinates wildlife conservation.	If the remedial action involves activities that affect wildlife and/or non-game fish, federal agencies must first consult with the USFWS and the relevant state agency with jurisdiction over wildlife resources.
Federal	Migratory Bird Treaty Act (MBTA, 1 U.S.C. 03 *et seq* .)	Applicable	The selected remedial action(s) must be carried out in a manner that avoids the taking or killing of protected migratory bird species, including individual birds or their nests or eggs.	Site activities and remedy would be designed and implemented to avoid adverse impact to migratory bird species and/or their nests.

Table 2-2
Location-Specific ARARs, Criteria, and Guidance
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Regulatory Level	ARARs	Status	Requirement Synopsis	Comments
State	New Jersey Endangered and Nongame Species Conservation Act (N.J.S.A. 23:2A-1 - 15)	Applicable	This act protects and conserves endangered and nongame species.	The records of NJDEP Natural Heritage Program indicate no occurrence of any threatened or special concern species except great blue heron (Ardea Herodias), a special concern species, on or in the immediate vicinity of the site. The species was not observed onsite during site ecological reconnaissance. However site activities and remedy would be designed and implemented in a manner that protects and conserves threatened or special concern species if they are observed on site.
State	New Jersey Endangered Plant Species List Act (N.J.A.C. 7:5B)	Applicable	This act protects endangered plant species.	Ecological reconnaissance did not indicate the presence of endangered plant species. With the exception of a small area of the gravel lot in the northern corner of the Unimatic property, sparse vegetation is present, A neglected landscaped patch, gravel lot, and the cracks of the driveways were overgrown with invasive vines, grasses, and wildflowers,
Cultural Resources, Historic Preservation Standards and Regulations				
Federal	National Historic Preservation Act (40 CFR 6.301)	Applicable	This requirement establishes procedures to provide for preservation of historical and archeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	To date, a cultural resources survey archeological investigation has not been completed at the site. The effects on historical and archeological data will be evaluated during remedy design.

Table 2-3
Action-Specific ARARs, Criteria, and Guidance
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Regulatory Level	ARARs	Status	Requirement Synopsis	Comments
	General Site Remediation			
Federal	OSHA Recording and Reporting Occupational Injuries and Illnesses (29 CFR 1904)	Applicable	This regulation outlines the record keeping and reporting requirements for an employer under OSHA.	These regulations apply to the companies contracted to implement the remedy. All applicable requirements will be met.
Federal	OSHA Occupational Safety and Health Standards (29 CFR 1910)	Applicable	These regulations specify an 8-hour time-weighted average concentration for worker exposure to various organic compounds. Training requirements for workers at hazardous waste operations are specified in 29 CFR 1910.120.	Proper respiratory equipment will be worn if it is not possible to maintain the work atmosphere below the 8-hour time-weighted average at these specified concentrations.
Federal	OSHA Safety and Health Regulations for Construction (29 CFR 1926)	Applicable	This regulation specifies the type of safety equipment and procedures to be followed during site remediation.	All appropriate safety equipment will be on site, and appropriate procedures will be followed during remediation activities.
Federal	RCRA Identification and Listing of Hazardous Wastes (40 CFR 261)	Applicable	This regulation describes methods for identifying hazardous wastes and lists known hazardous wastes.	This regulation is applicable to the identification of hazardous wastes that are generated, treated, stored, or disposed during remedial activities.
Federal	RCRA Standards Applicable to Generators of Hazardous Wastes (40 CFR 262)	Applicable	Describes standards applicable to generators of hazardous wastes.	Standards will be followed if any hazardous wastes are generated on site.
Federal	RCRA Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – General Facility Standards (40 CFR 264.10–264.19)	Relevant and Appropriate	This regulation lists general facility requirements, including general waste analysis, security measures, inspections, and training requirements.	Facility will be designed, constructed, and operated in accordance with this requirement. All workers will be properly trained.
Federal	RCRA Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – Preparedness and Prevention (40 CFR 264.30–264.37)	Relevant and Appropriate	This regulation outlines the requirements for safety equipment and spill control.	Safety and communication equipment will be installed at the site. Local authorities will be familiarized with the site.
Federal	RCRA Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – Contingency Plan and Emergency Procedures (40 CFR 264.50–264.56)	Relevant and Appropriate	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, or other emergencies.	Emergency procedure plans will be developed and implemented during remedial action. Copies of the plans will be kept on site.
State	New Jersey Technical Requirements for Site Remediation (N.J.A.C. 7:26E)	Applicable	This regulation provides the minimal technical requirements to investigate and remediate contamination at the site.	The regulation will be applied to any hazardous waste operation during remediation of the site.

Table 2-3
Action-Specific ARARs, Criteria, and Guidance
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Regulatory Level	ARARs	Status	Requirement Synopsis	Comments
State	New Jersey Uniform Construction Code (N.J.A.C. 5:23)	Applicable	This code provides the requirement for construction performed during remediation of the site.	This code will be applied to any construction performed during remediation of the site.
State	New Jersey Hazardous Waste Regulations - Identification and Listing of Hazardous Waste (N.J.A.C. 7:26G-5)	Applicable	This regulation describes methods for identifying hazardous wastes and lists known hazardous wastes.	This regulation will be applicable to the identification of hazardous wastes that are generated, treated, stored, or disposed during remedial activities.
State	New Jersey Soil Erosion and Sediment Control Act (N.J.A.C. 2:90)	Applicable	This act outlines the requirements for soil erosion and sediment control measures.	This act will be considered during the development of alternatives.
State	Hudson/Essex/Passaic Soil Conservation District Soil Erosion and Sediment Control (SESC) Plan Certification	Applicable	An SESC plan certification is required by the local soil conservation office for any project that disturbs more than 5,000 square feet of surface area of land.	The requirement will be considered during the development of the alternatives.
State	New Jersey Bureau of Water Allocation Temporary Dewatering Permit equivalency (N.J.A.C. 7:19)	Applicable	A temporary dewatering permit will be required for the withdrawal of groundwater in excess of 100,000 gallons of water per day for a period of more than 30 days in a consecutive 365-day period, for purposes other than agriculture, aquaculture, or horticulture. For dewatering in excess of 100,000 gallons of water per day, the project owner must obtain a Temporary Dewatering Allocation Permit, or Dewatering Permit-by-Rule, or Short Term Permit-by-Rule depending on the duration of construction and the method employed.	The requirement will be considered during the development of the alternatives.
State	New Jersey Noise Control (N.J.A.C. 7:29)	Applicable	This standard provides the requirement for noise control.	This standard will be applied to any remediation activities performed at the site.
	Waste Transportation			
Federal	Department of Transportation (DOT) Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171, 172, 177 to 179)	Applicable	This regulation outlines procedures for the packaging, labeling, manifesting, and transporting hazardous materials.	Any company contracted to transport hazardous material from the site will be required to comply with this regulation.
Federal	RCRA Standards Applicable to Transporters of Hazardous Waste (40 CFR 263)	Applicable	Establishes standards for hazardous waste transporters.	Any company contracted to transport hazardous material from the site will be required to comply with this regulation.
State	New Jersey Transportation of Hazardous Materials (N.J.A.C. 16:49)	Applicable	Establishes record keeping requirements and standards related to the manifest system for hazardous wastes.	Any company contracted to transport hazardous material from the site will be required to comply with this regulation.

Table 2-3
Action-Specific ARARs, Criteria, and Guidance
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Regulatory Level	ARARs	Status	Requirement Synopsis	Comments
	Waste Disposal			
Federal	TSCA Disposal of PCB Bulk Product Waste (40 CFR Part 761.62)	Applicable	This regulation identifies treatment and disposal requirements for bulk PCB contaminated waste.	Bulk PCB waste will be treated or disposed of to meet the regulatory requirements.
Federal	RCRA Land Disposal Restrictions (40 CFR 268)	Applicable	This regulation identifies hazardous wastes restricted for land disposal and provides treatment standards for land disposal.	Hazardous wastes will be treated to meet disposal requirements.
Federal	RCRA Alternate Soil Treatment Standards (40 CFR 268.49)	Applicable	This regulation identifies alternate treatment standards for contaminated soil to meet land disposal restrictions.	Hazardous wastes will be treated to meet alternate disposal requirements.
Federal	RCRA Hazardous Waste Permit Program (40 CFR 270)	Applicable	This regulation establishes provisions covering basic EPA permitting requirements.	All permitting requirements of EPA must be complied with.
Federal	Area of Contamination (55FR 8758-8760, March 8, 1990	Applicable	These regulations establish rules for consolidation of contiguous waste within an Area of Contamination.	Hazardous wastes may be consolidated and contained within a specific area based on these rules.
Federal	Corrective Action Management Units (Subpart S of 40 CFR 264.552)	Applicable	These regulations provide exceptions to LDR requirements and establish rules for consolidation and treatment of noncontiguous waste within a site.	Hazardous wastes that are noncontiguous may be consolidated and contained within the same area at a different location.
State	New Jersey Land Disposal Restrictions (N.J.A.C. 7:26G-11)	Applicable	These regulations provide exceptions to LDR requirements and establish rules for consolidation of non-contiguous waste from one area to another area within the site.	Hazardous wastes in one area of the site may be consolidated in a different portion of the site.
State	New Jersey Hazardous Waste (N.J.A.C. 7:26C)	Applicable	These regulations establish rules for the operation of hazardous waste facilities in the State of New Jersey.	All remedial activities must adhere to these regulations while handling hazardous waste during remedial operations.
	Water Discharge or Subsurface Injection			
State	The New Jersey Pollutant Discharge Elimination System (N.J.A.C. 7:14A)	Applicable	This permit governs the discharge of any wastes into or adjacent to State waters that may alter the physical, chemical, or biological properties of State waters, except as authorized pursuant to a NPDES or State permit.	Project will meet NPDES permit requirements for surface discharges or groundwater discharge such as injection of reagent for in situ treatment.
	Off-Gas Management			
Federal	Clean Air Act (CAA)—National Ambient Air Quality Standards (NAAQs) (40 CFR 50)	Applicable	These provide air quality standards for particulate matter, lead, nitrogen dioxide, sulfur dioxide, carbon monoxide, and volatile organic matter.	During excavation, treatment, and/or stabilization, air emissions will be properly controlled and monitored to comply with these standards.

Table 2-3
Action-Specific ARARs, Criteria, and Guidance
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Regulatory Level	ARARs	Status	Requirement Synopsis	Comments
Federal	Standards of Performance for New Stationary Sources (40 CFR 60)	Applicable	Set the general requirements for air quality.	During excavation, treatment, and/or stabilization, air emissions will be properly controlled and monitored to comply with these standards.
Federal	National Emission Standards for Hazardous Air Pollutants (40 CFR 61)	Applicable	These provide air quality standards for hazardous air pollutants.	During excavation, treatment, and/or stabilization, air emissions will be properly controlled and monitored to comply with these standards.
State	New Jersey Air Pollution Control Act (N.J.A.C. 7:27)	Applicable	Describes requirements and procedures for obtaining air permits and certificates; rules that govern the emission of contaminants into the ambient atmosphere.	Air-stripper emission from groundwater remediation activity is considered trivial activity and does not require application for an air permit.
State	New Jersey Ambient Air Quality Standards (N.J.A.C. 7:27-13)	Applicable	This standard provides the requirement for ambient air quality control.	This standard will be applied to any remediation activities performed at the site.

Table 2-4
Identification of PRGs for Site-Related COCs
Unimatic Manufacturing Superfund Site

Chemicals of Concern	Maximum Detected Soil Concentrations (ppm)	EPA Toxic Substances Control Act (TSCA) High Occupancy Area (HOA) Cleanup Level (ppm)		NJDEP Non-Residential Direct Contact Soil Remediation Standard (NJNRDCSRS) (ppm)	Calculated Impact to Groundwater Pathway Remediation Standard* (ppm)	Preliminary Remediation Goal (PRG)** (ppm)
		Unrestricted Use	Cap and Deed Notice			
Total PCBs (incl. Aroclor 1248 and Aroclor 1254)	7,000	≤1	>1 - ≤10	1	6.2	1
4,4'-DDE	62	NA		9	17.9	9
4,4'-DDT	29	NA		8	10.5	8
Aldrin	92	NA		0.2	3.9	0.2
Chlordane (alpha[cis] and gamma)	43	NA		1	2.4	1
Dieldrin	99	NA		0.2	0.03	0.03
Heptachlor	65	NA		0.7	2.82	0.7
Heptachlor epoxide	2.9	NA		0.3	0.67	0.3
Lindane	1.8	NA		2	0.002	0.002

Notes

* Impact to groundwater pathway concentrations were calculated using the soil partition equation included in "Development of Impact to Groundwater Soil Remediation Standards using the Soil-Water Partition Equation, Version 2.0 – November 2013" (NJDEP 2013). NJDEP default values and NJDEP Class IIA Ground Water Quality Standards were used to calculate the IGWSRS. See Appendix A for details.

** PRG is the lowest of TSCA HOA cleanup level, NJNRDCSRS, or Impact to Groundwater Remdiation Standard.

NA - not applicable
ppm - parts per million

Table 2-5
Summary of Estimated Contaminated Area and Volume
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Item	Description	Estimated Area (SF)	Estimated Volume (CY) Above Water Table	Below Water Table	Total Volume	Estimated Weight (ton)
1.	**Building Materials**					
1a	Non-hazardous waste with PCB greater than 50 mg/kg	----	800	0	800	1,500
1b	Non-hazardous waste with PCB between 50 mg/kg and 1 mg/kg	----	1,270	0	1,270	2,400
	Total Building Materials		2,070	0	2,070	3,900
2.	**Contaminated Soils**					
2a	Hazardous Waste Soil	-	1,000	-	1,000	1,400
2b	Non-hazardous waste with PCBs greater than 50 mg/kg	14,000	6,300	2,700	9,000	12,600
2c	Non-hazardous waste with PCBs between 10 to 50 mg/kg	16,000	2,700	300	3,000	4,200
2d	Non-hazardous waste with PCBs between 1 to 10 mg/kg	16,000	8,000	5,000	13,000	18,200
	Total Contaminated Soil	46,000	18,000	8,000	26,000	36,400

Table 4-1
Summary of Comparative Analysis for Alternatives
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Evaluation Criterion	ALTERNATIVE 1 No Action	ALTERNATIVE 2 Building Demolition, Excavation of Soils above 10 ppm PCBs to Water Table and Offsite Disposal, and In Situ Solidification/Stabilization and Capping of Remaining Soils above PRGs	ALTERNATIVE 3 Building Demolition and Offsite Disposal and In Situ Solidification/Stabilization and Capping of Soils above PRGs	ALTERNATIVE 4 Building Demolition, Excavation of Soils above PRGs, and Offsite Disposal	ALTERNATIVE 5 Building Demolition and Offsite Disposal, Excavation, Onsite Treatment of Soils above PRGs, and Backfill of Treated Material	ALTERNATIVE 6 Building Demolition, Targeted Excavation of Soils, and Offsite Disposal
Summary of Alternative Components	-Five-year reviews	-Pre-design investigation and remedial design -Building demolition and offsite disposal of debris -Excavation and soil backfill within JCMUA pipeline easement -Excavation of the PCB-contaminated soils exceeding 10 mg/kg to water table -Post excavation sampling -Offsite disposal of excavated soils -Consolidation of the remaining soil exceeding the PRGs (PCBs between 1 and 10 mg/kg) into the excavated areas -In situ solidification and stabilization (ISS) of contaminated soil exceeding the PRGs -Cap the stabilized soil with imported clean fill -Construction, inspection, monitoring and maintenance of the cap -Deed notice (all properties) -Five-year reviews	-Pre-design investigation and remedial design -Building demolition and offsite disposal of debris -Excavation and soil backfill within JCMUA pipeline easement -ISS of contaminated soils exceeding the PRGs -Capping -Inspection, monitoring, and maintenance of soil cap -Deed notice (all properties)	-Pre-design investigation and remedial design -Building demolition and offsite disposal of debris -Excavation and soil backfill within JCMUA pipeline easement -Excavation of contaminated soils exceeding the PRGs -Post excavation sampling -Backfill with imported clean fill -Offsite disposal -Deed notice (all properties)	-Pre-design investigation and remedial design -Building demolition and offsite disposal of debris -Excavation and soil backfill within JCMUA pipeline easement -Excavation of the contaminated soil exceeding the PRGs -Post excavation sampling -Treatment of excavated soils via LTTD -Backfill with treated soils and imported clean fill (if needed) -Deed notice (all properties)	-Pre-design investigation and remedial design -Building demolition and offsite disposal of debris -Excavation and soil backfill within JCMUA pipeline easement -Excavation of contaminated soils above the water table exceeding the PRGs -Excavation of contaminated soils below the water table exceeding 10 times PRG levels -Post excavation sampling -Backfill with imported clean fill -Offsite disposal -Deed notice (all properties) - Five-year reviews
Overall Protection of Human Health and the Environment	The No Action alternative would not protect human health or the environment since no action would be conducted to protect human health and treat the contaminated soil. This alternative would not meet the RAOs.	Alternative 2 would eliminate exposure pathways and reduce impact to groundwater, significantly reducing the level of risk at the site and providing long-term protection of human health and the environment.	The stabilization and capping of soils with COC concentrations exceeding PRGs would eliminate exposure pathways and impact to groundwater by minimizing the availability of contaminants to the environment. A deed restriction and notice would ensure the continued long-term protectiveness of the alternative.	The removal and offsite disposal of contaminated soils would eliminate exposure pathways and reduce impact to groundwater, significantly reducing the level of risk at the site and providing long-term protection of human health and the environment from unacceptable risks.	Alternative 5 would eliminate exposure pathways and reduce impact to groundwater, significantly reducing the level of risk at the site and thereby providing long-term protection of human health and the environment.	The removal and offsite disposal of most of the contaminated soils, along with the placement of clean fill over the remaining soils, would eliminate exposure pathways and reduce impact to groundwater. However, some contaminated soils exceeding PRG concentrations would remain below the water table and would continue to impact the groundwater quality.
Compliance with ARARs	The No Action Alternative fails to meet the threshold criterion of compliance with ARARs.	Chemical-specific ARARs, specifically TSCA (40 CFR Part 761.61 – PCB Remediation Waste) and NJDEP Non-Residential Direct Contact and Impact to Groundwater Standards (N.J.A.C. 26D) would be met by Alternative 2. Site activities and remedy would be designed to meet applicable location- and action-specific ARARs. Soil consolidation into excavations for in situ treatment or for offsite disposal of hazardous waste soil would be carried out in accordance with EPA AOC policy.	See Alternative 2.	Chemical-specific ARARs, specifically TSCA (40 CFR Part 761.61 – PCB Remediation Waste) and NJDEP Non-Residential Direct Contact and Impact to Groundwater Standards (N.J.A.C. 26D) would be met by Alternative 4. Site activities and remedy would be designed to meet applicable location- and action-specific ARARs. The EPA AOC policy would be applicable to the consolidation of the excavated hazardous waste soils prior to offsite disposal.	Same as Alternative 2. In addition, soils would be treated and backfilled on site in accordance with EPA CAMU policy and NJDEP site remediation regulations and fill material guidance for SRP sites (N.J.A.C. 26E).	Chemical-specific ARARs would be met by the removal and offsite disposal of building debris and soils with COC concentrations exceeding their PRGs. Soils with COC concentrations exceeding PRGs that remain below the water table would not meet the impact to groundwater criterion. The EPA AOC policy would be applicable to the consolidation of the excavated hazardous waste soils prior to offsite disposal.

Table 4-1
Summary of Comparative Analysis for Alternatives
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

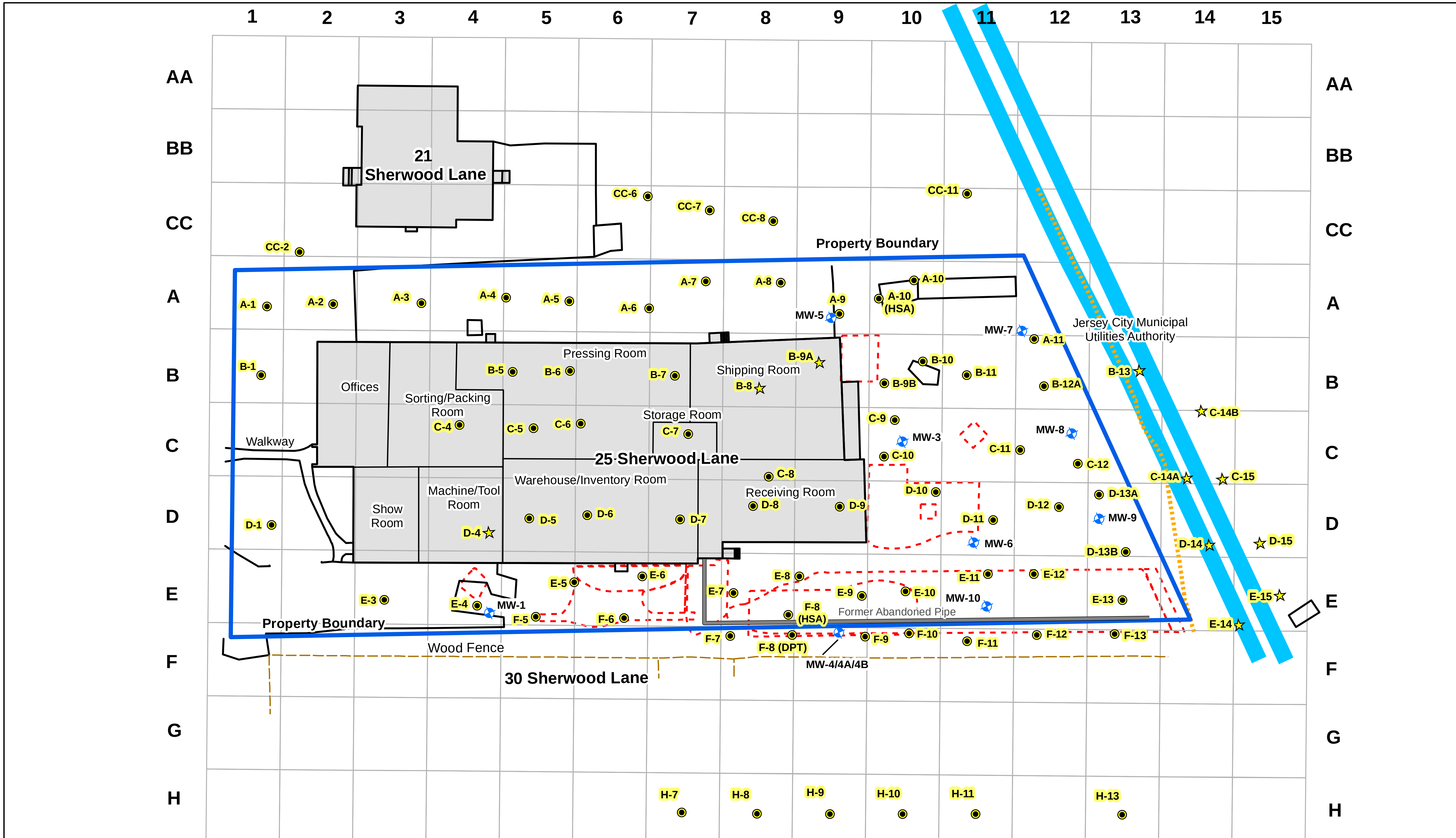
Evaluation Criterion	ALTERNATIVE 1 No Action	ALTERNATIVE 2 Building Demolition, Excavation of Soils above 10 ppm PCBs to Water Table and Offsite Disposal, and In Situ Solidification/Stabilization and Capping of Remaining Soils above PRGs	ALTERNATIVE 3 Building Demolition and Offsite Disposal and In Situ Solidification/Stabilization and Capping of Soils above PRGs	ALTERNATIVE 4 Building Demolition, Excavation of Soils above PRGs, and Offsite Disposal	ALTERNATIVE 5 Building Demolition and Offsite Disposal, Excavation, Onsite Treatment of Soils above PRGs, and Backfill of Treated Material	ALTERNATIVE 6 Building Demolition, Targeted Excavation of Soils, and Offsite Disposal
Long-Term Effectiveness and Permanence	Because the No Action Alternative would not address removal, treatment, or containment of contaminated soil, the magnitude of risk from untreated waste would not change. Additionally, no controls would be implemented at the site to prevent future exposure. Thus, this alternative would have no long-term effectiveness and permanence.	Long-term effectiveness and permanence would be provided by removing building debris and contaminated soils above 10 ppm PCBs for offsite disposal. Permanently immobilizing COCs in remaining soils via ISS, implementation of ICs, and maintenance of the cap would address any remaining residual risk following excavation and offsite disposal. At the JCMUA portion of the site, residual risk would be reduced and adequately and reliably controlled through the removal of contaminated soils above PRGs and placement of clean fill. Inspection, maintenance and monitoring would provide adequate and reliable controls to allow evaluation of long-term effectiveness and would ensure that the remedy would remain protective of human health and the environment as designed.	Long-term effectiveness and permanence would be provided by removing building debris and permanently immobilizing COCs in soils via ISS. At the JCMUA portion of the site, residual risk would be reduced and adequately and reliably controlled through the removal of contaminated soils above PRGs and placement of clean fill. Inspection, maintenance, and monitoring would allow evaluation of long-term effectiveness and would ensure that the remedy would remain protective of human health and the environment as designed.	Long-term effectiveness and permanence would be provided by removing building debris and contaminated soils for offsite disposal.	Long-term effectiveness and permanence would be provided by removing building debris for offsite disposal and treating contaminated soils via LTTD prior to backfilling treated soils on the site. At the JCMUA portion of the site, residual risk would be reduced and adequately and reliably controlled through the removal of contaminated soils above PRGs and placement of clean fill.	Because untreated waste above PRGs would remain below the water table, some degree of residual risk and continuing impact on groundwater would remain. This alternative does not provide long-term effectiveness and permanence since additional remedial action would be need to address impact to groundwater.
Reduction of Toxicity, Mobility, or Volume through Treatment	No remedial action would be taken under Alternative 1; thus, there would be no reduction in toxicity, mobility, or volume of contaminated soil. The statutory preference for treatment as a principal element of the remedial action would not be met.	For debris and soils removed for offsite disposal that are deemed hazardous, reduction of toxicity and mobility would occur through treatment at a RCRA-permitted treatment/disposal facility to meet UTS. For the remaining soils treated via ISS, toxicity would not change; however, the mobility of COCs in the treated soil would be greatly reduced. The volume of the ISS-treated soils would likely be greater than the pre-treated soils due to the addition of stabilization agent. The statutory preference for treatment as a principal element of the remedial action would be partially met for contaminated soil.	For debris removed for offsite disposal that are deemed hazardous, reduction of toxicity and mobility would occur through treatment at a RCRA-permitted treatment/disposal facility to meet UTS. For contaminated soils treated via ISS, toxicity would not change; however, the mobility of COCs in the treated soil would be greatly reduced. The volume of the ISS-treated soils would likely be greater than the pre-treated soils due to the addition of stabilization agent. The statutory preference for treatment as a principal element of the remedial action would be met for contaminated soil.	All waste materials above the PRGs would be removed from the site and disposed in landfills. For debris and soils removed for offsite disposal that are deemed hazardous, reduction of toxicity and mobility would occur through treatment at a RCRA-permitted treatment/disposal facility to meet UTS. The mobility for all other wastes would be reduced through disposal in permitted landfills. The statutory preference for treatment as a principal element of the remedial action would be partially met.	The onsite treatment of soils through LTTD is an irreversible treatment process and would meet the PRGs. The persistence, toxicity, mobility, and propensity of COCs to bioaccumulate would be minimal. In addition, the statutory preference for treatment as a principal element of the remedial action would be partially met for contaminated soil.	For debris and soils removed for offsite disposal that are deemed hazardous, reduction of toxicity and mobility would occur through treatment at a RCRA-permitted treatment/disposal facility to meet UTS. The mobility for the wastes disposed in permitted landfills would be reduced. There would be no reduction in toxicity, mobility, or volume of the contaminated soils remaining on site with COC concentrations greater than the PRG and below 10x the PRG that remain below the water table.

Table 4-1
Summary of Comparative Analysis for Alternatives
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Evaluation Criterion	ALTERNATIVE 1 No Action	ALTERNATIVE 2 Building Demolition, Excavation of Soils above 10 ppm PCBs to Water Table and Offsite Disposal, and In Situ Solidification/Stabilization and Capping of Remaining Soils above PRGs	ALTERNATIVE 3 Building Demolition and Offsite Disposal and In Situ Solidification/Stabilization and Capping of Soils above PRGs	ALTERNATIVE 4 Building Demolition, Excavation of Soils above PRGs, and Offsite Disposal	ALTERNATIVE 5 Building Demolition and Offsite Disposal, Excavation, Onsite Treatment of Soils above PRGs, and Backfill of Treated Material	ALTERNATIVE 6 Building Demolition, Targeted Excavation of Soils, and Offsite Disposal
Short-Term Effectiveness	There would be no short-term impacts or risks to workers, the community, and the environment from implementation. This alternative would neither minimize nor increase greenhouse gas emissions, air pollutants, energy consumption, or water use because no action would be taken.	Building demolition and excavation of contaminated soil would have significant short-term impact to workers and the community due to heavy construction. Airborne transport of contaminated materials would be increased during excavation and ISS construction activities. These short-term risks would be mitigated through the use of engineering measures. Short-term impacts to workers and the community would also include increased truck traffic and noise levels associated with the use of heavy equipment, which could be mitigated effectively and reliably through safety measures and engineering controls.	See Alternative 2.	See Alternative 2.	LTTD has high energy demands, which would require power be delivered to the site. Higher capacity electrical power lines may need to be provided to supply the electrical needs of the thermal treatment system and would pose a minor short-term risk to workers. Short-term risks to the community during treatment of the contaminated soils related to the off-gas of the thermal treatment system would be mitigated through off-gas treatment.	See Alternative 2.
Implementability	Alternative 1 would not involve any administrative or technical implementation issues because no remedial action would be implemented.	This alternative would be technically and administratively implementable. Construction could be completed using conventional heavy-construction equipment and services, which are readily available in the commercial market. Excavation of contaminated soil and backfill with clean soil could be easily conducted; however, seasonal conditions, such as significant rainfall, could impact construction in progress. For the ISS component of the alternative, a wide range of performance tests may need to be performed to determine the effectiveness of the process on site soils.	See Alternative 2.	See Alternative 2.	Alternative 5 would have significant implementability concerns at the site. Implementability issues are primarily due to the difficulties associated with excavating, treating, and backfilling a significant volume of material within the confines of a 1.5-acre site. Higher capacity electrical power lines may need to be provided to supply the electrical needs of the thermal treatment system. In addition, if an issue occurs during thermal treatment that requires shut down for an extended period of time, the heating process would need to be started over again, losing gains made during the initial soil heating process.	See Alternative 2.
Present Value Cost	$0	$14.3M	$6.4M	$18.1M	$15.1M	$16.4M

Notes:
1. Detailed cost spreadsheets (cost summaries, present value analyses, and cost worksheets) for each alternative are presented in Appendix C.
2. Costs presented are expected to have an accuracy between -30 to +50 percent of actual costs based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for feasibility study evaluation level purposes
3. Present value calculation is based on a 7 percent discount rate.

Figures



Legend

- Soil Boring
- Hand Auger Boring
- Monitoring Well
- Former Abandoned Pipe
- Approximate Toe of Slope
- Property Boundary
- JCMUA Pipeline
- Previous Excavation Area

Notes:
1. DPT - Direct Push Technology
2. HSA - Hollow Stem Auger
3. JCMUA - Jersey City Municipal Utilities Authority
4. Monitoring wells are shown for reference.

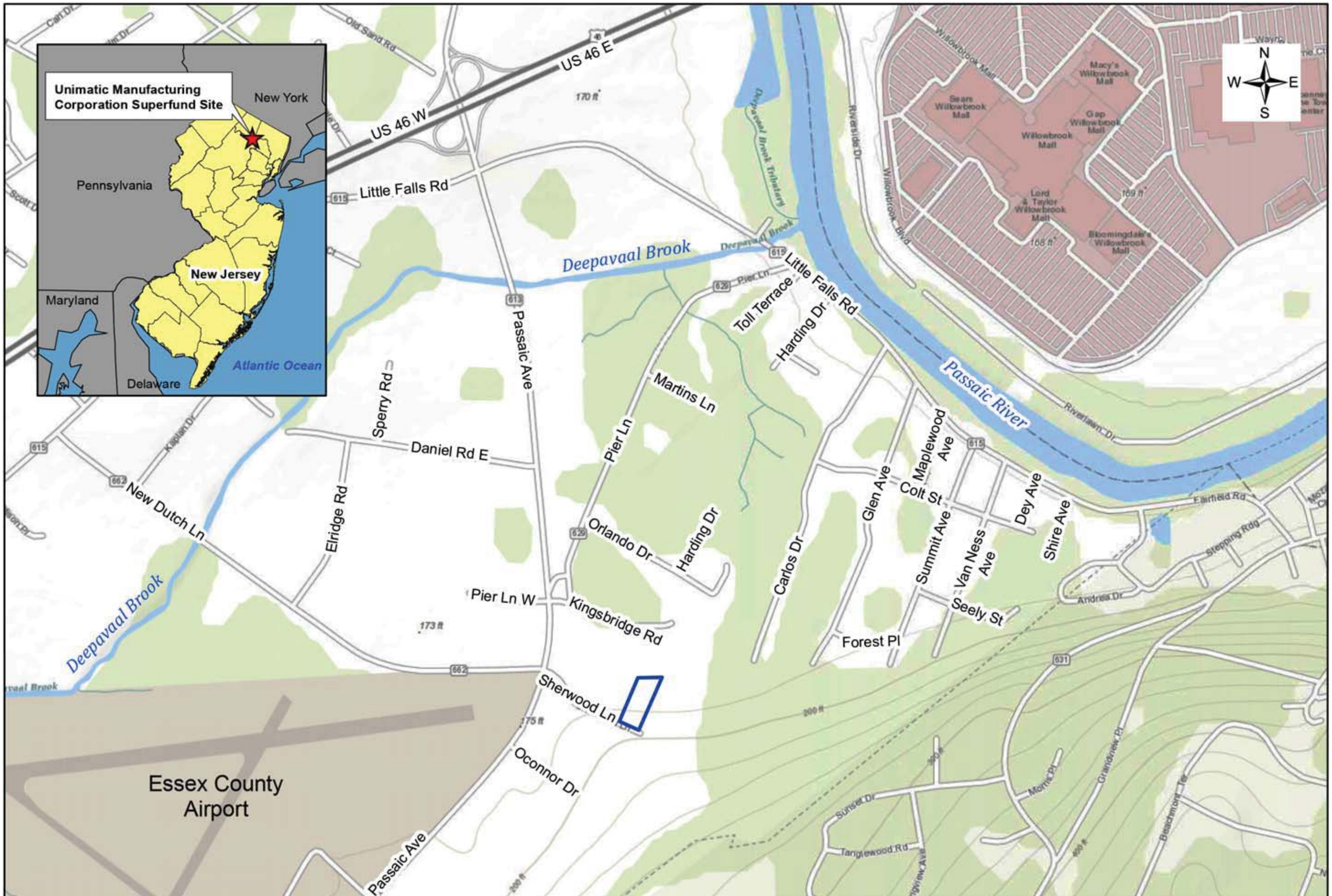
W N S E

0 20 40 80 Feet

CDM Smith

Figure ES-1
Site Layout and RI Sample Locations
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Document Path: F:\Unimatic\GIS\MXD\FS\ES_Site_Layout.mxd



Legend

Unimatic Property Boundary

0 500 1,000 2,000 Feet

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Figure 1-1
Site Location Map
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Document Path: F:\Unimatic\GIS\MXD\RIWP\Site Location Map_rev.mxd

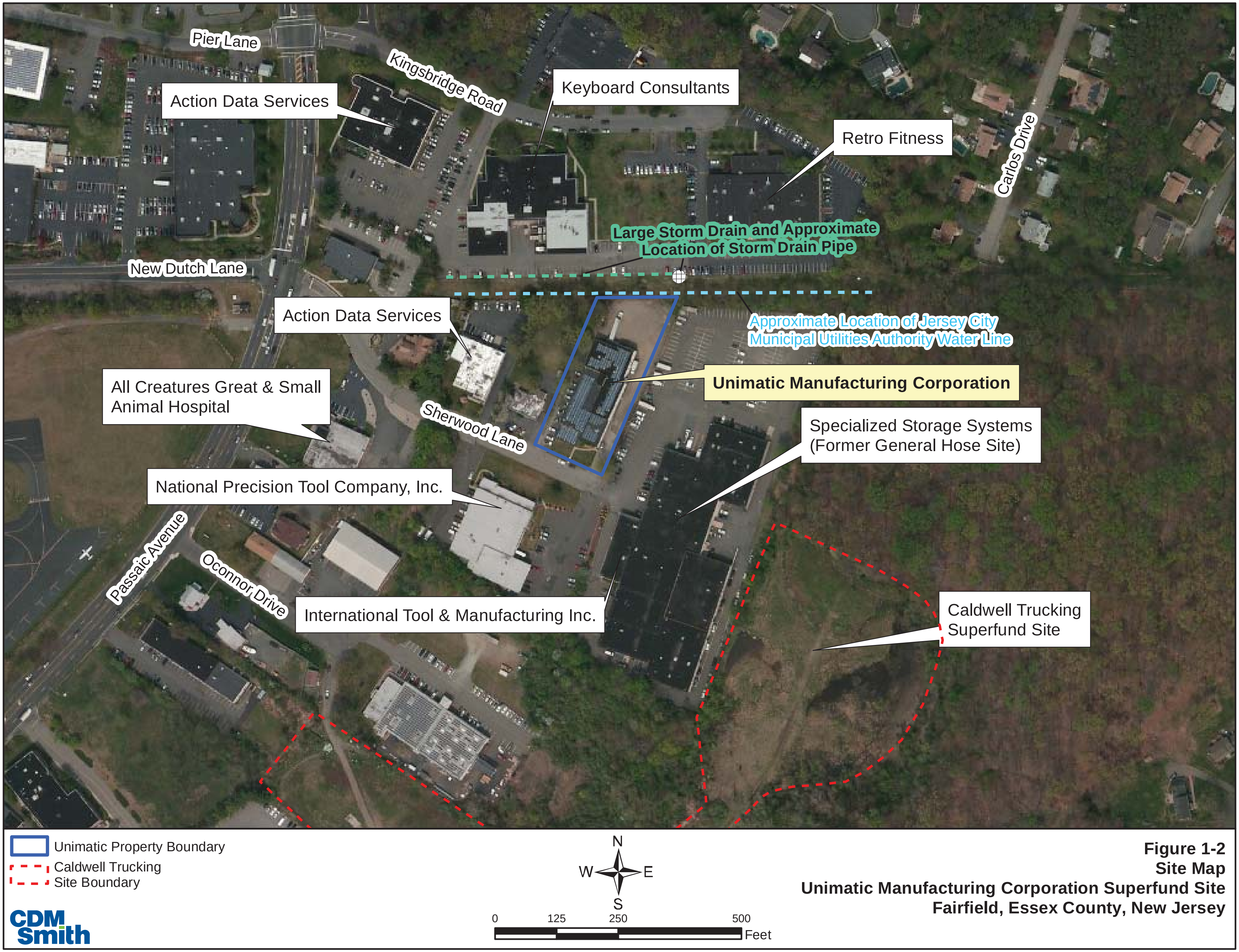
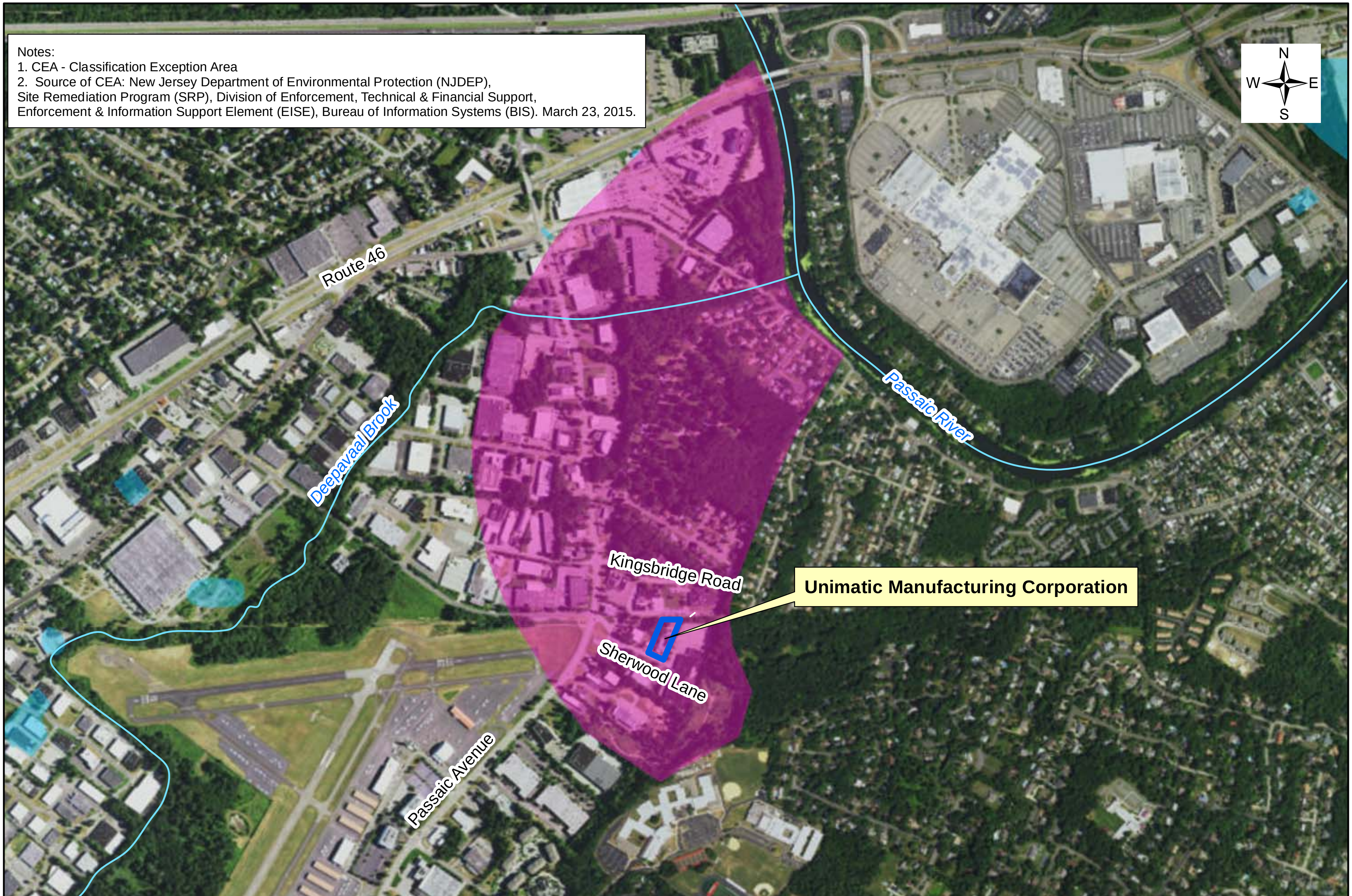


Figure 1-2
Site Map
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

CDM Smith

Document Path: C:\IMS\GIS\Unimatic\MXD\RI Report\Final\Site Map.mxd

Notes:
1. CEA - Classification Exception Area
2. Source of CEA: New Jersey Department of Environmental Protection (NJDEP), Site Remediation Program (SRP), Division of Enforcement, Technical & Financial Support, Enforcement & Information Support Element (EISE), Bureau of Information Systems (BIS). March 23, 2015.



Legend

- Unimatic Property Boundary
- Caldwell Trucking Site NJDEP Groundwater CEA
- Other NJDEP Groundwater CEA

0 500 1,000 2,000 Feet

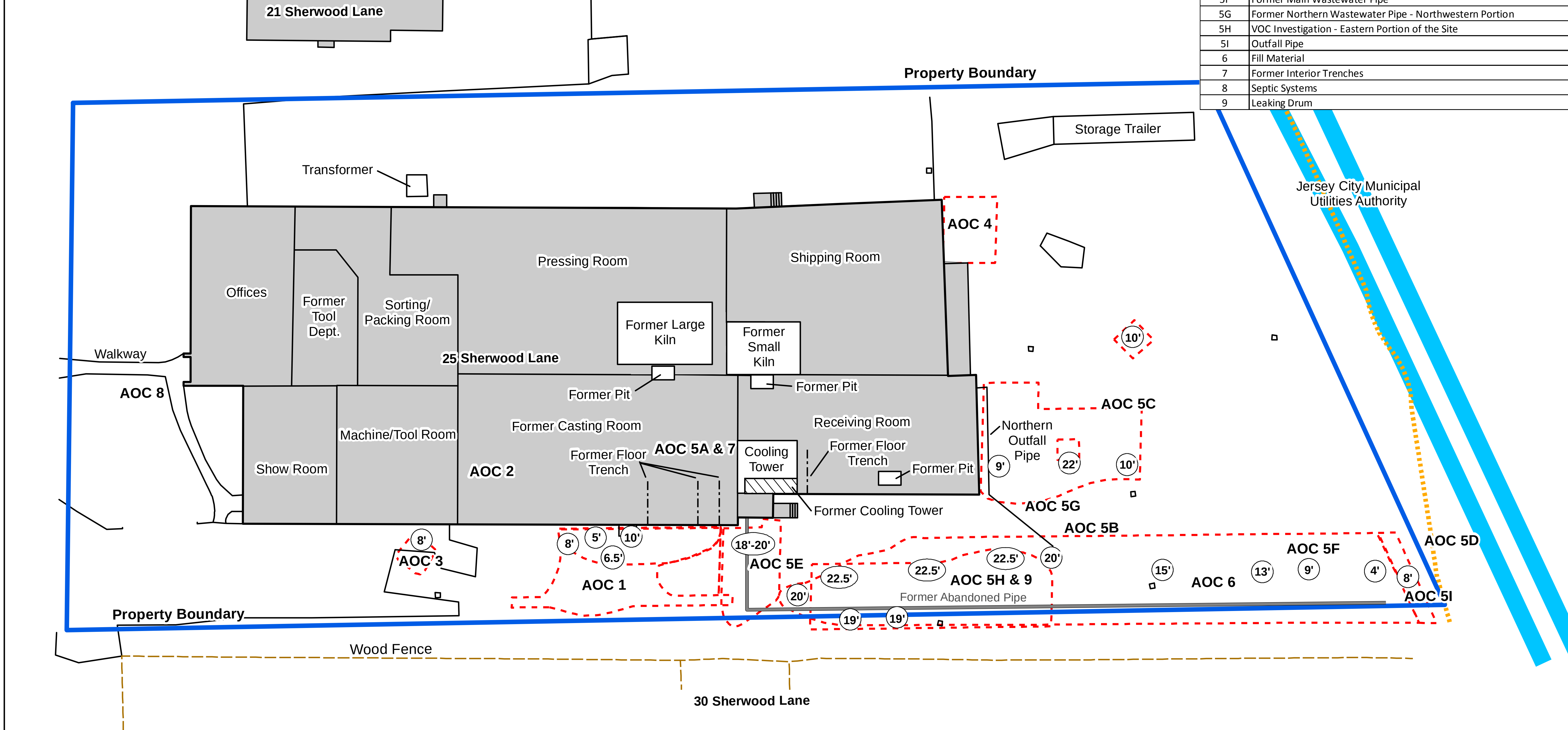
Figure 1-3
Caldwell Trucking Superfund Site Groundwater Classification Exception Area
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

CDM Smith

Document Path: F:\Unimatic\GIS\MXD\RI Report\Draft\CEA.mxd

Notes:
1. AOC - Area of concern
2. JCMUA - Jersey City Municipal Utilities Authority
3. PCB - Polychlorinated biphenyl
4. VOC - Volatile organic compound
5. AOCs are shown for reference.
6. Excavation depths were taken from the Remedial Investigation/Remedial Action Work Plan - (GZA - GeoEnvironmental Incorporated, February 2011).
7. Excavation depth units are feet.
8. The building layout, as depicted on this figure, represents the time periiod during active aluminum die-casting.

AOC NO.	AOC DESCRIPTION
1	Suspected 2,500-Gallon Naphtha Underground Storage Tank (UST)
2	Three 250-Gallon Naphtha Aboveground Storage Tanks (ASTs)
3	Fuel Oil UST
4	Empty Drum Storage Area
5A	Building Interior Flooring (PCB and VOC Investigation)
5B	Exterior PCB Investigation - Eastern and Northern Portions of the Site
5C	Downward Sloping Wedge of PCB Impacted Soils North of the Building
5D	Exterior PCB Soil Investigation - Adjoining JCMUA Property
5E	Former Main Wastewater Pipe Elbow
5F	Former Main Wastewater Pipe
5G	Former Northern Wastewater Pipe - Northwestern Portion
5H	VOC Investigation - Eastern Portion of the Site
5I	Outfall Pipe
6	Fill Material
7	Former Interior Trenches
8	Septic Systems
9	Leaking Drum



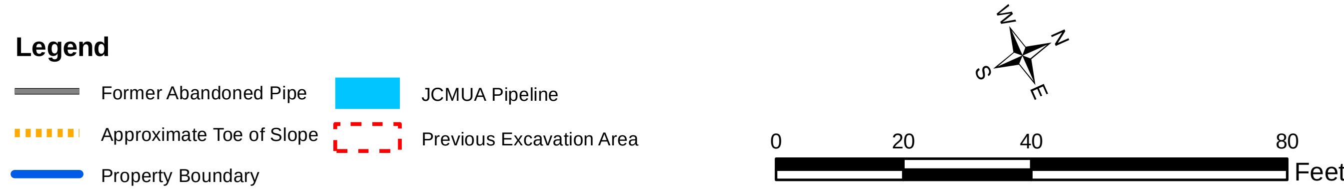


Figure 1-4
Areas of Concern Identified in Historical Reports
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

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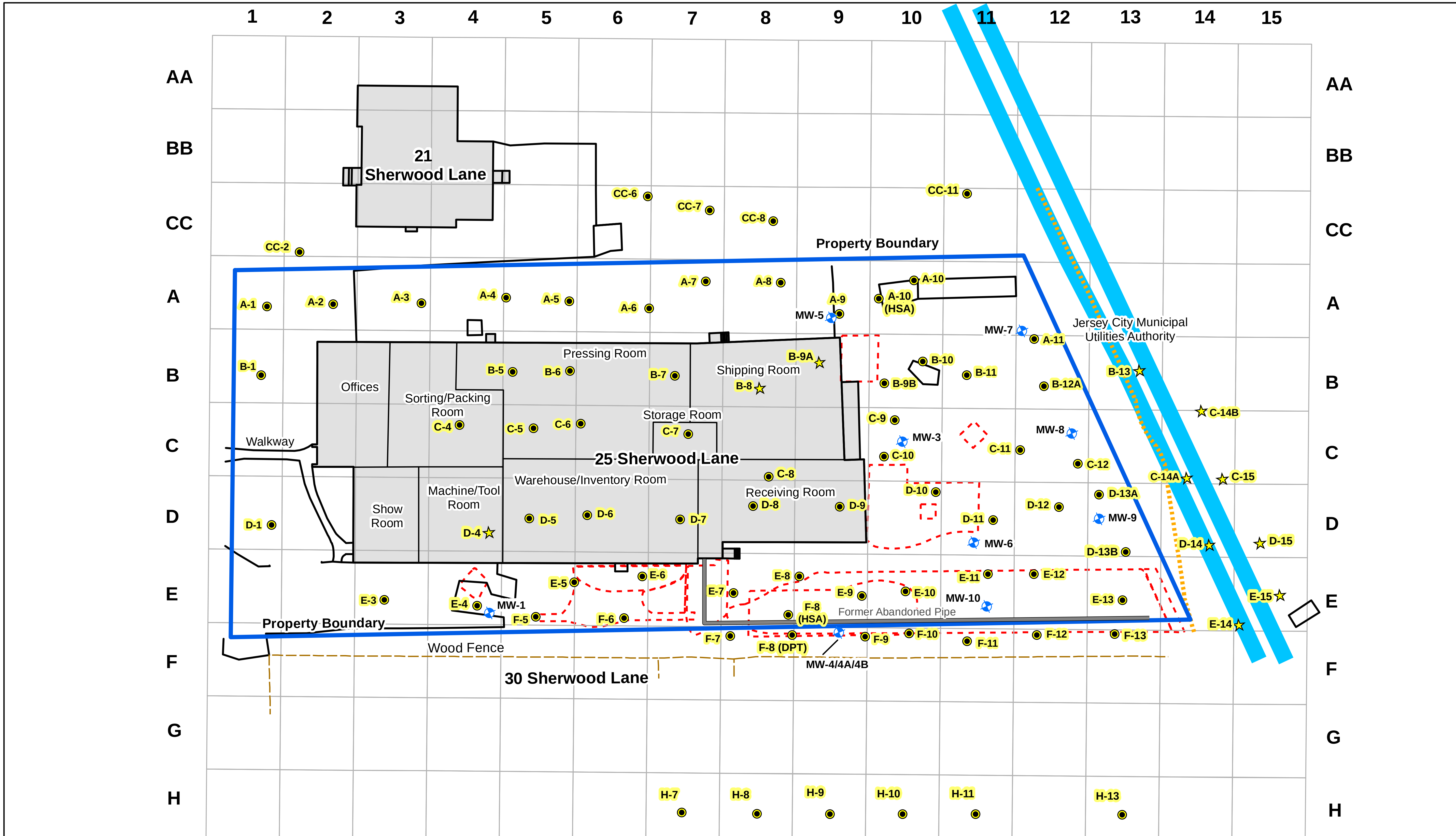

Legend

- Soil Boring
- Hand Auger Boring
- Monitoring Well
- Former Abandoned Pipe
- Approximate Toe of Slope
- Property Boundary
- JCMUA Pipeline
- Previous Excavation Area

Notes:
1. DPT - Direct Push Technology
2. HSA - Hollow Stem Auger
3. JCMUA - Jersey City Municipal Utilities Authority
4. Monitoring wells are shown for reference.

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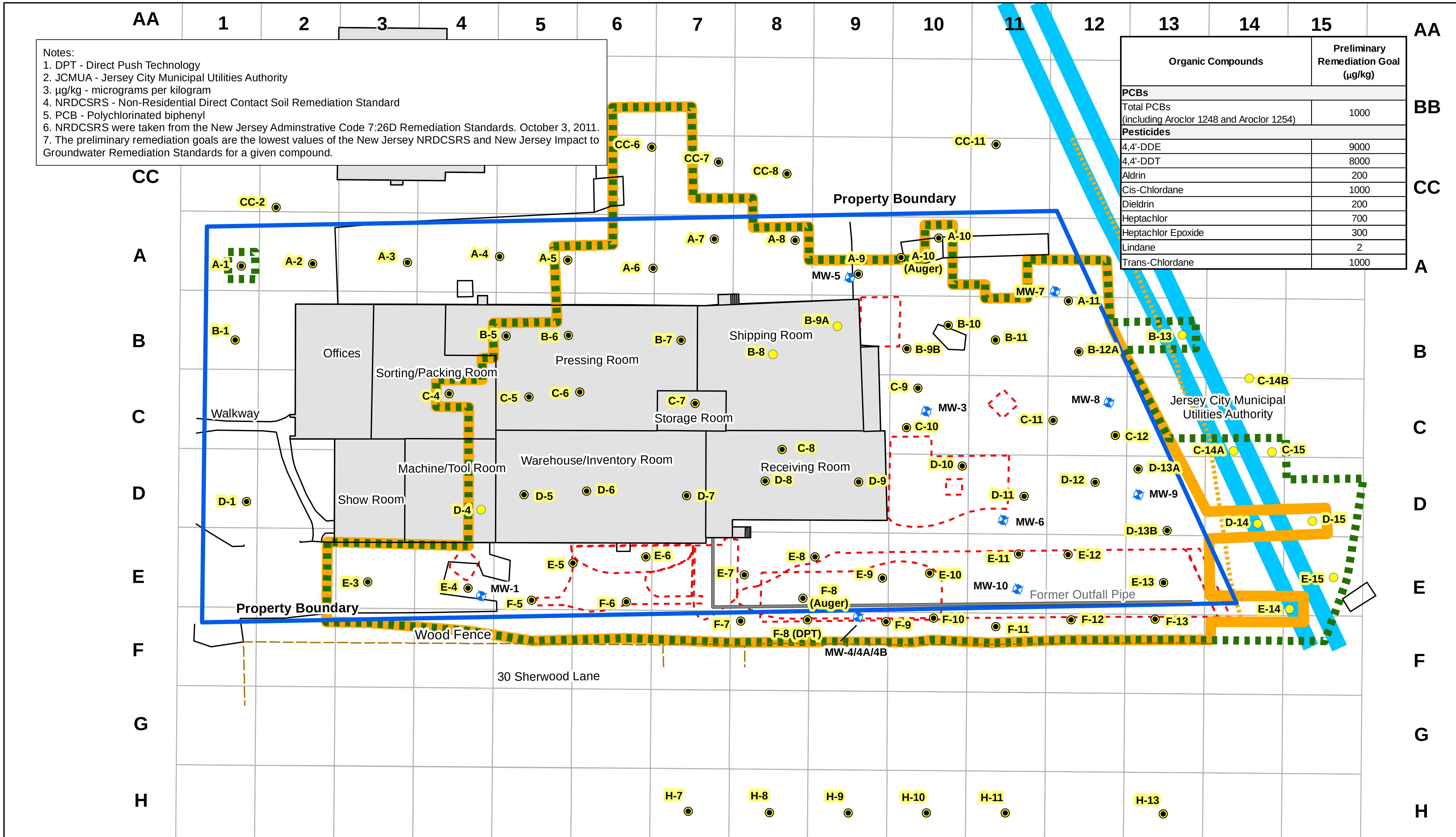
Figure 1-5
Soil Boring and Monitoring Well Locations
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Document Path: F:\Unimatic\GIS\MXD\FS\Soil_Boring_Location_v2.mxd



Organic Compounds	Preliminary Remediation Goal (µg/kg)
PCBs	
Total PCBs (including Aroclor 1248 and Aroclor 1254)	1000
Pesticides	
4,4'-DDE	9000
4,4'-DDT	8000
Aldrin	200
Cis-Chlordane	1000
Dieldrin	200
Heptachlor	700
Heptachlor Epoxide	300
Lindane	2
Trans-Chlordane	1000

Legend

- Monitoring Well
- Soil Boring
- Soil Boring/Hand Auger
- Former Outfall Pipe
- Property Boundary
- Approximate Toe of Slope
- Target Treatment Area - Total PCBs Exceeding Preliminary Remediation Goal
- Target Treatment Area - Pesticides Exceeding Preliminary Remediation Goals
- JCMUA Pipeline
- Previous Excavation Area

0 20 40 80 Feet

CDM Smith

Figure 2-1
Target Treatment Areas for PCBs and Pesticides
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Document Path: F:\Unimatic\GIS\MXD\FS\PCB_Pesticide_Extents_v3.mxd

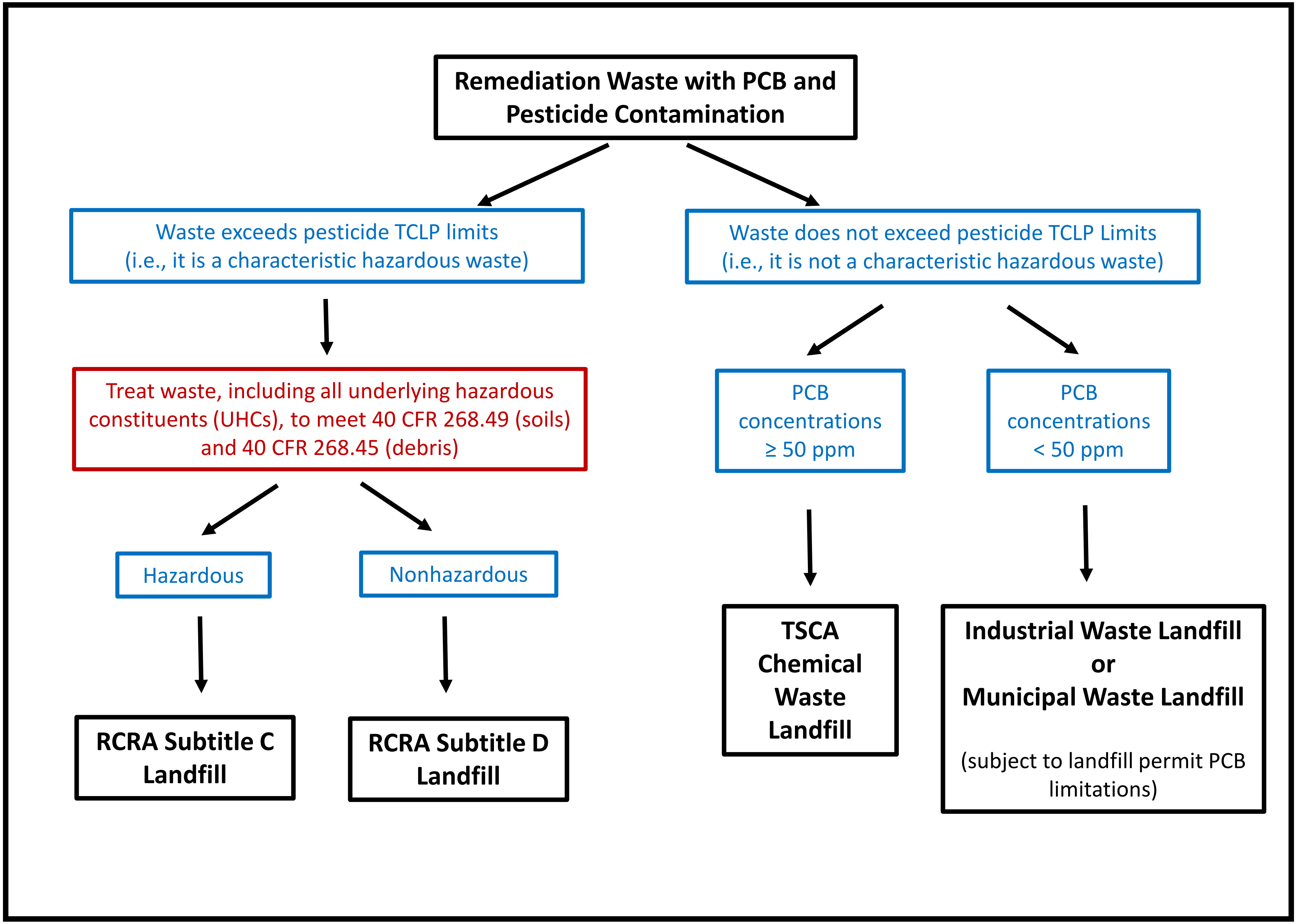
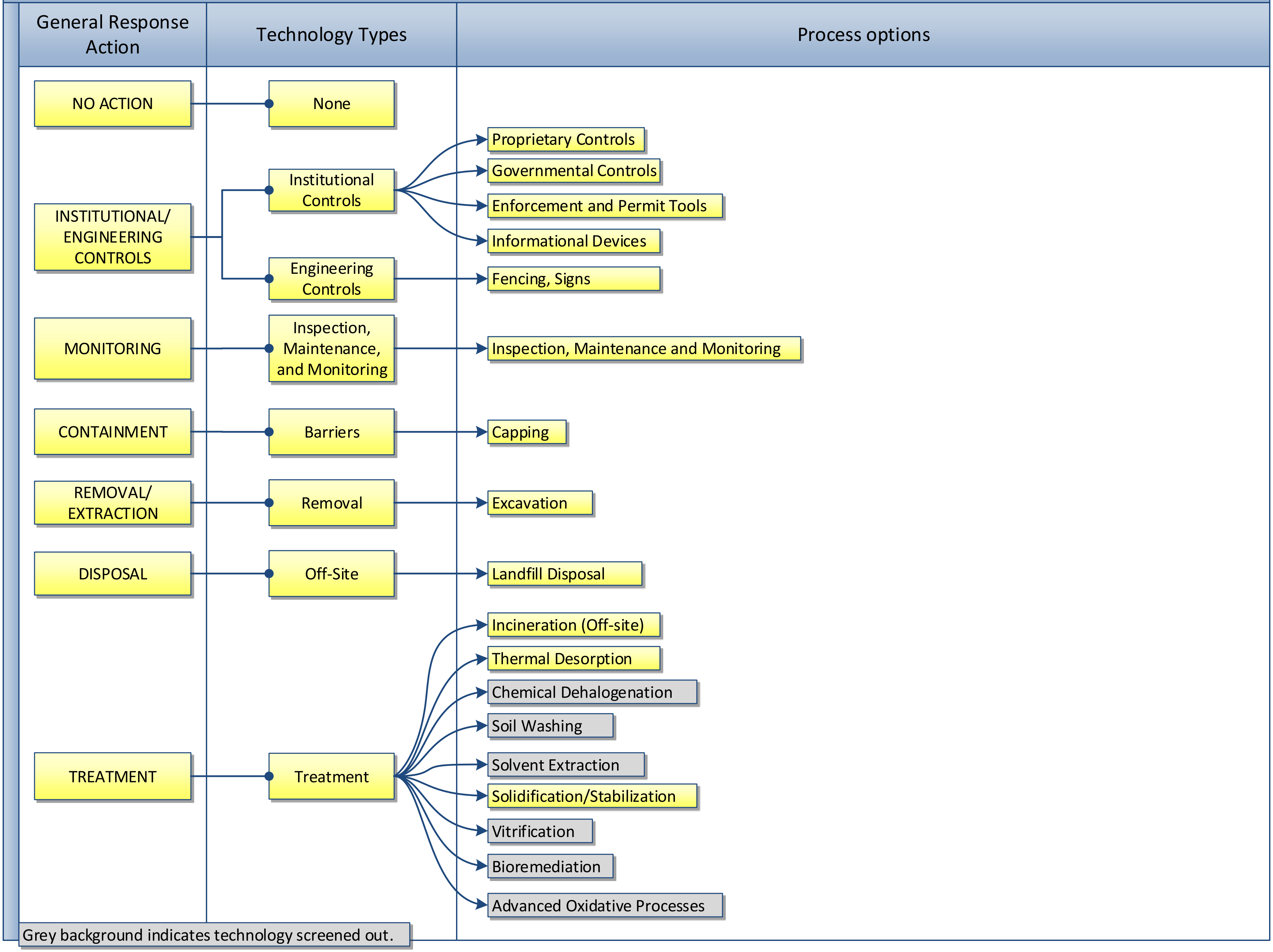


Figure 2-2
Remediation Waste Disposal Chart

Figure 2-3 Technology Screening Summary



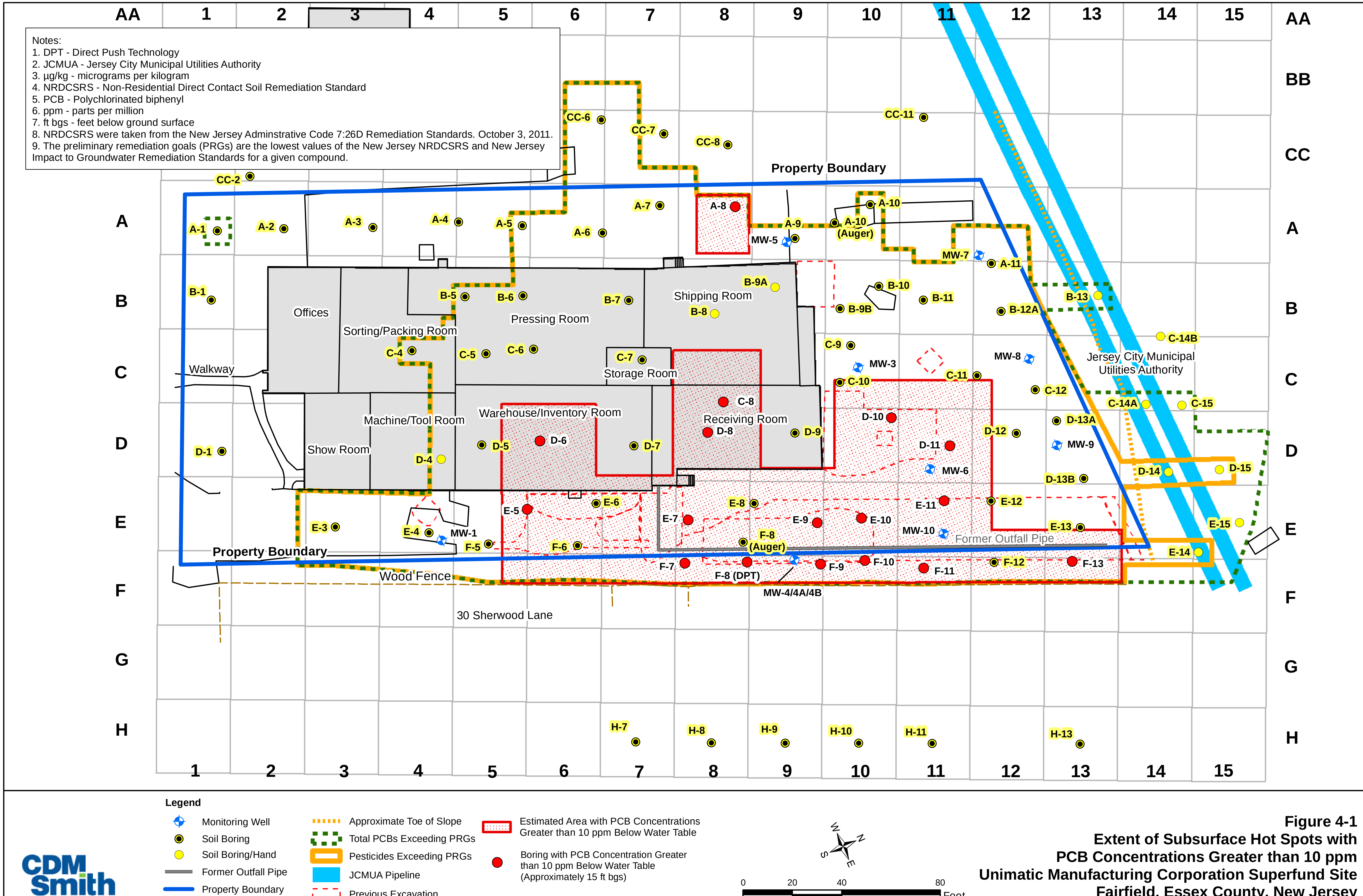


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Figure 4-1
Extent of Subsurface Hot Spots with PCB Concentrations Greater than 10 ppm
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Appendix A

Appendix A

Impact to Groundwater Soil Remediation Standard Calculations

APPENDIX A

A Soil-Water Partition Equation provided in the NJDEP guidance document *Development of Impact to Ground Water Soil Remediation Standards using the Soil-Water Partition Equation, Version 2.0 – November 2013* was used to develop an Impact to Ground Water Soil Remediation Standard (IGWSRS) for PCBs and pesticides in site vadose zone soils. The equation calculates the total amount of the contaminant that may be left behind in the soil so that the aqueous phase concentration of a contaminant will not exceed a specified criterion (e.g., the MCL).

The equation provided for organic contaminants was used:

$$IGWSRS = Cgw \left\{(Kocfoc) + \frac{\theta w + \theta a H'}{\rho b}\right\} DAF$$

where

IGWSRS = Impact-to-ground water soil remediation standard (mg/kg)
*C*gw = Ground Water Quality Criterion (mg/L)
*f*oc = organic carbon content of soil (kg/kg)
*K*oc=soil organic carbon-water partition coefficient (L/kg)
θw = water-filled soil porosity (Lwater/Lsoil)
θa = air-filled soil porosity (Lair/Lsoil)
H' = Henry's law constant (dimensionless)
ρb = dry soil bulk density (kg/L)
DAF = dilution-attenuation factor

With the exception of *C*gw, NJDEP default values were used for equation variables. For *C*gw, NJDEP Class IIA Ground Water Quality Standards were used to calculate the IGWSRS.

PCBs

For calculation of an IGWSRS for PCB in unsaturated soils, the following values were used:

*C*gw = 0.0005 mg/L (NJ GWS for PCBs)
*f*oc = 0.002 kg/kg (NJDEP default value)
*K*oc=309,000 L/kg (NJDEP default value)
θw = 0.23 L/L (NJDEP default value)
θa = 0.18 L/L (NJDEP default value)
H' = 0.107 (NJDEP default value)
ρb = 1.5 kg/L (NJDEP default value)
DAF = 20 (NJDEP default value)

$$IGWSRS = 0.0005 \left\{(309{,}000 * 0.002) + \frac{0.23 + 0.18(0.107)}{1.5}\right\} 20$$

$$IGWSRS = 0.0005 \left\{(618) + \frac{0.249}{1.5}\right\} 20$$

$$IGWSRS = 0.0005 \{618.17\} 20$$

$IGWSRS = 6.18\text{ mg/kg}$

Chlordanes (alpha and gamma)

For calculation of an IGWSRS for chlordanes in unsaturated soils, the following values were used:

Cgw = 0.0005 mg/L (NJ GWS for chlordanes)
$f$oc = 0.002 kg/kg (NJDEP default value)
Koc=120,000 L/kg (NJDEP default value)
θw = 0.23 L/L (NJDEP default value)
θa = 0.18 L/L (NJDEP default value)
H' = 0.00199 (NJDEP default value)
ρb = 1.5 kg/L (NJDEP default value)
DAF = 20 (NJDEP default value)

$$IGWSRS = 0.0005 \left\{(120{,}000 * 0.002) + \frac{0.23 + 0.18(0.00199)}{1.5}\right\} 20$$

$$IGWSRS = 0.0005 \{240.15\}20$$

$IGWSRS = 2.4\text{ mg/kg}$

Dieldrin

For calculation of an IGWSRS for dieldrin in unsaturated soils, the following values were used:

Cgw = 0.00003 mg/L (NJ GWS for dieldrin)
$f$oc = 0.002 kg/kg (NJDEP default value)
Koc=21,400 L/kg (NJDEP default value)
θw = 0.23 L/L (NJDEP default value)
θa = 0.18 L/L (NJDEP default value)
H' = 0.000619 (NJDEP default value)
ρb = 1.5 kg/L (NJDEP default value)
DAF = 20 (NJDEP default value)

$$IGWSRS = 0.00003 \left\{(21{,}400 * 0.002) + \frac{0.23 + 0.18(0.000619)}{1.5}\right\} 20$$

$$IGWSRS = 0.00003 \{42.95\}20$$

$IGWSRS = 0.026\text{ mg/kg}$

Heptachlor

For calculation of an IGWSRS for heptachlor in unsaturated soils, the following values were used:

Cgw = 0.00005 mg/L (NJ GWS for heptachlor)
$f$oc = 0.002 kg/kg (NJDEP default value)
Koc=1,410,000 L/kg (NJDEP default value)
θw = 0.23 L/L (NJDEP default value)
θa = 0.18 L/L (NJDEP default value)
H' = 0.0447 (NJDEP default value)
ρb = 1.5 kg/L (NJDEP default value)
DAF = 20 (NJDEP default value)

$$IGWSRS = 0.00005 \left\{(1{,}410{,}000 * 0.002) + \frac{0.23 + 0.18(0.0447)}{1.5}\right\} 20$$

$$IGWSRS = 0.00005 \{2{,}820.16\}20$$

$$IGWSRS = 2.82 \text{ mg/kg}$$

Heptachlor epoxide

For calculation of an IGWSRS for heptachlor epoxide in unsaturated soils, the following values were used:

Cgw = 0.0002 mg/L (NJ GWS for heptachlor epoxide)
$f$oc = 0.002 kg/kg (NJDEP default value)
Koc=83,200 L/kg (NJDEP default value)
θw = 0.23 L/L (NJDEP default value)
θa = 0.18 L/L (NJDEP default value)
H' = 0.000394 (NJDEP default value)
ρb = 1.5 kg/L (NJDEP default value)
DAF = 20 (NJDEP default value)

$$IGWSRS = 0.0002 \left\{(83{,}200 * 0.002) + \frac{0.23 + 0.18(0.000394)}{1.5}\right\} 20$$

$$IGWSRS = 0.0002 \{166.55\}20$$

$$IGWSRS = 0.67 \text{ mg/kg}$$

4,4'-DDE

For calculation of an IGWSRS for 4,4'-DDE in unsaturated soils, the following values were used:

Cgw = 0.0001 mg/L (NJ GWS for 4,4'-DDE)
$f$oc = 0.002 kg/kg (NJDEP default value)
Koc=4,476,000 L/kg (NJDEP default value)
θw = 0.23 L/L (NJDEP default value)
θa = 0.18 L/L (NJDEP default value)
H' = 0.000861 (NJDEP default value)
ρb = 1.5 kg/L (NJDEP default value)
DAF = 20 (NJDEP default value)

$$IGWSRS = 0.0001\left\{(4{,}476{,}000 * 0.002) + \frac{0.23 + 0.18(0.000861)}{1.5}\right\}20$$

$$IGWSRS = 0.0001\,\{8{,}952\}20$$

$$IGWSRS = 17.9 \text{ mg/kg}$$

4,4'-DDT

For calculation of an IGWSRS for 4,4'-DDT in unsaturated soils, the following values were used:

Cgw = 0.0001 mg/L (NJ GWS for 4,4'-DDT)
$f$oc = 0.002 kg/kg (NJDEP default value)
Koc=2,630,000 L/kg (NJDEP default value)
θw = 0.23 L/L (NJDEP default value)
θa = 0.18 L/L (NJDEP default value)
H' = 0.000332 (NJDEP default value)
ρb = 1.5 kg/L (NJDEP default value)
DAF = 20 (NJDEP default value)

$$IGWSRS = 0.0001\left\{(2{,}630{,}000 * 0.002) + \frac{0.23 + 0.18(0.000332)}{1.5}\right\}20$$

$$IGWSRS = 0.0001\,\{5{,}260.15\}20$$

$$IGWSRS = 10.52 \text{ mg/kg}$$

Aldrin

For calculation of an IGWSRS for aldrin in unsaturated soils, the following values were used:

Cgw = 0.00004 mg/L (NJ GWS for aldrin)
$f$oc = 0.002 kg/kg (NJDEP default value)
Koc=2,450,000 L/kg (NJDEP default value)
θw = 0.23 L/L (NJDEP default value)
θa = 0.18 L/L (NJDEP default value)
H' = 0.00697 (NJDEP default value)
ρb = 1.5 kg/L (NJDEP default value)
DAF = 20 (NJDEP default value)

$$IGWSRS = 0.00004\left\{(2{,}450{,}000 * 0.002) + \frac{0.23 + 0.18(0.00697)}{1.5}\right\}20$$

$$IGWSRS = 0.00004\,\{4{,}900.15\}20$$

$$IGWSRS = 3.92 \text{ mg/kg}$$

Lindane

For calculation of an IGWSRS for lindane in unsaturated soils, the following values were used:

Cgw = 0.00003 mg/L (NJ GWS for lindane)
$f$oc = 0.002 kg/kg (NJDEP default value)
Koc=1,070 L/kg (NJDEP default value)
θw = 0.23 L/L (NJDEP default value)
θa = 0.18 L/L (NJDEP default value)
H' = 0.000574 (NJDEP default value)
ρb = 1.5 kg/L (NJDEP default value)
DAF = 20 (NJDEP default value)

$$IGWSRS = 0.00003\left\{(1{,}070 * 0.002) + \frac{0.23 + 0.18(0.000574)}{1.5}\right\}20$$

$$IIGWSRS = 0.00003\ \{2.29\}20$$

$$IGWSRS = 0.0013 \text{ mg/kg (per NJDEP, round to 0.002 mg/kg due to detection limit)}$$

Appendix B

Appendix B

Building Debris and Contaminated Soil Volume Calculations

Appendix B-1 - Unimatic Manufacturing Building - C&D Waste Determination Table

The measurements which were input into the dimensional / volumetric calculations below were derived from historical architectural drawings obtained from the NJDEP during a file records search in November 2015. These measurements were confirmed with field collected surveys and GIS files, which are able to utilize precise scale measurements. The GIS measurements were found to correspond to the architectural drawing records to within <1' in each room and in the overall size of the building. Footer thickness was taken directly from the architectural drawings and these figures were carried through to the earliest areas of the building for which no footer records were found. Floor thickness was averaged from the architectural drawings and compared to concrete cores collected at the site by CDM Smith during the RI field event in the summer of 2015. The determination of TSCA vs. Non-TSCA waste was based on chip samples (for walls- collected by Weston in 2012 on behalf of EPA) and by soil and concrete samples collected during the RI field event in the summer of 2015 by CDM Smith.

Floor Dimensions

Floor Categories	Length (front of bldg to back of bldg)	Width (side to side)	Square Feet	Thickness	Cubic Feet	Cubic yards	Tons (1.9 * yd3)	
TSCA (eastern half of bldg.- thickness set to account for footers)	209	40	8360.00	0.8333	6966.67	**258.02**	**490.2**	**TSCA**
Non-TSCA (western half of bldg. - thickness set to account for footers)	226	50	11300.00	0.8333	9416.67	348.77	662.7	Non-TSCA
Mezzanine Floor	61	50	3050.00	0.25	762.50	28.24	53.7	Non-TSCA
Allowance for Roof material	220	90	19800.00	0.25	4950.00	183.33	348.3	Non-TSCA
Loading Dock	35	10	350.00	0.8333	291.66	10.80	20.5	Non-TSCA
						571.1	**1085.2**	**Non-TSCA Total**
Full building (floor, mezz. floor, loading dock, roof material)	220	90	19660.00	0.8333	16383.33	**829.17**	**1575.4**	**Total**

Wall Dimensions

Wall Categories	Length	Height	Square Feet	Thickness	Cubic Feet	Cubic yards	Tons (1.9 * yd3)		
TSCA (Eastern exterior and central walls) int. long. Wall	34.5	20	1104.00	1	1104.00	40.89	77.7		
interior longitudinal wall	48	20	960.00	1	960.00	35.56	67.6		
interior longitudinal wall	80	28.5	2280.00	1	2280.00	84.44	160.4		
exterior east side	80	28.5	2280.00	1	2280.00	84.44	160.4		
interior longitudinal wall	68	28.5	1938.00	1	1938.00	71.78	136.4		
exterior east side	68	28.5	1938.00	1	1938.00	71.78	136.4		
interior lateral wall	40	20	800.00	1	800.00	29.63	56.3		
interior lateral wall	40	28.5	1140.00	1	1140.00	42.22	80.2		
interior lateral wall	40	28.5	1140.00	1	1140.00	42.22	80.2		
Rear exterior wall	40	28.5	1140.00	1	1140.00	42.22	80.2		
						545.19	**1035.9**	**Total TSCA**	
Non-TSCA (Western exterior and interior western side) Ext	29	12	348.00	0.66	229.68	8.51	16.2		
Exterior	39	22.5	877.50	1	877.50	32.50	61.8		
Exterior	96	22.5	2160.00	1	2160.00	80.00	152.0		
Exterior	62	28.5	1767.00	1	1767.00	65.44	124.3		
Front lower	50	12	600.00	0.66	396.00	14.67	27.9		
Front higher	40	20	800.00	1	800.00	29.63	56.3		
Interior lateral	50	20	1000.00	1	1000.00	37.04	70.4		
Interior lateral	50	22.5	1125.00	1	1125.00	41.67	79.2		
Interior lateral	50	28.5	1425.00	1	1425.00	52.78	100.3		
Rear	50	28.5	1425.00	1	1425.00	52.78	100.3		
Lunch Room/Bathroom interior walls	20	20	400.00	1	400.00	14.81	28.1		
Lunch Room/Bathroom interior walls	20	20	400.00	1	400.00	14.81	28.1		
Lunch Room/Bathroom interior walls	38	20	760.00	1	760.00	28.15	53.5		
Lunch Room/Bathroom interior walls	48	20	960.00	1	960.00	35.56	67.6		
Exterior partial lateral wall at entrance	12	12	144.00	1	144.00	5.33	10.1		
						513.67	**976.0**	**Total**	**Non-TSCA**
							2011.8	**Building Walls Total**	
							1575.4		
					Grand Totals	**1888.02**	**3587.2**		

Walls are categorized based on the highest possible contaminated side.

Total yd3	**1888.0**	**2071.4**
Total Tons	**3935.6**	**3587.2**

Summary Table	**TONS**	**YD3**
TSCA Floors	490	258
TSCA Walls	1,036	545
TSCA Total	**1,526**	**803**
Non-TSCA Floors	1,085	571
Non-TSCA Roof	348	183
Non-TSCA Walls	976	514
Non-TSCA Total	**2,409**	**1,268**
Grand Totals	**3,936**	**2,071**

Appendix B-2
Calculation of Soil Volumes

To calculate soil volumes, areas with similar depths of contamination were outlined to facilitate volume calculation to a sufficient accuracy for the FS level. Areas and volumes were developed for soils exceeding 1 ppm, 10 ppm, and 50 ppm concentration of PCBs. A depth of 15 feet below ground surface was assumed as the depth to the water table. For alternatives calling for excavation to the water table, when contamination extended below the water table, a depth of 15 feet was used to estimate volume above the water table. For alternatives requiring excavation below the water table, total depths of contamination were used to estimate volumes. When results indicated that contamination above the target threshold did not extend to the water table, calculations were based on the depth to which the target concentrations extended. The attached tables show the assigned area and depth of excavations based on target concentrations of PCBs.

Table B-2a
Calculation of Soil Volumes above 1 ppm PCBs

	LENGTH	WIDTH	AREA	TOTAL DEPTH	VOLUME			VADOSE ZONE DEPTH	VADOSE ZONE VOLUME			SATURATED SOIL
	FT	FT	SF	FT	CF	CY			CF	CY		CY
A	65	38	2,470	14	34,580	1,281		14	34,580	1,281		
B	23	78	1,794	4	7,176	266		4	7,176	266		
C1	230	88	20,240	22	445,280	16,492		15	303,600	11,244		
C2	46	28	1,288	22	28,336	1,049		15	19,320	716		
C3	61	41	2,501	22	55,022	2,038		15	37,515	1,389		
D	25	24	600	8	4,800	178		0	-	-		
E	14	14	196	4	784	29		0	-	-		
F	61	42	2,562	10	25,620	949		0	-	-		
G	22	20	440	18	7,920	293		0	-	-		
H	86	54	4,644	14	65,016	2,408		14	65,016	2,408		
I1	74	61	4,514	2	9,028	334		2	9,028	334		
I2	61	33	2,013	2	4,026	149		2	4,026	149		
I3	41	30	1,230	2	2,460	91		2	2,460	91		
I4	29	22	638	2	1,276	47		2	1,276	47		
J	13	13	169	4	676	25		4	676	25		
K	18	18	324	32	10,368	384		13	4,212	156		
L	120	42	5,040	2	10,080	373		2	10,080	373		
Total			46,372		712,448	26,387			498,965	18,480		
					Round to	26,000			Round to	18,000		
Contaminated soil with PCB above 10 ppm			(29,903)			(13,000)				(10,000)		8,000
Net			16,469			13,000				8,000		5,000

Notes:
1: shaded areas are counted already within other areas.
FT - feet SF - square feet CF - cubic feet CY - cubic yard

Table B-2b
Calculation of Soil volumes above 10 ppm PCBs

	LENGTH	WIDTH	AREA	TOTAL DEPTH	VOLUME			VADOSE ZONE DEPTH	VOLUME		SATURATED SOIL
	FT	FT	SF	FT	CF	CY			CF	CY	
A	64	24	1,536	6	9,216	341		6	9,216	341	
B	64	20	1,280	2	2,560	95		2	2,560	95	
C	40	20	800	20	16,000	593		15	12,000	444	
D	19	25	475	30	14,250	528		15	7,125	264	
E	24	19	456	12	5,472	203		12	5,472	203	
F	193	50	9,650	20	193,000	7,148		15	144,750	5,361	
G	39	41	1,599	20	31,980	1,184		15	23,985	888	
H	18	39	702	6	4,212	156		6	4,212	156	
I	63	39	2,457	20	49,140	1,820		15	36,855	1,365	
J	32	56	1,792	2	3,584	133		2	3,584	133	
K	46	81	3,726	2	7,452	276		2	7,452	276	
L	25	40	1,000	2	2,000	74		2	2,000	74	
M	28	65	1,820	2	3,640	135		2	3,640	135	
N	87	30	2,610	2	5,220	193		2	5,220	193	
Total			29,903		347,726	12,879			268,071	9,929	
					Round to	13,000			Round to	10,000	3,000
Contaminated soil with PCBs above 50			(13,508)			(10,000)				(7,300)	
Net			16,395			3,000				2,700	300

Notes:

FT - feet SF - square feet CF - cubic feet CY - cubic yard

Table B-2c
Calculation of Soil Volumes above 50 ppm PCBs

	LENGTH	WIDTH	AREA	TOTAL DEPTH	VOLUME			VADOSE ZONE DEPTH	VADOSE ZONE VOLUME		SATURATED SOIL
	FT	FT	SF	FT	CF	CY			CF	CY	CY
C	40	20	800	20	16,000	593		15	12,000	444	
D	19	25	475	30	14,250	528		15	7,125	264	
E	24	19	456	12	5,472	203		12	5,472	203	
F	193	50	9,650	20	193,000	7,148		15	144,750	5,361	
G	39	41	1,599	20	31,980	1,184		15	23,985	888	
Z	44	12	528	6	3,168	117		6	3,168	117	
Total			13,508		263,870	9,773			196,500	7,278	
					Round to	10,000			Round to	7,300	2,700

Notes:

FT - feet SF - square feet CF - cubic feet CY - cubic yard

Legend

- Soil Boring
- Soil Boring/Hand Auger
- Monitoring Well
- Former Abandoned Pipe
- Property Boundary
- JCMUA Pipeline
- Previous Excavation Area
- Target Treatment Area - Total Aroclor Concentration greater than 50,000 µg/kg
- Target Treatment Area - Total Aroclor Concentration greater than 10,000 µg/kg
- Target Treatment Area - Total Aroclor Concentration greater than 1,000 µg/kg

Total Aroclor Concentration (µg/kg)

- < 1,000
- 1,000 - 50,000
- 50,000 - 100,000
- > 100,000

0 20 40 80 Feet

CDM Smith

Figure B-1
Target Treatment Areas for PCBs
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Document Path: F:\Unimatic\GIS\MXD\FS\Total_PCBs_Boxmap_1_ppm_10ppm_Extent_ANSI_D_v3.mxd

Notes:
1. DPT - Direct Push Technology
2. ft bgs - feet below ground surface
3. J - Estimated data due to exceeded quality control criteria.
4. JCMUA - Jersey City Municipal Utilities Authority
5. µg/kg - micrograms per kilogram
6. N - Presumptive evidence of a compound
7. NJNRDCSRS - New Jersey Non-Residential Direct Contact Soil Remediation Standard
8. The maximum concentration between a parent sample and duplicate sample is shown on this figure.
9. NRDCSRS were taken from the New Jersey Adminstrative Code 7:26D Remediation Standards. October 3, 2011.
10. Only pesticides whose concentrations exceeded their respective NRDCSRS are shown on this figure.
11. The preliminary remediation goals are the lowest values of the New Jersey NRDCSRS and New Jersey Impact to Groundwater Remediation Standards for a given compound.

Organic Compounds	Impact to Groundwater Remediation Standard (µg/kg)
Pesticides	
Dieldrin	30
Lindane	2

Organic Compounds	NJNRDCSRS (µg/kg)
Pesticides	
4,4'-DDE	9000
4,4'-DDT	8000
Aldrin	200
Dieldrin	200
Cis-Chlordane	1000
Heptachlor	700
Heptachlor Epoxide	300
Lindane	400
Trans-Chlordane	1000

Legend

- Monitoring Well
- Soil Boring
- Soil Boring/Hand Auger
- Former Outfall Pipe
- Property Boundary
- JCMUA Pipeline
- Previous Excavation Area
- Target Treatment Area - Total Pesticides Exceeding Preliminary Remediation Goal

0 20 40 80 Feet

CDM Smith

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Figure B-2
Target Treatment Area for Pesticides
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Appendix C

Appendix C

Remedial Action Alternative Cost Estimates

The cost spreadsheets included in this appendix were developed in accordance with EPA 540-R-00-002 (OSWER 9355.0-75) July 2000.

These costs should be used to compare alternative relative costs. Costs for project management and construction management were determined as percentages of capital cost per the guidance. Costs for these work items may not reflect costs for implementation. These costs are determined based on specific client requirements during implementation.

TABLE CS-ALT

ALTERNATIVE COST SUMMARY

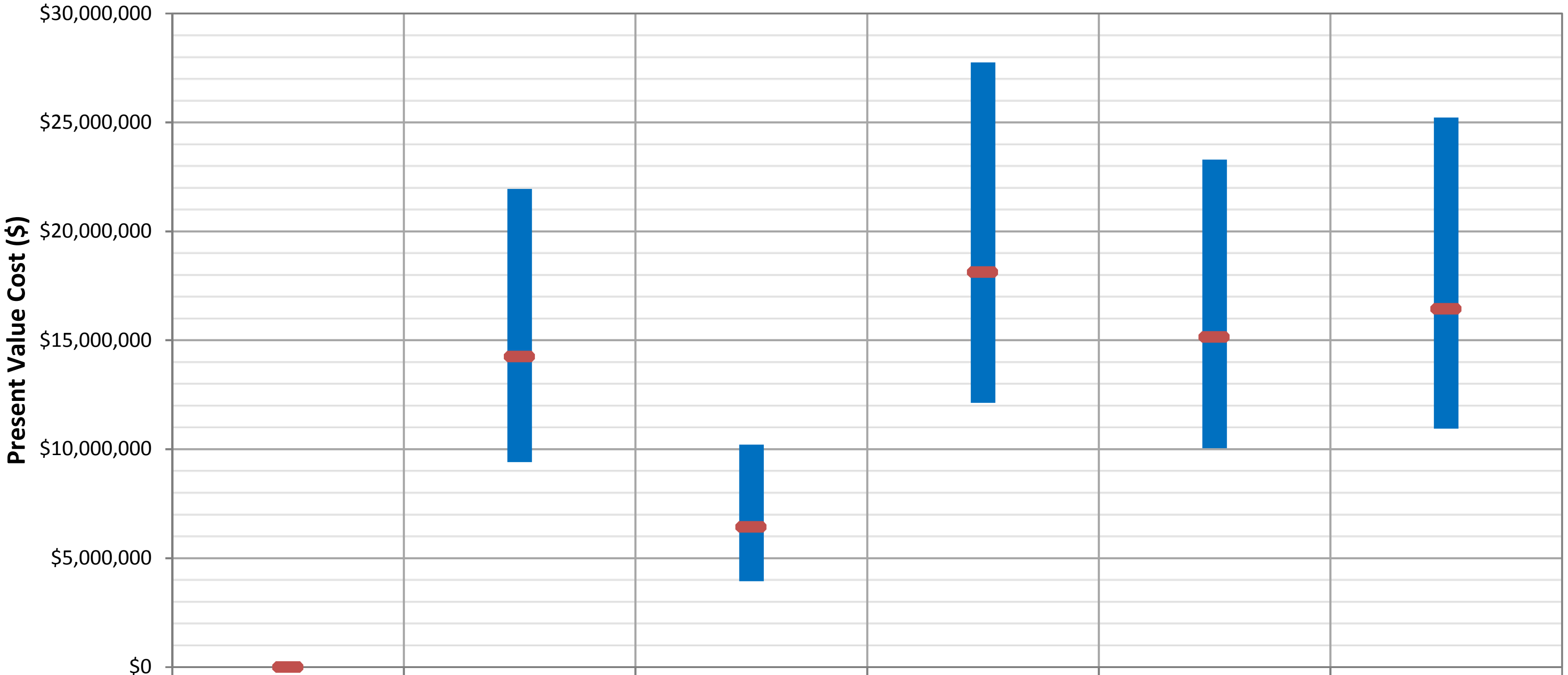
Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016

	Remedial Alternative	Total Capital Cost	Total Annual Cost	Total Periodic Cost	Total Non-Discounted Cost	Present Value Cost
1	No Action	$0	$0	$0	$0	$0
2	Building Demolition, Excavation to Water Table, Offsite Disposal, In Situ Solidification/Stabilization, and Capping	$13,929,000	$360,000	$308,000	$14,597,000	$14,253,000
3	Building Demolition and Offsite Disposal, In Situ Solidification/Stabilization and Capping	$6,108,000	$360,000	$308,000	$6,776,000	$6,432,000
4	Building Demolition, Excavation and Offsite Disposal	$18,122,000	$0	$0	$18,122,000	$18,122,000
5	Building Demolition and Offsite Disposal, Excavation, Onsite Treatment, and Backfill of Treated Material	$15,149,000	$0	$0	$15,149,000	$15,149,000
6	Building Demolition, Targeted Excavation of Soils and Offsite Disposal	$16,445,000	$0	$0	$16,445,000	$16,445,000

Notes:

1 - Capital costs, annual costs, and periodic costs are presented on tables CS-1 through CS-6.
2 - Estimated remedial timeframes and associated present value analysis for each remedial alternative are provided on tables PV-1 through PV-6.
3 - The non-discounted total cost demonstrates the impact of a discount rate on the total present value cost and the relative amount of future annual expenditures. Non-discounted costs are presented for comparison purposes only and should not be used in place of present value costs in the CERCLA remedy selection process.
4 - Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for feasibility study level evaluation purposes.

Exhibit 1: CS-PV
Alternative Cost Estimate Accuracy Ranges
Present Value (PV) Cost



	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
PV (+50%)	$0	$21,380,000	$9,648,000	$27,183,000	$22,724,000	$24,668,000
PV	$0	$14,253,000	$6,432,000	$18,122,000	$15,149,000	$16,445,000
PV (-30%)	$0	$9,978,000	$4,503,000	$12,686,000	$10,605,000	$11,512,000

Alternative

Present Value and Cost Estimate Summary

Remedial Alternative 2

TABLE SPV-2

Alternative 2

Building Demolition, Excavation to Water Table, Offsite Disposal, In Situ Solidification/Stabilization, and Capping

PRESENT VALUE ANALYSIS

Real Discount Rate: 7.00%

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016

Year[1]	Capital Costs[2] (Earthwork)	Capital Costs[2] (Institutional Controls)	Annual O&M Costs[2]	Periodic Costs[2]	Total Annual Expenditure[3]	Discount Factor	Present Value[4,5]
0	$13,894,000	$35,000	$0	$0	$13,929,000	1.0000	$13,929,000
1	$0	$0	$12,000	$22,000	$34,000	0.9346	$31,776
2	$0	$0	$12,000	$22,000	$34,000	0.8734	$29,696
3	$0	$0	$12,000	$22,000	$34,000	0.8163	$27,754
4	$0	$0	$12,000	$22,000	$34,000	0.7629	$25,939
5	$0	$0	$12,000	$22,000	$34,000	0.7130	$24,242
6	$0	$0	$12,000	$22,000	$34,000	0.6663	$22,654
7	$0	$0	$12,000	$22,000	$34,000	0.6227	$21,172
8	$0	$0	$12,000	$22,000	$34,000	0.5820	$19,788
9	$0	$0	$12,000	$22,000	$34,000	0.5439	$18,493
10	$0	$0	$12,000	$22,000	$34,000	0.5083	$17,282
11	$0	$0	$12,000	$0	$12,000	0.4751	$5,701
12	$0	$0	$12,000	$0	$12,000	0.4440	$5,328
13	$0	$0	$12,000	$0	$12,000	0.4150	$4,980
14	$0	$0	$12,000	$0	$12,000	0.3878	$4,654
15	$0	$0	$12,000	$22,000	$34,000	0.3624	$12,322
16	$0	$0	$12,000	$0	$12,000	0.3387	$4,064
17	$0	$0	$12,000	$0	$12,000	0.3166	$3,799
18	$0	$0	$12,000	$0	$12,000	0.2959	$3,551
19	$0	$0	$12,000	$0	$12,000	0.2765	$3,318
20	$0	$0	$12,000	$22,000	$34,000	0.2584	$8,786
21	$0	$0	$12,000	$0	$12,000	0.2415	$2,898
22	$0	$0	$12,000	$0	$12,000	0.2257	$2,708
23	$0	$0	$12,000	$0	$12,000	0.2109	$2,531
24	$0	$0	$12,000	$0	$12,000	0.1971	$2,365
25	$0	$0	$12,000	$22,000	$34,000	0.1842	$6,263
26	$0	$0	$12,000	$0	$12,000	0.1722	$2,066
27	$0	$0	$12,000	$0	$12,000	0.1609	$1,931
28	$0	$0	$12,000	$0	$12,000	0.1504	$1,805
29	$0	$0	$12,000	$0	$12,000	0.1406	$1,687
30	$0	$0	$12,000	$22,000	$34,000	0.1314	$4,468
TOTALS:	$13,894,000	$35,000	$360,000	$308,000	$14,597,000		$14,253,021
TOTAL PRESENT VALUE OF ALTERNATIVE 2							**$14,253,000**

Notes:

1 - Estimated remedial timeframes are discussed within the FS report.

2 - Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-2.

3 - Total annual expenditure is the total cost per year with no escalation or discounting.

4 - Present value is the total cost per year including a discount factor for that year. See Table SPV-ADRFT for details.

5 - Total present value is rounded up to the nearest $1,000. Depreciation is excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-2					
Alternative	**2**				
Building Demolition, Excavation to Water Table, Offsite Disposal, In Situ Solidification/Stabilization, and Capping					**COST ESTIMATE SUMMARY**

Site:	Unimatic Mfg. Corp. Superfund Site	Description: Alternative 2 consists of the following components: Building demolition and offsite disposal of debris; Excavation and soil cap within JCMUA pipeline easement; Excavation of the PCB contaminated soils exceeding 10 mg/kg to water table; Post excavation sampling; Offsite disposal of excavated soils; Consolidation of the remaining soil exceeding the PRGs (PCBs between 1 mg/kg and 10mg/kg) into the excavated areas; In situ solidification and stabilization (ISS) of contaminated soil exceeding the PRGs; Construct the soil cap for the stabilized soil with imported clean fill; Inspection, monitoring and maintenance of the cap; Deed notice; and Five-year reviews.
Location:	Fairfield, New Jersey	
Phase:	Feasibility Study - Final	
Base Year:	2016	
Date:	July 2016	

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Institutional Controls	1	LS	$16,347	$16,347	Includes cost for environmental lawyer for implementing ICs for the site
Community Awareness Activities	1	LS	$6,923	$6,923	Includes community awareness meetings
Deed Notice	1	LS	$8,613	$8,613	Includes preparation of deed notices for the site and JCMUA pipeline easement
SUBTOTAL				$31,883	
Project Management	10%			$3,188	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL				$35,071	
TOTAL CAPITAL COST				**$35,000**	Total capital cost is rounded to the nearest $1,000.

EARTHWORK CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
General Conditions					
General Requirements	5	MO	$139,030.00	$695,152	Includes onsite staff, per diem, safety and health requirements, temporary facilities, air monitoring, and site security.
Project Planning, Documents, and Submittals	1	LS	$225,999.00	$225,999	Includes project deliverables
Surveying	1	LS	$44,730.00	$44,730	Includes surveying during construction
Mobilization	1	LS	$15,952	$15,952	
Sediment and Erosion Control					
Installation	1	LS	$2,370	$2,370	Includes installation of silt fence and hay bales.
Maintenance	1	LS	$9,665	$9,665	Includes maintenance of silt fence and hay bales for the duration of project.
Monitoring Well Abandonment	11	EA	$824.00	$9,067	Includes abandonment of existing onsite 11 monitoring wells
Demolition of Structure					
Building Inspection	1	LS	$5,011	$5,011	Includes inspection of building prior to demolition for structural integrity.
Demolition	2,070	CY	$39.45	$81,671	Includes demolition of the building.
Transportation and Disposal - TSCA, Non-Haz	1,500	TON	$254.90	$382,347	Includes T&D of TSCA building demolition debris.
Transportation and Disposal - Non-Haz	2,400	TON	$142.44	$341,863	Includes T&D of Non-TSCA building demolition debris.
Excavation and Soil Cap within JCMUA Pipeline Easement					
Excavation	380	BCY	$3.48	$1,322	Includes excavation of contaminated soil within the JCMUA easement.
Transportation and Disposal - Non-Haz	720	TON	$134.95	$97,161	Includes T&D of Non-Haz/TSCA excavated soil.
Placement of Soil Cap	5,040	SF	$4.61	$23,246	Includes placement of clean backfill for soil cap and revegetation.
Excavation of Contaminated Soils					
Excavation Support Installation	21,700	SF	$40.27	$873,778	Includes installation of sheet piles for excavation support.
Contaminated Soils Excavation	10,000	BCY	$4.56	$45,588	Excavation of the PCB contaminated soils exceeding 10 mg/kg to water table.
Transportation and Disposal (T&D) of Contaminated Soils					
T&D of Hazardous and TSCA soil	1,400	TON	$813.96	$1,139,544	Includes T&D of Haz/TSCA excavated soil.
T&D of TSCA soil	12,600	TON	$245.26	$3,090,263	Includes T&D of TSCA excavated soil.
T&D of Non-Hazardous and Non-TSCA Soil	4,200	TON	$134.95	$566,773	Includes T&D of Non-Haz/TSCA excavated soil.
Consolidation of Contaminated Soil within Excavated Areas	8,000	BCY	$9.18	$73,429	Includes consolidating the rest of the contaminated soil (1 mg/kg) within excavated area.
Post Excavation Sampling	52	EA	$231.10	$12,017	Includes post excavation sampling to verify that the objective of excavation.
In-Situ Solidification and Stabilization (ISS)	1	LS	$1,426,827	$1,426,827	Includes implementation of ISS. Also, includes bench scale treatability study.
Clean Backfill and Placement of Soil Cap	8,000	ECY	$39.57	$316,553	Includes placement of clean fill along with a demarcation layer.
Topsoil Placement and Revegetation	46,000	SF	$1.63	$74,750	Includes placement of topsoil and installation of vegetation.
Chain Link Fence (6' High)	1,030	LF	$22.01	$22,668	Includes chain link fence (6' high) for site control.
Monitoring Well Installation and Development	11	EA	$3,195.00	$35,141	Includes installation of 11 monitoring wells
Demobilization	1	LS	$15,952	$15,952	
SUBTOTAL				$9,628,839	

TABLE CS-2

Alternative 2

Building Demolition, Excavation to Water Table, Offsite Disposal, In Situ Solidification/Stabilization, and Capping

COST ESTIMATE SUMMARY

Site:	Unimatic Mfg. Corp. Superfund Site
Location:	Fairfield, New Jersey
Phase:	Feasibility Study - Final
Base Year:	2016
Date:	July 2016

Description: Alternative 2 consists of the following components: Building demolition and offsite disposal of debris; Excavation and soil cap within JCMUA pipeline easement; Excavation of the PCB contaminated soils exceeding 10 mg/kg to water table; Post excavation sampling; Offsite disposal of excavated soils; Consolidation of the remaining soil exceeding the PRGs (PCBs between 1 mg/kg and 10mg/kg) into the excavated areas; In situ solidification and stabilization (ISS) of contaminated soil exceeding the PRGs; Construct the soil cap for the stabilized soil with imported clean fill; Inspection, monitoring and maintenance of the cap; Deed notice; and Five-year reviews.

Contingency (Scope and Bid)	30%			$2,888,652	20% Scope, 10% Bid (mid range of the recommended range in EPA 540-R-00-002).
SUBTOTAL				$12,517,491	
Project Management	5%			$625,875	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management	6%			$751,049	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL				$13,894,415	
TOTAL CAPITAL COST				**$13,894,000**	Total capital cost is rounded to the nearest $1,000.

ANNUAL OPERATION AND MAINTENANCE (O&M) COSTS (Years 1 through 30)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Cap/Backfill Maintenance	1	YR	$6,619	$6,619	Assumes 4 days maintenance per year
Chain Link Fence Maintenance	1	LS	$701	$701	Assumes 20 ft of fence would require maintenance per year
SUBTOTAL				$7,320	
Contingency (Scope and Bid)	30%			$2,196	20% Scope, 10% Bid (mid range of the recommended range in EPA 540-R-00-002).
SUBTOTAL				$9,516	
Project Management	10%			$952	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Technical Support	15%			$1,427	Middle value of the recommended range in EPA 540-R-00-002 was used.
TOTAL				$11,895	
TOTAL ANNUAL O&M COST				**$12,000**	Total capital cost is rounded to the nearest $1,000.

LONG-TERM MONITORING PERIODIC COSTS (Assumed to be Incurred Every Year During Year 1 through 10 and then Every 5 Year)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Groundwater Monitoring					
GW Sampling and Analysis	1	EA	$6,906.00	$6,906	Includes GW sampling of 11 WMs and analysis
GW Sampling Report	1	LS	$6,844.00	$6,844	Includes GW sampling report
SUBTOTAL				$13,750	
Contingency (Scope and Bid)	30%			$4,125	20% Scope, 10% Bid (mid range of the recommended range in EPA 540-R-00-002).
SUBTOTAL				$17,875	
Project Management	10%			$1,788	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Technical Support	15%			$2,681	Middle value of the recommended range in EPA 540-R-00-002 was used.
TOTAL				$22,344	
TOTAL PERIODIC COST				**$22,000**	Total capital cost is rounded to the nearest $1,000.

Notes:

Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.
Remedial Design and Five Year Review costs were excluded from the cost estimate per EPA's direction.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

BCY	Bank Cubic Yard	MO	Month
CY	Cubic Yard	QTY	Quantity
ECY	Embankment Cubic Yard	SF	Square Feet
LCY	Loose Cubic Yard	TON	Ton
LS	Lump Sum	YR	Year

Present Value and Cost Estimate Summary

Remedial Alternative 3

TABLE SPV-3

Alternative 3

Building Demolition and Offsite Disposal, In Situ Solidification/Stabilization and Capping

PRESENT VALUE ANALYSIS

Real Discount Rate: 7.00%

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016

Year[1]	Capital Costs[2] (Earthwork)	Capital Costs[2] (Institutional Controls)	Annual O&M Costs[2]	Periodic Costs[2]	Total Annual Expenditure[3]	Discount Factor	Present Value[4,5]
0	$6,073,000	$35,000	$0	$0	$6,108,000	1.0000	$6,108,000
1	$0	$0	$12,000	$22,000	$34,000	0.9346	$31,776
2	$0	$0	$12,000	$22,000	$34,000	0.8734	$29,696
3	$0	$0	$12,000	$22,000	$34,000	0.8163	$27,754
4	$0	$0	$12,000	$22,000	$34,000	0.7629	$25,939
5	$0	$0	$12,000	$22,000	$34,000	0.7130	$24,242
6	$0	$0	$12,000	$22,000	$34,000	0.6663	$22,654
7	$0	$0	$12,000	$22,000	$34,000	0.6227	$21,172
8	$0	$0	$12,000	$22,000	$34,000	0.5820	$19,788
9	$0	$0	$12,000	$22,000	$34,000	0.5439	$18,493
10	$0	$0	$12,000	$22,000	$34,000	0.5083	$17,282
11	$0	$0	$12,000	$0	$12,000	0.4751	$5,701
12	$0	$0	$12,000	$0	$12,000	0.4440	$5,328
13	$0	$0	$12,000	$0	$12,000	0.4150	$4,980
14	$0	$0	$12,000	$0	$12,000	0.3878	$4,654
15	$0	$0	$12,000	$22,000	$34,000	0.3624	$12,322
16	$0	$0	$12,000	$0	$12,000	0.3387	$4,064
17	$0	$0	$12,000	$0	$12,000	0.3166	$3,799
18	$0	$0	$12,000	$0	$12,000	0.2959	$3,551
19	$0	$0	$12,000	$0	$12,000	0.2765	$3,318
20	$0	$0	$12,000	$22,000	$34,000	0.2584	$8,786
21	$0	$0	$12,000	$0	$12,000	0.2415	$2,898
22	$0	$0	$12,000	$0	$12,000	0.2257	$2,708
23	$0	$0	$12,000	$0	$12,000	0.2109	$2,531
24	$0	$0	$12,000	$0	$12,000	0.1971	$2,365
25	$0	$0	$12,000	$22,000	$34,000	0.1842	$6,263
26	$0	$0	$12,000	$0	$12,000	0.1722	$2,066
27	$0	$0	$12,000	$0	$12,000	0.1609	$1,931
28	$0	$0	$12,000	$0	$12,000	0.1504	$1,805
29	$0	$0	$12,000	$0	$12,000	0.1406	$1,687
30	$0	$0	$12,000	$22,000	$34,000	0.1314	$4,468
TOTALS:	$6,073,000	$35,000	$360,000	$308,000	$6,776,000		$6,432,021
TOTAL PRESENT VALUE OF ALTERNATIVE 3							**$6,432,000**

Notes:

1 - Estimated remedial timeframes are discussed within the FS report.

2 - Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-3.

3 - Total annual expenditure is the total cost per year with no escalation or discounting.

4 - Present value is the total cost per year including a discount factor for that year. See Table SPV-ADRFT for details.

5 - Total present value is rounded up to the nearest $1,000. Depreciation is excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-3

Alternative **3**

Building Demolition and Offsite Disposal, In Situ Solidification/Stabilization and Capping

COST ESTIMATE SUMMARY

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016
Date: July 2016

Description: Alternative 3 consists of the following components: Building demolition and offsite disposal of debris; Excavation and soil cap within JCMUA pipeline easement; ISS of contaminated soils exceeding the PRGs; Capping; Inspection, monitoring, and maintenance of soil cap; Deed notice. ISS would be conducted from ground surface to target treatment depths. The operation of ISS would be as described under Alternative 2. After completion of ISS, a 10-inch compacted soil cap would be placed on top of the ISS treated area to eliminate the direct contact risks and to minimize infiltration and leaching of contaminants into groundwater or through surface water runoff. It should be noted that after ISS treatment, the soil volume would increase and the final grade at the treated area would be higher than the original grade. The site would be graded for positive drainage.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Institutional Controls	1	LS	$16,347	$16,347	Includes cost for environmental lawyer for implementing ICs for the site
Community Awareness Activities	1	LS	$6,923	$6,923	Includes community awareness meetings
Deed Notice	1	LS	$8,613	$8,613	Includes preparation of deed notices for the site and JCMUA pipeline easement.
SUBTOTAL				$31,883	
Project Management	10%			$3,188	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL				$35,071	
TOTAL CAPITAL COST				**$35,000**	Total capital cost is rounded to the nearest $1,000.

EARTHWORK CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
General Conditions					
General Requirements	4	MO	$139,031.00	$556,122	Includes onsite staff, per diem, safety and health requirements, temporary facilities, air monitoring, and site security.
Project Planning, Documents, and Submittals	1	LS	$225,999.00	$225,999	Includes project deliverables
Surveying	1	LS	$35,783.00	$35,783	Includes surveying during construction
Mobilization	1	LS	$15,952	$15,952	
Sediment and Erosion Control					
Installation	1	LS	$2,370	$2,370	Includes installation of silt fence and hay bales.
Maintenance	1	LS	$9,665	$9,665	Includes maintenance of silt fence and hay bales for the duration of project.
Monitoring Well Abandonment	11	EA	$824.00	$9,067	Includes abandonment of existing onsite 11 monitoring wells
Demolition of Structure					
Building Inspection	1	LS	$5,011	$5,011	Includes inspection of building prior to demolition for structural integrity.
Demolition	2,070	CY	$39.45	$81,671	Includes demolition of the building.
Transportation and Disposal - TSCA, Non-Haz	1,500	TON	$254.90	$382,347	Includes T&D of TSCA building demolition debris.
Transportation and Disposal - Non-Haz	2,400	TON	$142.00	$341,863	Includes T&D of Non-TSCA building demolition debris.
Excavation and Soil Cap within JCMUA Pipeline Easement					
Excavation	380	BCY	$3.48	$1,322	Includes excavation of contaminated soil within the JCMUA easement.
Transportation and Disposal - Non-Haz	720	TON	$134.95	$97,161	Includes T&D of Non-Haz/TSCA excavated soil.
Placement of Soil Cap	5,040	SF	$4.61	$23,246	Includes placement of clean backfill for soil cap and revegetation.
In-Situ Solidification and Stabilization (ISS)	1	LS	$2,208,275	$2,208,275	Includes implementation of ISS. Also, includes bench scale treatability study.
Placement for Soil Cap	1,500	ECY	$42.93	$64,394	Includes placement of clean fill along with a demarcation layer.
Topsoil Placement and Revegetation	46,000	SF	$1.63	$74,750	Includes placement of topsoil and installation of vegetation.
Chain Link Fence (6' High)	1,030	LF	$22.01	$22,668	Includes chain link fence (6' high) for site control.
Monitoring Well Installation and Development	11	EA	$3,195.00	$35,141	Includes installation of 11 monitoring wells
Demobilization	1	LS	$15,952	$15,952	
SUBTOTAL				$4,208,759	
Contingency (Scope and Bid)	30%			$1,262,628	20% Scope, 10% Bid (mid range of the recommended range in EPA 540-R-00-002).
SUBTOTAL				$5,471,387	
Project Management	5%			$273,569	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management	6%			$328,283	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL				$6,073,239	
TOTAL CAPITAL COST				**$6,073,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-3

Alternative 3

Building Demolition and Offsite Disposal, In Situ Solidification/Stabilization and Capping

COST ESTIMATE SUMMARY

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016
Date: July 2016

Description: Alternative 3 consists of the following components: Building demolition and offsite disposal of debris; Excavation and soil cap within JCMUA pipeline easement; ISS of contaminated soils exceeding the PRGs; Capping; Inspection, monitoring, and maintenance of soil cap; Deed notice. ISS would be conducted from ground surface to target treatment depths. The operation of ISS would be as described under Alternative 2. After completion of ISS, a 10-inch compacted soil cap would be placed on top of the ISS treated area to eliminate the direct contact risks and to minimize infiltration and leaching of contaminants into groundwater or through surface water runoff. It should be noted that after ISS treatment, the soil volume would increase and the final grade at the treated area would be higher than the original grade. The site would be graded for positive drainage.

ANNUAL OPERATION AND MAINTENANCE (O&M) COSTS (Years 1 through 30)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Cap/Backfill Maintenance	1	YR	$6,619	$6,619	Assumes 4 days maintenance per year
Chain Link Fence Maintenance	1	LS	$701	$701	Assumes 20 ft of fence would require maintenance per year
SUBTOTAL				$7,320	
Contingency (Scope and Bid)	30%			$2,196	20% Scope, 10% Bid (mid range of the recommended range in EPA 540-R-00-002).
SUBTOTAL				$9,516	
Project Management	10%			$952	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Technical Support	15%			$1,427	Middle value of the recommended range in EPA 540-R-00-002 was used.
TOTAL				$11,895	
TOTAL ANNUAL O&M COST				**$12,000**	Total capital cost is rounded to the nearest $1,000.

LONG-TERM MONITORING PERIODIC COSTS (Assumed to be Incurred Every Year During Year 1 through 10 and then Every 5 Year)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Long-Term Groundwater Monitoring					
GW Sampling and Analysis	1	EA	$6,906.00	$6,906	Includes GW sampling of 11 WMs and analysis
GW Sampling Report	1	LS	$6,844.00	$6,844	Includes GW sampling report
SUBTOTAL				$13,750	
Contingency (Scope and Bid)	30%			$4,125	20% Scope, 10% Bid (mid range of the recommended range in EPA 540-R-00-002).
SUBTOTAL				$17,875	
Project Management	10%			$1,788	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Technical Support	15%			$2,681	Middle value of the recommended range in EPA 540-R-00-002 was used.
TOTAL				$22,344	
TOTAL PERIODIC COST				**$22,000**	Total capital cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.
Remedial Design and Five Year Review costs were excluded from the cost estimate per EPA's direction.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:
BCY Bank Cubic Yard
CY Cubic Yard
ECY Embankment Cubic Yard
LCY Loose Cubic Yard
LS Lump Sum
MO Month
QTY Quantity
SF Square Feet
TON Ton
YR Year

Present Value and Cost Estimate Summary

Remedial Alternative 4

TABLE SPV-4

Alternative 4
Building Demolition, Excavation and Offsite Disposal

PRESENT VALUE ANALYSIS

Site: Unimatic Mfg. Corp. Superfund Site
Real Discount Rate: 7.00%
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016

Year[1]	Capital Costs[2] (Earthwork)	Capital Costs[2] (Institutional Controls)	Annual O&M Costs[2]	Periodic Costs[2]	Total Annual Expenditure[3]	Discount Factor	Present Value[4,5]
0	$18,087,000	$35,000	$0	$0	$18,122,000	1.0000	$18,122,000
1	$0	$0	$0	$0	$0	0.9346	$0
2	$0	$0	$0	$0	$0	0.8734	$0
3	$0	$0	$0	$0	$0	0.8163	$0
4	$0	$0	$0	$0	$0	0.7629	$0
5	$0	$0	$0	$0	$0	0.7130	$0
6	$0	$0	$0	$0	$0	0.6663	$0
7	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$0	0.5820	$0
9	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$0	0.5083	$0
11	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$0	0.3878	$0
15	$0	$0	$0	$0	$0	0.3624	$0
16	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$0	0.2959	$0
19	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	0.2584	$0
21	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$0	0.2257	$0
23	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	0.1842	$0
26	$0	$0	$0	$0	$0	0.1722	$0
27	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$0	0.1314	$0
TOTALS:	$18,087,000	$35,000	$0	$0	$18,122,000		$18,122,000
TOTAL PRESENT VALUE OF ALTERNATIVE 4							**$18,122,000**

Notes:
1 - Estimated remedial timeframes are discussed within the FS report.
2 - Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-4.
3 - Total annual expenditure is the total cost per year with no escalation or discounting.
4 - Present value is the total cost per year including a discount factor for that year. See Table SPV-ADRFT for details.
5 - Total present value is rounded up to the nearest $1,000. Depreciation is excluded from the present value cost.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.
They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-4

Alternative **4**

Building Demolition, Excavation and Offsite Disposal

COST ESTIMATE SUMMARY

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016
Date: July 2016

Description: Alternative 4 Building demolition and offsite disposal of debris; Excavation and soil cap within JCMUA pipeline easement; Excavation of contaminated soils exceeding the PRGs; Post excavation sampling; Backfill with imported clean fill; Offsite disposal; Deed notice. Under this alternative, contaminated soils exceeding the PRGs would be excavated. Dewatering would be necessary for excavation below the water table, sheet piling may be used along the eastern property boundary for excavation support. Water generated from dewatering of excavation areas would be treated onsite and discharged to the stormwater system. Post excavation samples would be collected as necessary to verify that the cleanup standards are met. The excavated area would be backfilled with imported clean fill. The ground surface would be restored to the original grade consistent with the surrounding areas.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Institutional Controls	1	LS	$16,347	$16,347	Includes cost for environmental lawyer for implementing ICs for the site
Community Awareness Activities	1	LS	$6,923	$6,923	Includes community awareness meetings
Deed Notice	1	LS	$8,613	$8,613	Includes preparation of deed notices for the site and JCMUA pipeline easement.
SUBTOTAL				$31,883	
Project Management	10%			$3,188	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL				$35,071	
TOTAL CAPITAL COST				**$35,000**	Total capital cost is rounded to the nearest $1,000.

EARTHWORK CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
General Conditions					
General Requirements	5	MO	$139,030.00	$695,152	Includes onsite staff, per diem, safety and health requirements, temporary facilities, air monitoring, and site security.
Project Planning, Documents, and Submittals	1	LS	$225,999.00	$225,999	Includes project deliverables
Surveying	1	LS	$44,730.00	$44,730	Includes surveying during construction
Mobilization	1	LS	$15,952	$15,952	
Sediment and Erosion Control					
Installation	1	LS	$2,370	$2,370	Includes installation of silt fence and hay bales.
Maintenance	1	LS	$9,665	$9,665	Includes maintenance of silt fence and hay bales for the duration of project.
Demolition of Structure					
Building Inspection	1	LS	$5,011	$5,011	Includes inspection of building prior to demolition for structural integrity.
Demolition	2,070	CY	$39.45	$81,671	Includes demolition of the building.
Transportation and Disposal - TSCA, Non-Haz	1,500	TON	$254.90	$382,347	Includes T&D of TSCA building demolition debris.
Transportation and Disposal - Non-Haz	2,400	TON	$142.00	$341,863	Includes T&D of Non-TSCA building demolition debris.
Excavation and Soil Cap within JCMUA Pipeline Easement					
Excavation	380	BCY	$3.48	$1,322	Includes excavation of contaminated soil within the JCMUA easement.
Transportation and Disposal - Non-Haz	720	TON	$134.95	$97,161	Includes T&D of Non-Haz/TSCA excavated soil.
Placement of Soil Cap	5,040	SF	$4.61	$23,246	Includes placement of clean backfill for soil cap and revegetation.
Excavation of Contaminated Soils					
Excavation Support Installation	41,300	SF	$40.27	$1,662,997	Includes installation of sheet piles for excavation support.
Contaminated Soils Excavation	26,000	BCY	$4.57	$118,800	Includes excavation of contaminated soils exceeding the PRGs
Dewatering and Water Treatment	5	MO	$91,455	$457,277	Includes dewatering and installation and O&M of portable water treatment system
Transportation and Disposal (T&D) of Contaminated Soils					
T&D of Hazardous and TSCA soil	1,400	TON	$813.96	$1,139,544	Includes T&D of Haz/TSCA excavated soil.
T&D of TSCA soil	12,600	TON	$245.26	$3,090,263	Includes T&D of TSCA excavated soil.
T&D of Non-Hazardous and Non-TSCA Soil	22,400	TON	$134.95	$3,022,790	Includes T&D of Non-Haz/TSCA excavated soil.
Post Excavation Sampling	88	EA	$230.39	$20,274	Includes post excavation sampling to verify that the objective of excavation.
Clean Backfill Placement	26,000	ECY	$38.66	$1,005,136	Includes placement of clean soil as excavation backfills.
Topsoil Placement and Revegetation	46,000	SF	$1.63	$74,750	Includes placement of topsoil and installation of vegetation.
Demobilization	1	LS	$15,952	$15,952	
SUBTOTAL				$12,534,272	

TABLE CS-4

Alternative **4**

Building Demolition, Excavation and Offsite Disposal

COST ESTIMATE SUMMARY

Site:	Unimatic Mfg. Corp. Superfund Site	Description:	Alternative 4 Building demolition and offsite disposal of debris; Excavation and soil cap within JCMUA pipeline easement; Excavation of contaminated soils exceeding the PRGs; Post excavation sampling; Backfill with imported clean fill; Offsite disposal; Deed notice. Under this alternative, contaminated soils exceeding the PRGs would be excavated. Dewatering would be necessary for excavation below the water table, sheet piling may be used along the eastern property boundary for excavation support. Water generated from dewatering of excavation areas would be treated onsite and discharged to the stormwater system. Post excavation samples would be collected as necessary to verify that the cleanup standards are met. The excavated area would be backfilled with imported clean fill. The ground surface would be restored to the original grade consistent with the surrounding areas.
Location:	Fairfield, New Jersey		
Phase:	Feasibility Study - Final		
Base Year:	2016		
Date:	July 2016		

Contingency (Scope and Bid)	30%	$3,760,282	20% Scope, 10% Bid (mid range of the recommended range in EPA 540-R-00-002).
SUBTOTAL		$16,294,554	
Project Management	5%	$814,728	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management	6%	$977,673	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL		$18,086,955	
TOTAL CAPITAL COST		**$18,087,000**	Total capital cost is rounded to the nearest $1,000.

Notes:

Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.
Remedial Design and Five Year Review costs were excluded from the cost estimate per EPA's direction.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

BCY Bank Cubic Yard
CY Cubic Yard
ECY Embankment Cubic Yard
LS Lump Sum
MO Month
QTY Quantity
SF Square Feet
TON Ton

Present Value and Cost Estimate Summary

Remedial Alternative 5

TABLE SPV-5

Alternative 5

Building Demolition and Offsite Disposal, Excavation, Onsite Treatment, and Backfill of Treated Material

PRESENT VALUE ANALYSIS

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016

Real Discount Rate: 7.00%

Year[1]	Capital Costs[2] (Earthwork)	Capital Costs[2] (Institutional Controls)	Annual O&M Costs[2]	Periodic Costs[2]	Total Annual Expenditure[3]	Discount Factor	Present Value[4,5]
0	$15,114,000	$35,000	$0	$0	$15,149,000	1.0000	$15,149,000
1	$0	$0	$0	$0	$0	0.9346	$0
2	$0	$0	$0	$0	$0	0.8734	$0
3	$0	$0	$0	$0	$0	0.8163	$0
4	$0	$0	$0	$0	$0	0.7629	$0
5	$0	$0	$0	$0	$0	0.7130	$0
6	$0	$0	$0	$0	$0	0.6663	$0
7	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$0	0.5820	$0
9	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$0	0.5083	$0
11	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$0	0.3878	$0
15	$0	$0	$0	$0	$0	0.3624	$0
16	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$0	0.2959	$0
19	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	0.2584	$0
21	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$0	0.2257	$0
23	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	0.1842	$0
26	$0	$0	$0	$0	$0	0.1722	$0
27	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$0	0.1314	$0
TOTALS:	$15,114,000	$35,000	$0	$0	$15,149,000		$15,149,000
TOTAL PRESENT VALUE OF ALTERNATIVE 5							**$15,149,000**

Notes:
1 - Estimated remedial timeframes are discussed within the FS report.
2 - Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-5.
3 - Total annual expenditure is the total cost per year with no escalation or discounting.
4 - Present value is the total cost per year including a discount factor for that year. See Table SPV-ADRFT for details.
5 - Total present value is rounded up to the nearest $1,000. Depreciation is excluded from the present value cost.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.
They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-5

Alternative 5

Building Demolition and Offsite Disposal, Excavation, Onsite Treatment, and Backfill of Treated Material

COST ESTIMATE SUMMARY

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016
Date: July 2016

Description: Alternative 5 Building demolition and offsite disposal of debris; Excavation and soil cap within JCMUA pipeline easement; Excavation of the contaminated soil exceeding the PRGs; Post excavation sampling; Treatment of excavated soils via LTTD; Backfill with treated soils and imported clean fill (if needed); Deed notice. Implementation of this alternative would be similar to Alternative 4, except that excavated soils would be treated onsite using low temperature thermal desorption systems. The treatment is expected to reduce contamination concentrations to meet the PRGs. Following treatment, soils would be backfilled onsite in accordance with EPA AOC and CAMU policy and NJDEP site remediation regulations and fill material guidance for Site Remediation Program (SRP) sites (NJDEP 2015), Additional imported clean fill would be brought onsite to complete the remedial action as necessary.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Institutional Controls	1	LS	$16,347	$16,347	Includes cost for environmental lawyer for implementing ICs for the site
Community Awareness Activities	1	LS	$6,923	$6,923	Includes community awareness meetings
Deed Notice	1	LS	$8,613	$8,613	Includes preparation of deed notices for the site and JCMUA pipeline easement.
SUBTOTAL				$31,883	
Project Management	10%			$3,188	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL				$35,071	
TOTAL CAPITAL COST				**$35,000**	Total capital cost is rounded to the nearest $1,000.

EARTHWORK CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
General Conditions					Includes onsite staff, per diem, safety and health requirements, temporary facilities, air monitoring, and site security.
For First 4 Months	4	MO	$139,031	$556,122	Assumes higher cost for initial site work and setup for LTTD process
For Next 9 Months	9	MO	$70,625	$635,628	Assumes reduced cost after LTTD process is operational
Project Planning, Documents, and Submittals	1	LS	$225,999.00	$225,999	Includes project deliverables
Surveying	1	LS	$116,296.00	$116,296	Includes surveying during construction
Mobilization	1	LS	$15,952	$15,952	
Sediment and Erosion Control					
Installation	1	LS	$2,370	$2,370	Includes installation of silt fence and hay bales.
Maintenance	1	LS	$9,665	$9,665	Includes maintenance of silt fence and hay bales for the duration of project.
Demolition of Structure					
Building Inspection	1	LS	$5,011	$5,011	Includes inspection of building prior to demolition for structural integrity.
Demolition	2,070	CY	$39.45	$81,671	Includes demolition of the building.
Transportation and Disposal - TSCA, Non-Haz	1,500	TON	$254.90	$382,347	Includes T&D of TSCA building demolition debris.
Transportation and Disposal - Non-Haz	2,400	TON	$142.00	$341,863	Includes T&D of Non-TSCA building demolition debris.
Excavation and Soil Cap within JCMUA Pipeline Easement					
Excavation	380	BCY	$3.48	$1,322	Includes excavation of contaminated soil within the JCMUA easement.
Transportation and Disposal - Non-Haz	720	TON	$134.95	$97,161	Includes T&D of Non-Haz/TSCA excavated soil.
Placement of Soil Cap	5,040	SF	$4.61	$23,246	Includes placement of clean backfill for soil cap and revegetation.
Excavation of Contaminated Soils					
Excavation Support Installation	41,300	SF	$40.27	$1,662,997	Includes installation of sheet piles for excavation support.
Contaminated Soils Excavation	26,000	BCY	$4.57	$118,800	Includes excavation of contaminated soils exceeding the PRGs
Dewatering and Water Treatment	13	MO	$53,136	$690,772	Includes dewatering and installation and O&M of portable water treatment system
Ex-Situ Thermal Treatment (LTTD)	31,200	LCY	$167.41	$5,223,114	includes onsite ex-situ LTTD of excavated contaminated soils
Post Excavation Sampling	88	EA	$230.39	$20,274	Includes post excavation sampling to verify that the objective of excavation.
Backfill using Treated Soil	26,000	ECY	$6.63	$172,363	Includes placement of treated soils as excavation backfill material.
Topsoil Placement and Revegetation	46,000	SF	$1.63	$74,750	Includes placement of topsoil and installation of vegetation.
Demobilization	1	LS	$15,952	$15,952	
SUBTOTAL				$10,473,675	

TABLE CS-5

Alternative **5**

Building Demolition and Offsite Disposal, Excavation, Onsite Treatment, and Backfill of Treated Material

COST ESTIMATE SUMMARY

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016
Date: July 2016

Description: Alternative 5 Building demolition and offsite disposal of debris; Excavation and soil cap within JCMUA pipeline easement; Excavation of the contaminated soil exceeding the PRGs; Post excavation sampling; Treatment of excavated soils via LTTD; Backfill with treated soils and imported clean fill (if needed); Deed notice. Implementation of this alternative would be similar to Alternative 4, except that excavated soils would be treated onsite using low temperature thermal desorption systems. The treatment is expected to reduce contamination concentrations to meet the PRGs. Following treatment, soils would be backfilled onsite in accordance with EPA AOC and CAMU policy and NJDEP site remediation regulations and fill material guidance for Site Remediation Program (SRP) sites (NJDEP 2015), Additional imported clean fill would be brought onsite to complete the remedial action as necessary.

Contingency (Scope and Bid)	30%	$3,142,103	20% Scope, 10% Bid (mid range of the recommended range in EPA 540-R-00-002).
SUBTOTAL		$13,615,778	
Project Management	5%	$680,789	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management	6%	$816,947	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL		$15,113,514	
TOTAL CAPITAL COST		**$15,114,000**	Total capital cost is rounded to the nearest $1,000.

Notes:

Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.
Remedial Design and Five Year Review costs were excluded from the cost estimate per EPA's direction.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

BCY Bank Cubic Yard
CY Cubic Yard
ECY Embankment Cubic Yard
LCY Loose Cubic Yard
LS Lump Sum
MO Month
QTY Quantity
SF Square Feet
TON Ton

Present Value and Cost Estimate Summary

Remedial Alternative 6

TABLE SPV-6

Alternative 6

Building Demolition, Targeted Excavation of Soils and Offsite Disposal

PRESENT VALUE ANALYSIS

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016

Real Discount Rate: **7.00%**

Year[1]	Capital Costs[2] (Earthwork)	Capital Costs[2] (Institutional Controls)	Annual O&M Costs[2]	Periodic Costs[2]	Total Annual Expenditure[3]	Discount Factor	Present Value[4,5]
0	$16,410,000	$35,000	$0	$0	$16,445,000	1.0000	$16,445,000
1	$0	$0	$0	$0	$0	0.9346	$0
2	$0	$0	$0	$0	$0	0.8734	$0
3	$0	$0	$0	$0	$0	0.8163	$0
4	$0	$0	$0	$0	$0	0.7629	$0
5	$0	$0	$0	$0	$0	0.7130	$0
6	$0	$0	$0	$0	$0	0.6663	$0
7	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$0	0.5820	$0
9	$0	$0	$0	$0	$0	0.5439	$0
10	$0	$0	$0	$0	$0	0.5083	$0
11	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$0	$0	0.3878	$0
15	$0	$0	$0	$0	$0	0.3624	$0
16	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$0	0.2959	$0
19	$0	$0	$0	$0	$0	0.2765	$0
20	$0	$0	$0	$0	$0	0.2584	$0
21	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$0	0.2257	$0
23	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$0	$0	0.1971	$0
25	$0	$0	$0	$0	$0	0.1842	$0
26	$0	$0	$0	$0	$0	0.1722	$0
27	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$0	$0	0.1406	$0
30	$0	$0	$0	$0	$0	0.1314	$0
TOTALS:	$16,410,000	$35,000	$0	$0	$16,445,000		$16,445,000
TOTAL PRESENT VALUE OF ALTERNATIVE 6							**$16,445,000**

Notes:

1 - Estimated remedial timeframes are discussed within the FS report.

2 - Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-6.

3 - Total annual expenditure is the total cost per year with no escalation or discounting.

4 - Present value is the total cost per year including a discount factor for that year. See Table SPV-ADRFT for details.

5 - Total present value is rounded up to the nearest $1,000. Depreciation is excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.
They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE CS-6

Alternative **6**

Building Demolition, Targeted Excavation of Soils and Offsite Disposal

COST ESTIMATE SUMMARY

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016
Date: July 2016

Description: Alternative 6 Building demolition and offsite disposal of debris; Excavation and soil cap within JCMUA pipeline easement; Excavation of contaminated soils with PCBs greater than 10 ppm; Post excavation sampling; Backfill with imported clean fill; Offsite disposal; Deed notice. Under this alternative, contaminated soils exceeding the PRGs would be excavated. Dewatering would be necessary for excavation below the water table, sheet piling may be used along the eastern property boundary for excavation support. Water generated from dewatering of excavation areas would be treated onsite and discharged to the stormwater system. Post excavation samples would be collected as necessary to verify that the cleanup standards are met. The excavated area would be backfilled with imported clean fill. The ground surface would be restored to the original grade consistent with the surrounding areas.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Institutional Controls	1	LS	$16,347	$16,347	Includes cost for environmental lawyer for implementing ICs for the site
Community Awareness Activities	1	LS	$6,923	$6,923	Includes community awareness meetings
Deed Notice	1	LS	$8,613	$8,613	Includes preparation of deed notices for the site and JCMUA pipeline easement.
SUBTOTAL				$31,883	
Project Management	10%			$3,188	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL				$35,071	
TOTAL CAPITAL COST				**$35,000**	Total capital cost is rounded to the nearest $1,000.

EARTHWORK CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
General Conditions					
General Requirements	5	MO	$139,030.00	$695,152	Includes onsite staff, per diem, safety and health requirements, temporary facilities, air monitoring, and site security.
Project Planning, Documents, and Submittals	1	LS	$225,999.00	$225,999	Includes project deliverables
Surveying	1	LS	$44,730.00	$44,730	Includes surveying during construction
Mobilization	1	LS	$15,952	$15,952	
Sediment and Erosion Control					
Installation	1	LS	$2,370	$2,370	Includes installation of silt fence and hay bales.
Maintenance	1	LS	$9,665	$9,665	Includes maintenance of silt fence and hay bales for the duration of project.
Demolition of Structure					
Building Inspection	1	LS	$5,011	$5,011	Includes inspection of building prior to demolition for structural integrity.
Demolition	2,070	CY	$39.45	$81,671	Includes demolition of the building.
Transportation and Disposal - TSCA, Non-Haz	1,500	TON	$254.90	$382,347	Includes T&D of TSCA building demolition debris.
Transportation and Disposal - Non-Haz	2,400	TON	$142.00	$341,863	Includes T&D of Non-TSCA building demolition debris.
Excavation and Soil Cap within JCMUA Pipeline Easement					
Excavation	380	BCY	$3.48	$1,322	Includes excavation of contaminated soil within the JCMUA easement.
Transportation and Disposal - Non-Haz	720	TON	$134.95	$97,161	Includes T&D of Non-Haz/TSCA excavated soil.
Placement of Soil Cap	5,040	SF	$4.61	$23,246	Includes placement of clean backfill for soil cap and revegetation.
Excavation of Contaminated Soils					
Excavation Support Installation	41,300	SF	$40.27	$1,662,997	Includes installation of sheet piles for excavation support.
Contaminated Soils Excavation	21,000	BCY	$4.51	$94,656	Includes excavation of contaminated soils exceeding the PRGs
Dewatering and Water Treatment	5	MO	$91,455	$457,277	Includes dewatering and installation and O&M of portable water treatment system
Transportation and Disposal (T&D) of Contaminated Soils					
T&D of Hazardous and TSCA soil	1,400	TON	$813.96	$1,139,544	Includes T&D of Haz/TSCA excavated soil.
T&D of TSCA soil	12,600	TON	$245.26	$3,090,263	Includes T&D of TSCA excavated soil.
T&D of Non-Hazardous and Non-TSCA Soil	22,400	TON	$92.78	$2,078,168	Includes T&D of Non-Haz/TSCA excavated soil.
Post Excavation Sampling	88	EA	$230.39	$20,274	Includes post excavation sampling to verify that the objective of excavation.
Clean Backfill Placement	21,000	ECY	$38.65	$811,575	Includes placement of clean soil as excavation backfills.
Topsoil Placement and Revegetation	46,000	SF	$1.63	$74,750	Includes placement of topsoil and installation of vegetation.
Demobilization	1	LS	$15,952	$15,952	
SUBTOTAL				$11,371,945	

TABLE CS-6

Alternative 6

Building Demolition, Targeted Excavation of Soils and Offsite Disposal

COST ESTIMATE SUMMARY

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016
Date: July 2016

Description: Alternative 6 Building demolition and offsite disposal of debris; Excavation and soil cap within JCMUA pipeline easement; Excavation of contaminated soils with PCBs greater than 10 ppm; Post excavation sampling; Backfill with imported clean fill; Offsite disposal; Deed notice. Under this alternative, contaminated soils exceeding the PRGs would be excavated. Dewatering would be necessary for excavation below the water table, sheet piling may be used along the eastern property boundary for excavation support. Water generated from dewatering of excavation areas would be treated onsite and discharged to the stormwater system. Post excavation samples would be collected as necessary to verify that the cleanup standards are met. The excavated area would be backfilled with imported clean fill. The ground surface would be restored to the original grade consistent with the surrounding areas.

Contingency (Scope and Bid)	30%	$3,411,584	20% Scope, 10% Bid (mid range of the recommended range in EPA 540-R-00-002).
SUBTOTAL		$14,783,529	
Project Management	5%	$739,176	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
Construction Management	6%	$887,012	Percentage from Exhibit 5-8 in EPA 540-R-00-002 was used.
TOTAL		$16,409,717	
TOTAL CAPITAL COST		**$16,410,000**	Total capital cost is rounded to the nearest $1,000.

Notes:
Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.
Remedial Design and Five Year Review costs were excluded from the cost estimate per EPA's direction.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:
BCY Bank Cubic Yard
CY Cubic Yard
ECY Embankment Cubic Yard
LS Lump Sum
MO Month
QTY Quantity
SF Square Feet
TON Ton

Detailed Cost Breakout

Standard Report Selections

Unimatic FS - Final

Fairfield, Essex County, New Jersey

Estimated by	CDM Federal Programs Corporation
Designed by	CDM Federal Programs Corporation
Prepared by	Abhay Sonawane
Preparation Date	7/15/2016
Effective Date of Pricing	7/15/2016
Estimated Construction Time	Days

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
ALT2 Alternative 2	**1.00**	**LS**	**8,929,713**	**726,023**	**9,665,842**
(Note: Building Demolition, Excavation to Water Table, Offsite Disposal, In Situ Solidification/Stabilization, and Capping)					
CC Capital Costs	**1.00**	**LS**	**8,914,799**	**719,946**	**9,644,772**
			169,670.73		*193,176.24*
01 General Conditions	**5.00**	**MO**	**848,354**	**113,679**	**965,881**
			122,113.33		*139,030.43*
USR GC General Conditions	5.00	MO	610,567	81,816	695,152
USR PD Project Planning, Documents, and Submittals	1.00	LS	198,500	26,599	225,999
USR SUR Surveying	1.00	LS	39,287	5,264	44,730
02 Institutional Controls	**1.00**	**LS**	**10,121**	**6,161**	**16,347**
			59.67		*97.16*
LGL L-ASP Environmental Lawyer	120.00	HR	7,161	4,451	11,659
			28.67		*46.68*
LGL L-LARE Paralegal	60.00	HR	1,720	1,069	2,801
			24.31		*39.58*
FOP FB-CLTYP Clerks, Typists, Bookkeepers & Receptionist	40.00	HR	972	604	1,583
USR REPRO-01-M Reproduction Costs for Institutional Controls	1.00	LS	268	36	305
(Note: Per Estimator)					
03 Community Awareness Activities	**1.00**	**LS**	**4,685**	**2,211**	**6,923**
(Note: Includes 1 community awareness meeting)					
			90.69		*147.66*
FOP FA-AGENS General Superintendents (P.M.)	16.00	HR	1,451	902	2,362
			120.84		*196.75*
FOP FA-PROJM Project Manager	16.00	HR	1,934	1,202	3,148
			200.00		*210.84*
USR TRAV-01-M Per Diem	4.00	DAY	800	40	843
(Note: Per Diem Rate 2016, Essex County, New Jersey)					
USR ALLOW-COMM Community Awareness Activities Allowance	1.00	LS	500	67	569
(Note: Per Estimator)					
04 Mobilization/Demobilization	**1.00**	**LS**	**14,011**	**1,878**	**15,952**
			1,120.83		*1,276.10*
USR MBDM-01 Tractor w/ Lowbed Trailer (Heavy Equipment)	3.00	EA	3,362	451	3,828
			1,086.35		*1,236.85*
USR MBDM-02 Tractor w/ Flatbed Trailer (Large Equipment)	5.00	EA	5,432	728	6,184
			983.41		*1,119.64*
USR MBDM-03 Tractor w/ Flatbed Trailer (Medium Equipment)	5.00	EA	4,917	659	5,598
			100.00		*113.85*
USR Heavy Equipment Permit	3.00	EA	300	40	342

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: **Per Estimator**)					
05 Sediment and Erosion Control	**1.00**	**LS**	**7,988**	**3,999**	**12,035**
Installation	**1.00**	**LS**	**1,786**	**575**	**2,370**
01 Labor	**1.00**	**LS**	**689**	**428**	**1,121**
			0.90		*1.46*
USR SLTFEN-L Silt Fence Installation - L	600.00	LF	539	335	878
(Note: Productivity: CostWorks 2016 - 312514161000)					
			0.75		*1.22*
USR HAYB-L Hay Bales Installation - L	200.00	LF	150	93	243
(Note: Synthetic erosion control, hay bales, staked. Productivity: CostWorks 2016 -312514161250)					
02 Equipment	**1.00**	**LS**	**57**	**8**	**65**
			0.07		*0.08*
USR SLTFEN-E Silt Fence Installation - E	600.00	LF	40	5	45
(Note: Productivity: CostWorks 2016 - 312514161000)					
			0.09		*0.10*
USR HAYB-E Hay Bales Installation - E	200.00	LF	17	2	20
(Note: Synthetic erosion control, hay bales, staked. Productivity: CostWorks 2016 -312514161250)					
03 Material	**1.00**	**LS**	**1,040**	**139**	**1,184**
			0.31		*0.35*
USR SLTFEN-M Silt Fence - M	600.00	LF	186	25	212
(Note: 3' high, polypropylene. Material Cost: CostWorks 2016 - 312514161000)					
			4.27		*4.86*
USR HAYB-M Hay Bales Installation - M	200.00	LF	854	114	972
(Note: Synthetic erosion control, hay bales, staked. Material Cost: CostWorks 2016 -312514161250)					
Maintenance	**1.00**	**LS**	**6,203**	**3,424**	**9,665**
			166.14		*270.49*
USR USR-LE-ES-001-L Inspection and maintenance of erosion and sediment control measures	32.00	HR	5,316	3,305	8,656
			22.68		*25.82*
USR U-LE-ES-001-E Inspection and maintenance of erosion and sediment control measures	32.00	HR	726	97	826
			1.61		*1.83*
USR U-MT-ES-002 Silt Fence - Erosion and sediment control maintenance allowance	100.00	LF	161	22	183
(Note: Assumes a percentage of original silt fence would require replacement.)					
06 Demolition of Structures	**1.00**	**LS**	**735,636**	**74,911**	**810,892**
01 Building Inspection	**1.00**	**LS**	**3,133**	**1,857**	**5,011**
(Note: Assumes 20 hours for structural integrity inspection of buildings.)					
13.01.01 Labor	**1.00**	**LS**	**2,948**	**1,833**	**4,800**

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			147.41		*240.00*
USR BUILD-INS-L Building Inspection - L	20.00	HR	2,948	1,833	4,800
13.01.02 Equipment	**1.00**	**LS**	**185**	**25**	**211**
			9.25		*10.53*
USR BUILD-INS-E Building Inspection - E	20.00	HR	185	25	211
			27.20		*39.45*
02 Demolition	**2,070.00**	**CY**	**56,303**	**25,043**	**81,671**
			17.34		*28.22*
USR SW-BLDG-DEM-L Building Demolition	2,070.00	CY	35,886	22,307	58,426
(Note: Productivity: CostWorks 2016 - 024116130600 and 024116130650 (average of concrete and masonry demolition productivities). Includes water truck for keeping all materials "adequately wet" per NESHAP.)					
			9.86		*11.23*
USR SW-BLDG-DEM-E Building Demolition	2,070.00	CY	20,417	2,736	23,245
(Note: Productivity: CostWorks 2016 - 024116130600 and 024116130650 (average of concrete and masonry demolition productivities). Includes water truck for keeping all materials "adequately wet" per NESHAP.)					
			173.38		*185.69*
03 Transportation and Disposal	**3,900.00**	**TON**	**676,200**	**48,010**	**724,210**
			238.00		*254.90*
USR DSPTSCA-D TSCA C&D - Trasportation and Disposal	1,500.00	TON	357,000	25,347	382,347
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			133.00		*142.44*
USR DSPNH-D Non-Hazardous C&D - Trasportation and Disposal	2,400.00	TON	319,200	22,663	341,863
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			22.01		*24.15*
07 Excavation and Soil Cap within JCMUA Pipeline Easement	**5,040.00**	**SF**	**110,920**	**10,779**	**121,729**
			2.38		*3.48*
01 Excavation	**380.00**	**BCY**	**905**	**411**	**1,322**
			1.57		*2.55*
USR EW-EXC-01A-L Shallow Excavation (0-10 ft)	380.00	BCY	595	370	969
(Note: Refer to Calculation Sheet PD-01A.)					
			0.82		*0.93*
USR EW-EXC-01A-E Shallow Excavation (0-10 ft)	380.00	BCY	310	42	353
(Note: Refer to Calculation Sheet PD-01A.)					
			126.00		*134.95*
02 Trasportation and Disposal	**720.00**	**TON**	**90,720**	**6,441**	**97,161**
			126.00		*134.95*
USR DSPNH-S Non-Hazardous Soil - Trasportation and Disposal	720.00	TON	90,720	6,441	97,161
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			3.83		*4.61*

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
03 Placement of Soil Cap	**5,040.00**	**SF**	**19,294**	**3,927**	**23,246**
			21.08		*23.90*
USR FILL-M Common Fill - M	510.00	LCY	10,750	1,441	12,191
(Note: CostWorks 2016 - 31 23 2315 4010)					
			30.50		*34.58*
USR TPSL-M Topsoil - M	140.00	LCY	4,269	572	4,841
(Note: **Vendor Quote, PC Sand and Gravel, 2015, includes delivery**)					
			0.09		*0.10*
USR SEED-M Seeding - M	5,040.00	SF	454	61	516
(Note: **Previous Work/Estimate**)					
			3.26		*5.31*
USR CMP-L Backfill and Compaction - L	380.00	ECY	1,238	770	2,016
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					
			8.17		*13.31*
USR TSLPL-L Topsoil Placement - L	140.00	LCY	1,144	711	1,863
			73.00		*118.85*
USR SEED-L Seeding - L	5.04	MSF	368	229	599
(Note: Seeding athletic fields, seeding rye, annual, 10 lb. per M.S.F., push spreader Productivity: CostWorks 2016 - 329219143300)					
			5.20		*5.92*
USR TSLPL-E Topsoil Placement - E	140.00	LCY	728	98	828
			0.90		*1.03*
USR CMP-E Backfill and Compaction - E	380.00	ECY	343	46	390
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					
			87.60		*91.94*
08 Excavation of Contaminated Soils	**10,000.00**	**BCY**	**876,003**	**39,701**	**919,367**
			38.93		*40.27*
01 Excavation Support Installation	**21,700.00**	**SF**	**844,785**	**25,512**	**873,778**
01 Labor	**1.00**	**LS**	**131,698**	**3,977**	**136,218**
			6.07		*6.28*
USR SHT-L Sheet piling, steel, 27 psf, 30' deep - L	21,700.00	SF	131,698	3,977	136,218
(Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Productivity: CostWorks 2016 - 314116101500)					
02 Equipment	**1.00**	**LS**	**38,806**	**1,172**	**40,138**
			1.79		*1.85*
USR SHT-E Sheet piling, steel, 27 psf, 30' deep - E	21,700.00	SF	38,806	1,172	40,138
(Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Productivity: CostWorks 2016 - 314116101500)					
03 Material	**1.00**	**LS**	**674,280**	**20,363**	**697,422**
			31.07		*32.14*
USR SHT-M Sheet piling, steel, 27 psf, 30' deep - M	21,700.00	SF	674,280	20,363	697,422
(Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Material Cost: CostWorks 2016 - 314116101500)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			3.12		*4.56*
02 Contaminated Soils Excavation	**10,000.00**	**BCY**	**31,218**	**14,189**	**45,588**
01 Labor	**1.00**	**LS**	**20,519**	**12,755**	**33,406**
			1.57		*2.55*
USR EW-EXC-01A-L Shallow Excavation (0-10 ft) (Note: Refer to Calculation Sheet PD-01A.)	2,000.00	BCY	3,131	1,947	5,098
			2.17		*3.54*
USR EW-EXC-01B-L Deep Excavation (>10 ft) (Note: Refer to Calculation Sheet PD-01B.)	8,000.00	BCY	17,387	10,808	28,308
02 Equipment	**1.00**	**LS**	**10,700**	**1,434**	**12,182**
			0.82		*0.93*
USR EW-EXC-01A-E Shallow Excavation (0-10 ft) (Note: Refer to Calculation Sheet PD-01A.)	2,000.00	BCY	1,633	219	1,859
			1.13		*1.29*
USR EW-EXC-01B-E Deep Excavation (>10 ft) (Note: Refer to Calculation Sheet PD-01B.)	8,000.00	BCY	9,067	1,215	10,323
			246.08		*263.55*
09 Transportation and Disposal of Contaminated Soils	**18,200.00**	**TON**	**4,478,600**	**317,981**	**4,796,581**
			760.00		*813.96*
USR DSPHAZ RCRA/TSCA Soil - Trasportation and Disposal (Note: Vendor Quote: Sea Coast, Apr 07 2016)	1,400.00	TON	1,064,000	75,544	1,139,544
			229.00		*245.26*
USR DSPTSCA-S TSCA Soil - Trasportation and Disposal (Note: Vendor Quote: Sea Coast, Apr 07 2016)	12,600.00	TON	2,885,400	204,863	3,090,263
			126.00		*134.95*
USR DSPNH-S Non-Hazardous Soil - Trasportation and Disposal (Note: Vendor Quote: Sea Coast, Apr 07 2016)	4,200.00	TON	529,200	37,573	566,773
			196.71		*231.09*
10 Post Excavation Sampling	**52.00**	**EA**	**10,229**	**1,782**	**12,017**
01 Labor (Note: Assume a crew of 2)	**1.00**	**LS**	**843**	**524**	**1,373**
			42.17		*68.66*
FOP FC-FLDER Field Engineer (Note: Rates are based on the Kearny, New Jersey area. Source: FLCdatacenter.com.)	20.00	HR	843	524	1,373
02 Material	**1.00**	**LS**	**9,386**	**1,258**	**10,643**
			65.00		*73.71*
USR LAB8082 Polychlorinated Biphenyls (PCBs) (soil/solid) (Note: Vendor Quote, Pace Analytical, April 12 2016)	52.00	EA	3,380	453	3,833
			105.00		*119.07*

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
USR LAB8081 Pesticides, Organochlorine (GC) (Soil) (Note: Vendor Quote, Pace Analytical, April 12 2016)	52.00	EA	5,460	732	6,192
			5.35		*6.07*
USR SHP-M Shipping Allowance, per Sample - M (Note: **Per Estimator**)	52.00	EA	278	37	315
USR SUPL-M Miscellaneous Sampling Supplies (Note: **Per Estimator** Includes paper towels, ziploc bags, and disposable gloves)	1.00	LS	268	36	303
			6.13		*9.18*
11 Consolidation of Contaminated Soil within Excavated Areas	**8,000.00**	**BCY**	**49,018**	**24,118**	**73,429**
01 Labor	**1.00**	**LS**	**35,991**	**22,373**	**58,597**
			1.57		*2.55*
USR EW-EXC-01A-L Shallow Excavation (0-10 ft) (Note: Refer to Calculation Sheet PD-01A.)	8,000.00	BCY	12,526	7,786	20,394
			3.26		*5.31*
USR CMP-L Backfill and Compaction - L (Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)	7,200.00	ECY	23,465	14,586	38,204
02 Equipment	**1.00**	**LS**	**13,027**	**1,746**	**14,832**
			0.82		*0.93*
USR EW-EXC-01A-E Shallow Excavation (0-10 ft) (Note: Refer to Calculation Sheet PD-01A.)	8,000.00	BCY	6,532	875	7,437
			0.90		*1.03*
USR CMP-E Backfill and Compaction - E (Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)	7,200.00	ECY	6,495	870	7,395
12 In situ solidification and stabilization (ISS)	**1.00**	**LS**	**1,385,000**	**41,827**	**1,426,827**
USR ISSPILT In-Situ Solidification and Stabilization (ISS) - Bench Scale Study (Note: Vendor Quote, Geo-Solutions, April 07 2016)	1.00	LS	35,000	1,057	36,057
USR ISSPAR In-Situ Solidification and Stabilization (ISS) (Note: Vendor Quote, Geo-Solutions, April 07 2016)	1.00	LS	1,350,000	40,770	1,390,770
			33.36		*39.57*
13 Clean Backfill and Placement of Soil Cap	**8,000.00**	**ECY**	**266,847**	**48,471**	**316,553**
01 Labor	**1.00**	**LS**	**26,072**	**16,207**	**42,448**
			3.26		*5.31*
USR CMP-L Backfill and Compaction - L (Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)	8,000.00	ECY	26,072	16,207	42,448
02 Equipment	**1.00**	**LS**	**7,217**	**967**	**8,216**
			0.90		*1.03*
USR CMP-E Backfill and Compaction - E (Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)	8,000.00	ECY	7,217	967	8,216

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
03 Material	**1.00**	**LS**	**233,558**	**31,297**	**265,889**
			21.08		*24.00*
USR FILL-M Common Fill - M	10,700.00	LCY	225,545	30,223	256,791
(Note: CostWorks 2016 - 31 23 2315 4010)					
			797.15		*907.58*
USR LAB-TCLP TCLP Full Analytical Suite	3.00	EA	2,391	320	2,723
(Note: Lab analysis cost based on previous work.)					
			65.00		*73.71*
USR LAB8082 Polychlorinated Biphenyls (PCBs) (soil/solid)	3.00	EA	195	26	221
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			105.00		*119.07*
USR LAB8081 Pesticides, Organochlorine (GC) (Soil)	3.00	EA	315	42	357
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			0.11		*0.13*
USR MRKLYR Marker Barrier Layer	46,000.00	SF	5,111	685	5,796
(Note: **Vendor Quote, US Fabrics, 04/2016** US 160NW-HVO Warning Barrier (Orange Nonwoven Geotextile))					
			1.31		*1.63*
14 Topsoil Placement and Revegetation	**46,000.00**	**SF**	**60,138**	**14,479**	**74,750**
(Note: Includes 6" of topsoil with seeding for surface restoration.)					
01 Labor	**1.00**	**LS**	**13,167**	**8,185**	**21,438**
			8.17		*13.31*
USR TSLPL-L Topsoil Placement - L	1,200.00	LCY	9,810	6,098	15,971
			73.00		*118.85*
USR SEED-L Seeding - L	46.00	MSF	3,358	2,087	5,467
(Note: Seeding athletic fields, seeding rye, annual, 10 lb. per M.S.F., push spreader Productivity: CostWorks 2016 - 329219143300)					
02 Equipment	**1.00**	**LS**	**6,237**	**836**	**7,101**
			5.20		*5.92*
USR TSLPL-E Topsoil Placement - E	1,200.00	LCY	6,237	836	7,101
03 Material	**1.00**	**LS**	**40,734**	**5,458**	**46,211**
			30.50		*34.58*
USR TPSL-M Topsoil - M	1,200.00	LCY	36,594	4,904	41,498
(Note: **Vendor Quote, PC Sand and Gravel, 2015, includes delivery**)					
			0.09		*0.10*
USR SEED-M Seeding - M	46,000.00	SF	4,140	555	4,714
(Note: **Previous Work/Estimate**)					
15 Deed Notice	**1.00**	**LS**	**5,593**	**2,989**	**8,613**
			59.67		*97.16*
LGL L-ASP Environmental Lawyer	40.00	HR	2,387	1,484	3,886

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			28.67		*46.68*
LGL L-LARE Paralegal	60.00	HR	1,720	1,069	2,801
			24.31		*39.58*
FOP FB-CLTYP Clerks, Typists, Bookkeepers & Receptionist	20.00	HR	486	302	792
USR Miscellaneous Allowance (Note: **Per Estimator**)	1.00	LS	1,000	134	1,134
			19.41		*22.01*
16 Chain Link Fence	**1,030.00**	**LF**	**19,990**	**2,679**	**22,668**
			18.85		*21.38*
USR CLF6-F Chain Link Fence, 6' High (Note: Cost Works 2016 - 32 31 1325 0100)	1,030.00	LF	19,416	2,602	22,017
			287.00		*325.46*
USR CLF6-G Chain Link Fence Gate, 6' High (Note: Cost Works 2016 - 32 31 1325 0190)	2.00	EA	574	77	651
			669.74		*824.30*
17 Monitoring Well Abandonment	**11.00**	**EA**	**7,367**	**1,664**	**9,067**
			1,112.50		*1,266.62*
01 Mobilization/Demobilization (Note: Refer to Calculations QTO-03)	**2.00**	**EA**	**2,225**	**298**	**2,533**
			1,112.50		*1,266.62*
USR USR-WI-800-V Mobilization or Demobilization (Note: Based on previous work.)	2.00	EA	2,225	298	2,533
			12.96		*15.66*
02 Well Abandonment	**310.00**	**VLF**	**4,019**	**818**	**4,856**
L Labor	**1.00**	**LS**	**797**	**495**	**1,298**
			2.57		*4.19*
USR USR-WI-010-E Well Abandonment, 2" Well	310.00	VLF	797	495	1,298
E Equipment	**1.00**	**LS**	**1,183**	**159**	**1,347**
			3.82		*4.35*
USR USR-WI-010-L Well Abandonment, 2" Well	310.00	VLF	1,183	159	1,347
M Materials	**161.00**	**LS**	**738**	**99**	**841**
			24.61		*28.02*
USR USR-WI-010-M Cement-grout mixture (Note: Cost Source - CostWorks 2016 - 31 43 1313 0200.)	30.00	CF	738	99	841
O Other	**1.00**	**LS**	**1,300**	**65**	**1,370**
			100.00		*105.42*
USR USR-WI-020-O Administration (Note: Per estimator.)	11.00	EA	1,100	55	1,160

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			200.00		*210.84*
USR TRAV-01-M Per Diem	1.00	DAY	200	10	211
(Note: Per Diem Rate 2016, Essex County, New Jersey)					
03 Oversight	**1.00**	**LS**	**1,123**	**548**	**1,678**
(Note: Assumes oversight of well abandonment crew.)					
L Labor	**1.00**	**LS**	**849**	**528**	**1,383**
			70.79		*115.26*
FOP FC-ENGPE Engineers, Project	12.00	HR	849	528	1,383
(Note: Rates are based on FLCdatacenter.com for the project area.)					
E Equipment	**1.00**	**LS**	**74**	**10**	**84**
			73.99		*84.24*
USR USR-BI-900-E Geologist/Engineer - Oversight	1.00	DAY	74	10	84
(Note: .)					
O Other	**1.00**	**LS**	**200**	**10**	**211**
			200.00		*210.84*
USR TRAV-01-M Per Diem	1.00	DAY	200	10	211
(Note: Per Diem Rate 2016, Essex County, New Jersey)					
			2,209.04		*3,194.66*
18 Monitoring Well Installation and Development	**11.00**	**EA**	**24,299**	**10,638**	**35,141**
(Note: Includes installation and development of 11 monitoring wells following remedial activities.)					
46.01 Labor	**1.00**	**LS**	**15,138**	**9,410**	**24,646**
			39.13		*63.70*
USR WLLDR-L Well Drilling - 4" Monitoring Well - L	310.00	LF	12,129	7,540	19,748
(Note: Monitoring well construction, drilling, hollow stem auger, normal soil, 4" or less casing/screen, 6-5/8" ID x 11" OD auger. Productivity: MII English Cost Book 2016 - 023223135113)					
			12.17		*19.81*
USR WLLC-L Concrete, hand mix - L	11.00	CF	134	83	218
(Note: Concrete, hand mix, for small quantities or remote areas, using pre-bagged dry mix and wheelbarrow. Cost Source: Means CostWorks 2016 - 033113250340)					
			3.68		*5.99*
USR WLLF-L Concrete, forms - L	110.00	LF	405	252	659
(Note: C.I.P. concrete forms, slab on grade, bulkhead with keyway, wood, 6" high, 4 uses, includes erecting, bracing, stripping and cleaning. Cost Source: Means CostWorks 2016 - 031113651100)					
			56.14		*91.40*
USR WLLDVP-L Well Development - L	44.00	HR	2,470	1,536	4,022
(Note: Assume 4 hr/monitoring well)					
46.02 Equipment	**1.00**	**LS**	**3,539**	**474**	**4,030**
			11.42		*13.00*
USR WLLDR-E Well Drilling - 4" Monitoring Well - E	310.00	LF	3,539	474	4,030
(Note: Monitoring well construction, drilling, hollow stem auger, normal soil, 4" or less casing/screen, 6-5/8" ID x 11" OD auger. Productivity: MII English Cost Book 2016 - 023223135113)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
46.03 Material	**1.00**	**LS**	**5,622**	**753**	**6,465**
			8.03		*9.25*
USR WLLCS-M 4" PVC Well Casing - M	200.00	LF	1,605	215	1,849
(Note: Vendor Quote - Dean Bennett Supply, 2015)					
			10.38		*11.96*
USR WLLSC-M 4" PVC Well Screen - M	110.00	LF	1,142	153	1,315
(Note: Vendor Quote - Dean Bennett Supply, 2015)					
			11.07		*12.61*
USR WLLGT-M Cement-grout mixture - M	33.00	CF	365	49	416
(Note: Material Cost: CostWorks 2016 - 314313130320)					
			435.99		*496.39*
USR WLLPK-M Sand/Filter Pack - M	1.10	CY	480	64	546
(Note: Material Cost: MII English Cost Book 2012 (escalated to 2Q2016) - 023223136111)					
			162.64		*187.38*
USR WLLCSG-M Protective enclosures, hinged lid, lockable, 6" x 3' - M	11.00	EA	1,789	240	2,061
(Note: Vendor Quote - Dean Bennett Supply, 2015)					
			17.92		*20.65*
USR WLLPLG-M Monitoring well fittings, J-Plugs, 4"	11.00	EA	197	26	227
(Note: Vendor Quote - Dean Bennett Supply, 2015)					
			7.17		*8.16*
USR WLLC-M Concrete, hand mix - M	1.30	CF	9	1	11
(Note: Concrete, hand mix, for small quantities or remote areas, using pre-bagged dry mix and wheelbarrow. Cost Source: Means CostWorks 2016 - 033113250340)					
			0.35		*0.40*
USR WLLF-M Concrete, forms - M	99.00	LF	35	5	40
(Note: C.I.P. concrete forms, slab on grade, bulkhead with keyway, wood, 6" high, 4 uses, includes erecting, bracing, stripping and cleaning. Cost Source: Means CostWorks 2016 - 031113651100)					
OM Annual O&M Costs	**1.00**	**LS**	**5,100**	**2,195**	**7,320**
			4,484.66		*6,619.45*
01 Cap/Backfill Maintenance	**1.00**	**YR**	**4,485**	**2,113**	**6,619**
01 Labor	**1.00**	**LS**	**3,101**	**1,927**	**5,048**
			775.19		*1,262.09*
USR OM-CREW-L Backfill/Cover O&M	4.00	DAY	3,101	1,927	5,048
(Note: Assumes 1 day per maintenance event, 4 events yearly.)					
02 Equipment	**1.00**	**LS**	**384**	**51**	**437**
			95.98		*109.28*
USR OM-CREW-E Backfill/Cover O&M	4.00	DAY	384	51	437
(Note: Assumes 1 day per maintenance event, 4 events yearly.)					
03 Material	**1.00**	**LS**	**1,000**	**134**	**1,134**
USR OM-ALLOW Backfill/Cover Allowance	1.00	LS	1,000	134	1,134
(Note: Per Estimator. $250/O&M Event.)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
02 Chain Link Fence	**1.00**	**LS**	**616**	**82**	**701**
			5.78		*6.58*
USR CLF6-M Maintenance, Chain Link Fence, 6' High (Note: Cost Works 2016 - 32 31 1325 0100)	20.00	LF	116	15	132
USR Maintenance Allowance	1.00	LS	500	67	569
<u>PC Periodic Costs</u>	**1.00**	**LS**	**9,814**	**3,881**	**13,750**
			9,813.85		*13,749.55*
03 Long-Term Groundwater Monitoring	**1.00**	**EA**	**9,814**	**3,881**	**13,750**
			5,610.30		*6,905.72*
03-1 GW Monitoring	**1.00**	**EA**	**5,610**	**1,268**	**6,906**
01 Labor	**1.00**	**LS**	**2,465**	**846**	**3,325**
			42.17		*68.66*
FOP FC-FLDER Field Engineer (Note: Assume crew of 3 for 2 days.)	30.00	HR	1,265	786	2,060
			200.00		*210.84*
USR TRAV-01-M Per Diem (Note: Per Diem Rate 2016, Essex County, New Jersey)	6.00	DAY	1,200	60	1,265
02 Equipment	**1.00**	**LS**	**385**	**52**	**439**
			96.30		*109.64*
USR TRAV-02-M Daily Pickup Truck Rental (Note: Daily Rental Rate. Vendor Quote: Enterprise, 2015. Assume 2 trucks)	4.00	DAY	385	52	439
03 Material	**1.00**	**LS**	**2,760**	**370**	**3,142**
			368.08		*419.07*
USR Flow-Through Cell (Note: Professional XP MPT 9500, w/Quick-Connect **Previous Work**)	1.00	DAY	368	49	419
			10.70		*12.18*
USR Auto Calibration Solution (Note: 2 pk, **Previous Work**)	1.00	DAY	11	1	12
			32.10		*36.55*
USR Portable Bladder Pump (Note: **Previous Work**)	1.00	DAY	32	4	37
			8.56		*9.75*
USR Disposable Poly Bladder for Pump (Note: **Previous Work**)	2.00	EA	17	2	19
			48.15		*54.82*
USR Pump Controller, QED (Note: **Previous Work**)	1.00	DAY	48	6	55
			16.05		*18.27*
USR Compressor for Pump, QED	1.00	DAY	16	2	18

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: **Previous Work**)					
			17.12		*19.49*
USR Turbidity Meter	1.00	DAY	17	2	19
(Note: LaMotte 2020, w/Cal Std **Previous Work**)					
			12.84		*14.62*
USR Water Level Meter	1.00	DAY	13	2	15
(Note: 200' **Previous Work**)					
			53.50		*60.91*
USR PID	1.00	DAY	54	7	61
(Note: With Isobutylene Cal Std **Previous Work**)					
			481.50		*548.21*
USR Poly Tubing	1.00	EA	482	65	548
(Note: 500' Roll of Single and Combination Tubing **Previous Work**)					
			50.38		*57.36*
USR LABCW9 Organochlorine PCBs	13.00	EA	655	88	746
(Note: Vendor Quote GSA Test America 2016)					
			80.60		*91.77*
USR LABCW10 Organochlorine Pesticides	13.00	EA	1,048	140	1,193
(Note: Vendor Quote GSA Test America 2016)					
03-2 GW Sampling Report	**1.00**	**LS**	**4,204**	**2,613**	**6,844**
(Note: 1 Report per event)					
			93.41		*152.08*
USR Project Manager	8.00	HR	747	465	1,217
			72.67		*118.31*
USR Quality Control Engineer	4.00	HR	291	181	473
			62.62		*101.96*
USR Hydrogeologist	40.00	HR	2,505	1,557	4,078
			47.29		*76.99*
USR Draftsman	8.00	HR	378	235	616
			35.31		*57.48*
USR Adminstrative Clerk	8.00	HR	282	176	460

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
ALT3 Alternative 3 (Note: Building Demolition and Offsite Disposal, In Situ Solidification/Stabilization and Capping)	**1.00**	**LS**	**3,923,523**	**308,887**	**4,245,761**
CC Capital Costs	**1.00**	**LS**	**3,908,609**	**302,811**	**4,224,691**
01 General Conditions	**4.00**	**MO**	*179,595.58* **718,382**	**96,263**	*204,476.04* **817,904**
USR GC General Conditions	4.00	MO	*122,113.33* 488,453	65,453	*139,030.43* 556,122
USR PD Project Planning, Documents, and Submittals	1.00	LS	198,500	26,599	225,999
USR SUR Surveying	1.00	LS	31,429	4,211	35,783
02 Institutional Controls	**1.00**	**LS**	**10,121**	**6,161**	**16,347**
LGL L-ASP Environmental Lawyer	120.00	HR	*59.67* 7,161	4,451	*97.16* 11,659
LGL L-LARE Paralegal	60.00	HR	*28.67* 1,720	1,069	*46.68* 2,801
FOP FB-CLTYP Clerks, Typists, Bookkeepers & Receptionist	40.00	HR	*24.31* 972	604	*39.58* 1,583
USR REPRO-01-M Reproduction Costs for Institutional Controls (Note: Per Estimator)	1.00	LS	268	36	305
03 Community Awareness Activities (Note: Includes 1 community awareness meeting)	**1.00**	**LS**	**4,685**	**2,211**	**6,923**
FOP FA-AGENS General Superintendents (P.M.)	16.00	HR	*90.69* 1,451	902	*147.66* 2,362
FOP FA-PROJM Project Manager	16.00	HR	*120.84* 1,934	1,202	*196.75* 3,148
USR TRAV-01-M Per Diem (Note: Per Diem Rate 2016, Essex County, New Jersey)	4.00	DAY	*200.00* 800	40	*210.84* 843
USR ALLOW-COMM Community Awareness Activities Allowance (Note: Per Estimator)	1.00	LS	500	67	569
04 Mobilization/Demobilization	**1.00**	**LS**	**14,011**	**1,878**	**15,952**
USR MBDM-01 Tractor w/ Lowbed Trailer (Heavy Equipment)	3.00	EA	*1,120.83* 3,362	451	*1,276.10* 3,828
USR MBDM-02 Tractor w/ Flatbed Trailer (Large Equipment)	5.00	EA	*1,086.35* 5,432	728	*1,236.85* 6,184
USR MBDM-03 Tractor w/ Flatbed Trailer (Medium Equipment)	5.00	EA	*983.41* 4,917	659	*1,119.64* 5,598
USR Heavy Equipment Permit	3.00	EA	*100.00* 300	40	*113.85* 342

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: **Per Estimator**)					
05 Sediment and Erosion Control	**1.00**	**LS**	**7,988**	**3,999**	**12,035**
Installation	**1.00**	**LS**	**1,786**	**575**	**2,370**
01 Labor	**1.00**	**LS**	**689**	**428**	**1,121**
			0.90		*1.46*
USR SLTFEN-L Silt Fence Installation - L	600.00	LF	539	335	878
(Note: Productivity: CostWorks 2016 - 312514161000)					
			0.75		*1.22*
USR HAYB-L Hay Bales Installation - L	200.00	LF	150	93	243
(Note: Synthetic erosion control, hay bales, staked. Productivity: CostWorks 2016 -312514161250)					
02 Equipment	**1.00**	**LS**	**57**	**8**	**65**
			0.07		*0.08*
USR SLTFEN-E Silt Fence Installation - E	600.00	LF	40	5	45
(Note: Productivity: CostWorks 2016 - 312514161000)					
			0.09		*0.10*
USR HAYB-E Hay Bales Installation - E	200.00	LF	17	2	20
(Note: Synthetic erosion control, hay bales, staked. Productivity: CostWorks 2016 -312514161250)					
03 Material	**1.00**	**LS**	**1,040**	**139**	**1,184**
			0.31		*0.35*
USR SLTFEN-M Silt Fence - M	600.00	LF	186	25	212
(Note: 3' high, polypropylene. Material Cost: CostWorks 2016 - 312514161000)					
			4.27		*4.86*
USR HAYB-M Hay Bales Installation - M	200.00	LF	854	114	972
(Note: Synthetic erosion control, hay bales, staked. Material Cost: CostWorks 2016 -312514161250)					
Maintenance	**1.00**	**LS**	**6,203**	**3,424**	**9,665**
			166.14		*270.49*
USR USR-LE-ES-001-L Inspection and maintenance of erosion and sediment control measures	32.00	HR	5,316	3,305	8,656
			22.68		*25.82*
USR U-LE-ES-001-E Inspection and maintenance of erosion and sediment control measures	32.00	HR	726	97	826
			1.61		*1.83*
USR U-MT-ES-002 Silt Fence - Erosion and sediment control maintenance allowance	100.00	LF	161	22	183
(Note: Assumes a percentage of original silt fence would require replacement.)					
06 Demolition of Structures	**1.00**	**LS**	**735,636**	**74,911**	**810,892**
01 Building Inspection	**1.00**	**LS**	**3,133**	**1,857**	**5,011**
(Note: Assumes 20 hours for structural integrity inspection of buildings.)					
13.01.01 Labor	**1.00**	**LS**	**2,948**	**1,833**	**4,800**

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			147.41		*240.00*
USR BUILD-INS-L Building Inspection - L	20.00	HR	2,948	1,833	4,800
13.01.02 Equipment	**1.00**	**LS**	**185**	**25**	**211**
			9.25		*10.53*
USR BUILD-INS-E Building Inspection - E	20.00	HR	185	25	211
			27.20		*39.45*
02 Demolition	**2,070.00**	**CY**	**56,303**	**25,043**	**81,671**
			17.34		*28.22*
USR SW-BLDG-DEM-L Building Demolition	2,070.00	CY	35,886	22,307	58,426
(Note: Productivity: CostWorks 2016 - 024116130600 and 024116130650 (average of concrete and masonry demolition productivities). Includes water truck for keeping all materials "adequately wet" per NESHAP.)					
			9.86		*11.23*
USR SW-BLDG-DEM-E Building Demolition	2,070.00	CY	20,417	2,736	23,245
(Note: Productivity: CostWorks 2016 - 024116130600 and 024116130650 (average of concrete and masonry demolition productivities). Includes water truck for keeping all materials "adequately wet" per NESHAP.)					
			173.38		*185.69*
03 Transportation and Disposal	**3,900.00**	**TON**	**676,200**	**48,010**	**724,210**
			238.00		*254.90*
USR DSPTSCA-D TSCA C&D - Trasportation and Disposal	1,500.00	TON	357,000	25,347	382,347
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			133.00		*142.44*
USR DSPNH-D Non-Hazardous C&D - Trasportation and Disposal	2,400.00	TON	319,200	22,663	341,863
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			22.01		*24.15*
07 Excavation and Soil Cap within JCMUA Pipeline Easement	**5,040.00**	**SF**	**110,920**	**10,779**	**121,729**
			2.38		*3.48*
01 Excavation	**380.00**	**BCY**	**905**	**411**	**1,322**
			1.57		*2.55*
USR EW-EXC-01A-L Shallow Excavation (0-10 ft)	380.00	BCY	595	370	969
(Note: Refer to Calculation Sheet PD-01A.)					
			0.82		*0.93*
USR EW-EXC-01A-E Shallow Excavation (0-10 ft)	380.00	BCY	310	42	353
(Note: Refer to Calculation Sheet PD-01A.)					
			126.00		*134.95*
02 Trasportation and Disposal	**720.00**	**TON**	**90,720**	**6,441**	**97,161**
			126.00		*134.95*
USR DSPNH-S Non-Hazardous Soil - Trasportation and Disposal	720.00	TON	90,720	6,441	97,161
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			3.83		*4.61*

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
03 Placement of Soil Cap	**5,040.00**	**SF**	**19,294**	**3,927**	**23,246**
			21.08		*23.90*
USR FILL-M Common Fill - M	510.00	LCY	10,750	1,441	12,191
(Note: CostWorks 2016 - 31 23 2315 4010)					
			30.50		*34.58*
USR TPSL-M Topsoil - M	140.00	LCY	4,269	572	4,841
(Note: **Vendor Quote, PC Sand and Gravel, 2015, includes delivery**)					
			0.09		*0.10*
USR SEED-M Seeding - M	5,040.00	SF	454	61	516
(Note: **Previous Work/Estimate**)					
			3.26		*5.31*
USR CMP-L Backfill and Compaction - L	380.00	ECY	1,238	770	2,016
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					
			8.17		*13.31*
USR TSLPL-L Topsoil Placement - L	140.00	LCY	1,144	711	1,863
			73.00		*118.85*
USR SEED-L Seeding - L	5.04	MSF	368	229	599
(Note: Seeding athletic fields, seeding rye, annual, 10 lb. per M.S.F., push spreader Productivity: CostWorks 2016 - 329219143300)					
			5.20		*5.92*
USR TSLPL-E Topsoil Placement - E	140.00	LCY	728	98	828
			0.90		*1.03*
USR CMP-E Backfill and Compaction - E	380.00	ECY	343	46	390
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					
08 In situ solidification and stabilization (ISS)	**1.00**	**LS**	**2,135,000**	**64,477**	**2,208,275**
USR ISSPILT In-Situ Solidification and Stabilization (ISS) - Bench Scale Study	1.00	LS	35,000	1,057	36,201
(Note: Vendor Quote, Geo-Solutions, April 07 2016)					
USR ISSFULL In-Situ Solidification and Stabilization (ISS)	1.00	LS	2,100,000	63,420	2,172,074
(Note: Vendor Quote, Geo-Solutions, April 07 2016)					
			36.32		*42.93*
09 Placement for Soil Cap	**1,500.00**	**ECY**	**54,478**	**9,684**	**64,394**
01 Labor	**1.00**	**LS**	**4,889**	**3,039**	**7,959**
			3.26		*5.31*
USR CMP-L Backfill and Compaction - L	1,500.00	ECY	4,889	3,039	7,959
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					
02 Equipment	**1.00**	**LS**	**1,353**	**181**	**1,541**
			0.90		*1.03*
USR CMP-E Backfill and Compaction - E	1,500.00	ECY	1,353	181	1,541
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
03 Material	**1.00**	**LS**	**48,236**	**6,464**	**54,895**
			21.08		*24.00*
USR FILL-M Common Fill - M	2,000.00	LCY	42,158	5,649	47,998
(Note: CostWorks 2016 - 31 23 2315 4010)					
			797.15		*907.58*
USR LAB-TCLP TCLP Full Analytical Suite	1.00	EA	797	107	908
(Note: Lab analysis cost based on previous work.)					
			65.00		*73.71*
USR LAB8082 Polychlorinated Biphenyls (PCBs) (soil/solid)	1.00	EA	65	9	74
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			105.00		*119.07*
USR LAB8081 Pesticides, Organochlorine (GC) (Soil)	1.00	EA	105	14	119
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			0.11		*0.13*
USR MRKLYR Marker Barrier Layer	46,000.00	SF	5,111	685	5,796
(Note: **Vendor Quote, US Fabrics, 04/2016** US 160NW-HVO Warning Barrier (Orange Nonwoven Geotextile))					
			1.31		*1.63*
10 Topsoil Placement and Revegetation	**46,000.00**	**SF**	**60,138**	**14,479**	**74,750**
(Note: Includes 6" of topsoil with seeding for surface restoration.)					
01 Labor	**1.00**	**LS**	**13,167**	**8,185**	**21,438**
			8.17		*13.31*
USR TSLPL-L Topsoil Placement - L	1,200.00	LCY	9,810	6,098	15,971
			73.00		*118.85*
USR SEED-L Seeding - L	46.00	MSF	3,358	2,087	5,467
(Note: Seeding athletic fields, seeding rye, annual, 10 lb. per M.S.F., push spreader Productivity: CostWorks 2016 - 329219143300)					
02 Equipment	**1.00**	**LS**	**6,237**	**836**	**7,101**
			5.20		*5.92*
USR TSLPL-E Topsoil Placement - E	1,200.00	LCY	6,237	836	7,101
03 Material	**1.00**	**LS**	**40,734**	**5,458**	**46,211**
			30.50		*34.58*
USR TPSL-M Topsoil - M	1,200.00	LCY	36,594	4,904	41,498
(Note: **Vendor Quote, PC Sand and Gravel, 2015, includes delivery**)					
			0.09		*0.10*
USR SEED-M Seeding - M	46,000.00	SF	4,140	555	4,714
(Note: **Previous Work/Estimate**)					
11 Deed Notice	**1.00**	**LS**	**5,593**	**2,989**	**8,613**
			59.67		*97.16*
LGL L-ASP Environmental Lawyer	40.00	HR	2,387	1,484	3,886

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
LGL L-LARE Paralegal	60.00	HR	*28.67* 1,720	1,069	*46.68* 2,801
FOP FB-CLTYP Clerks, Typists, Bookkeepers & Receptionist	20.00	HR	*24.31* 486	302	*39.58* 792
USR Miscellaneous Allowance (Note: **Per Estimator**)	1.00	LS	1,000	134	1,134
12 Chain Link Fence	**1,030.00**	**LF**	*19.41* **19,990**	**2,679**	*22.01* **22,668**
USR CLF6-F Chain Link Fence, 6' High (Note: Cost Works 2016 - 32 31 1325 0100)	1,030.00	LF	*18.85* 19,416	2,602	*21.38* 22,017
USR CLF6-G Chain Link Fence Gate, 6' High (Note: Cost Works 2016 - 32 31 1325 0190)	2.00	EA	*287.00* 574	77	*325.46* 651
13 Monitoring Well Abandonment	**11.00**	**EA**	*669.74* **7,367**	**1,664**	*824.30* **9,067**
01 Mobilization/Demobilization (Note: Refer to Calculations QTO-03)	**2.00**	**EA**	*1,112.50* **2,225**	**298**	*1,266.62* **2,533**
USR USR-WI-800-V Mobilization or Demobilization (Note: Based on previous work.)	2.00	EA	*1,112.50* 2,225	298	*1,266.62* 2,533
02 Well Abandonment	**310.00**	**VLF**	*12.96* **4,019**	**818**	*15.66* **4,856**
L Labor	**1.00**	**LS**	**797**	**495**	**1,298**
USR USR-WI-010-E Well Abandonment, 2" Well	310.00	VLF	*2.57* 797	495	*4.19* 1,298
E Equipment	**1.00**	**LS**	**1,183**	**159**	**1,347**
USR USR-WI-010-L Well Abandonment, 2" Well	310.00	VLF	*3.82* 1,183	159	*4.35* 1,347
M Materials	**161.00**	**LS**	**738**	**99**	**841**
USR USR-WI-010-M Cement-grout mixture (Note: Cost Source - CostWorks 2016 - 31 43 1313 0200.)	30.00	CF	*24.61* 738	99	*28.02* 841
O Other	**1.00**	**LS**	**1,300**	**65**	**1,370**
USR USR-WI-020-O Administration	11.00	EA	*100.00* 1,100	55	*105.42* 1,160

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: Per estimator.)					
			200.00		*210.84*
USR TRAV-01-M Per Diem	1.00	DAY	200	10	211
(Note: Per Diem Rate 2016, Essex County, New Jersey)					
03 Oversight	**1.00**	**LS**	**1,123**	**548**	**1,678**
(Note: Assumes oversight of well abandonment crew.)					
L Labor	**1.00**	**LS**	**849**	**528**	**1,383**
			70.79		*115.26*
FOP FC-ENGPE Engineers, Project	12.00	HR	849	528	1,383
(Note: Rates are based on FLCdatacenter.com for the project area.)					
E Equipment	**1.00**	**LS**	**74**	**10**	**84**
			73.99		*84.24*
USR USR-BI-900-E Geologist/Engineer - Oversight	1.00	DAY	74	10	84
(Note: .)					
O Other	**1.00**	**LS**	**200**	**10**	**211**
			200.00		*210.84*
USR TRAV-01-M Per Diem	1.00	DAY	200	10	211
(Note: Per Diem Rate 2016, Essex County, New Jersey)					
			2,209.04		*3,194.66*
14 Monitoring Well Installation and Development	**11.00**	**EA**	**24,299**	**10,638**	**35,141**
(Note: Includes installation and development of 11 monitoring wells following remedial activities.)					
46.01 Labor	**1.00**	**LS**	**15,138**	**9,410**	**24,646**
			39.13		*63.70*
USR WLLDR-L Well Drilling - 4" Monitoring Well - L	310.00	LF	12,129	7,540	19,748
(Note: Monitoring well construction, drilling, hollow stem auger, normal soil, 4" or less casing/screen, 6-5/8" ID x 11" OD auger. Productivity: MII English Cost Book 2016 - 023223135113)					
			12.17		*19.81*
USR WLLC-L Concrete, hand mix - L	11.00	CF	134	83	218
(Note: Concrete, hand mix, for small quantities or remote areas, using pre-bagged dry mix and wheelbarrow. Cost Source: Means CostWorks 2016 - 033113250340)					
			3.68		*5.99*
USR WLLF-L Concrete, forms - L	110.00	LF	405	252	659
(Note: C.I.P. concrete forms, slab on grade, bulkhead with keyway, wood, 6" high, 4 uses, includes erecting, bracing, stripping and cleaning. Cost Source: Means CostWorks 2016 - 031113651100)					
			56.14		*91.40*
USR WLLDVP-L Well Development - L	44.00	HR	2,470	1,536	4,022
(Note: Assume 4 hr/monitoring well)					
46.02 Equipment	**1.00**	**LS**	**3,539**	**474**	**4,030**
			11.42		*13.00*
USR WLLDR-E Well Drilling - 4" Monitoring Well - E	310.00	LF	3,539	474	4,030

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: Monitoring well construction, drilling, hollow stem auger, normal soil, 4" or less casing/screen, 6-5/8" ID x 11" OD auger. Productivity: MII English Cost Book 2016 - 023223135113)					
46.03 Material	**1.00**	**LS**	**5,622**	**753**	**6,465**
			8.03		*9.25*
USR WLLCS-M 4" PVC Well Casing - M	200.00	LF	1,605	215	1,849
(Note: Vendor Quote - Dean Bennett Supply, 2015)					
			10.38		*11.96*
USR WLLSC-M 4" PVC Well Screen - M	110.00	LF	1,142	153	1,315
(Note: Vendor Quote - Dean Bennett Supply, 2015)					
			11.07		*12.61*
USR WLLGT-M Cement-grout mixture - M	33.00	CF	365	49	416
(Note: Material Cost: CostWorks 2016 - 314313130320)					
			435.99		*496.39*
USR WLLPK-M Sand/Filter Pack - M	1.10	CY	480	64	546
(Note: Material Cost: MII English Cost Book 2012 (escalated to 2Q2016) - 023223136111)					
			162.64		*187.38*
USR WLLCSG-M Protective enclosures, hinged lid, lockable, 6" x 3' - M	11.00	EA	1,789	240	2,061
(Note: Vendor Quote - Dean Bennett Supply, 2015)					
			17.92		*20.65*
USR WLLPLG-M Monitoring well fittings, J-Plugs, 4"	11.00	EA	197	26	227
(Note: Vendor Quote - Dean Bennett Supply, 2015)					
			7.17		*8.16*
USR WLLC-M Concrete, hand mix - M	1.30	CF	9	1	11
(Note: Concrete, hand mix, for small quantities or remote areas, using pre-bagged dry mix and wheelbarrow. Cost Source: Means CostWorks 2016 - 033113250340)					
			0.35		*0.40*
USR WLLF-M Concrete, forms - M	99.00	LF	35	5	40
(Note: C.I.P. concrete forms, slab on grade, bulkhead with keyway, wood, 6" high, 4 uses, includes erecting, bracing, stripping and cleaning. Cost Source: Means CostWorks 2016 - 031113651100)					
OM Annual O&M Costs	**1.00**	**LS**	**5,100**	**2,195**	**7,320**
			4,484.66		*6,619.45*
01 Cap/Backfill Maintenance	**1.00**	**YR**	**4,485**	**2,113**	**6,619**
01 Labor	**1.00**	**LS**	**3,101**	**1,927**	**5,048**
			775.19		*1,262.09*
USR OM-CREW-L Backfill/Cover O&M	4.00	DAY	3,101	1,927	5,048
(Note: Assumes 1 day per maintenance event, 4 events yearly.)					
02 Equipment	**1.00**	**LS**	**384**	**51**	**437**
			95.98		*109.28*
USR OM-CREW-E Backfill/Cover O&M	4.00	DAY	384	51	437
(Note: Assumes 1 day per maintenance event, 4 events yearly.)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
03 Material	**1.00**	**LS**	**1,000**	**134**	**1,134**
USR OM-ALLOW Backfill/Cover Allowance	1.00	LS	1,000	134	1,134
(Note: Per Estimator. $250/O&M Event.)					
02 Chain Link Fence	**1.00**	**LS**	**616**	**82**	**701**
			5.78		*6.58*
USR CLF6-M Maintenance, Chain Link Fence, 6' High	20.00	LF	116	15	132
(Note: Cost Works 2016 - 32 31 1325 0100)					
USR Maintenance Allowance	1.00	LS	500	67	569
PC Periodic Costs	**1.00**	**LS**	**9,814**	**3,881**	**13,750**
			9,813.85		*13,749.55*
03 Long-Term Groundwater Monitoring	**1.00**	**EA**	**9,814**	**3,881**	**13,750**
			5,610.30		*6,905.72*
03-1 GW Monitoring	**1.00**	**EA**	**5,610**	**1,268**	**6,906**
01 Labor	**1.00**	**LS**	**2,465**	**846**	**3,325**
			42.17		*68.66*
FOP FC-FLDER Field Engineer	30.00	HR	1,265	786	2,060
(Note: Assume crew of 3 for 2 days.)					
			200.00		*210.84*
USR TRAV-01-M Per Diem	6.00	DAY	1,200	60	1,265
(Note: Per Diem Rate 2016, Essex County, New Jersey)					
02 Equipment	**1.00**	**LS**	**385**	**52**	**439**
			96.30		*109.64*
USR TRAV-02-M Daily Pickup Truck Rental	4.00	DAY	385	52	439
(Note: Daily Rental Rate. Vendor Quote: Enterprise, 2015. Assume 2 trucks)					
03 Material	**1.00**	**LS**	**2,760**	**370**	**3,142**
			368.08		*419.07*
USR Flow-Through Cell	1.00	DAY	368	49	419
(Note: Professional XP MPT 9500, w/Quick-Connect **Previous Work**)					
			10.70		*12.18*
USR Auto Calibration Solution	1.00	DAY	11	1	12
(Note: 2 pk, **Previous Work**)					
			32.10		*36.55*
USR Portable Bladder Pump	1.00	DAY	32	4	37
(Note: **Previous Work**)					
			8.56		*9.75*
USR Disposable Poly Bladder for Pump	2.00	EA	17	2	19
(Note: **Previous Work**)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			48.15		*54.82*
USR Pump Controller, QED (Note: **Previous Work**)	1.00	DAY	48	6	55
			16.05		*18.27*
USR Compressor for Pump, QED (Note: **Previous Work**)	1.00	DAY	16	2	18
			17.12		*19.49*
USR Turbidity Meter (Note: LaMotte 2020, w/Cal Std **Previous Work**)	1.00	DAY	17	2	19
			12.84		*14.62*
USR Water Level Meter (Note: 200' **Previous Work**)	1.00	DAY	13	2	15
			53.50		*60.91*
USR PID (Note: With Isobutylene Cal Std **Previous Work**)	1.00	DAY	54	7	61
			481.50		*548.21*
USR Poly Tubing (Note: 500' Roll of Single and Combination Tubing **Previous Work**)	1.00	EA	482	65	548
			50.38		*57.36*
USR LABCW9 Organochlorine PCBs (Note: Vendor Quote GSA Test America 2016)	13.00	EA	655	88	746
			80.60		*91.77*
USR LABCW10 Organochlorine Pesticides (Note: Vendor Quote GSA Test America 2016)	13.00	EA	1,048	140	1,193
03-2 GW Sampling Report (Note: 1 Report per event)	**1.00**	**LS**	**4,204**	**2,613**	**6,844**
			93.41		*152.08*
USR Project Manager	8.00	HR	747	465	1,217
			72.67		*118.31*
USR Quality Control Engineer	4.00	HR	291	181	473
			62.62		*101.96*
USR Hydrogeologist	40.00	HR	2,505	1,557	4,078
			47.29		*76.99*
USR Draftsman	8.00	HR	378	235	616
			35.31		*57.48*
USR Adminstrative Clerk	8.00	HR	282	176	460

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
ALT4 Alternative 4 (Note: Building Demolition, Excavation and Offsite Disposal)	**1.00**	**LS**	**11,462,966**	**1,069,718**	**12,550,203**
CC Capital Costs	**1.00**	**LS**	**11,462,966**	**1,069,718**	**12,550,203**
			169,670.73		*193,176.24*
01 General Conditions	**5.00**	**MO**	**848,354**	**113,679**	**965,881**
			122,113.33		*139,030.43*
USR GC General Conditions	5.00	MO	610,567	81,816	695,152
USR PD Project Planning, Documents, and Submittals	1.00	LS	198,500	26,599	225,999
USR SUR Surveying	1.00	LS	39,287	5,264	44,730
02 Institutional Controls	**1.00**	**LS**	**10,121**	**6,161**	**16,347**
			59.67		*97.16*
LGL L-ASP Environmental Lawyer	120.00	HR	7,161	4,451	11,659
			28.67		*46.68*
LGL L-LARE Paralegal	60.00	HR	1,720	1,069	2,801
			24.31		*39.58*
FOP FB-CLTYP Clerks, Typists, Bookkeepers & Receptionist	40.00	HR	972	604	1,583
USR REPRO-01-M Reproduction Costs for Institutional Controls (Note: Per Estimator)	1.00	LS	268	36	305
03 Community Awareness Activities (Note: Includes 1 community awareness meeting)	**1.00**	**LS**	**4,685**	**2,211**	**6,923**
			90.69		*147.66*
FOP FA-AGENS General Superintendents (P.M.)	16.00	HR	1,451	902	2,362
			120.84		*196.75*
FOP FA-PROJM Project Manager	16.00	HR	1,934	1,202	3,148
			200.00		*210.84*
USR TRAV-01-M Per Diem (Note: Per Diem Rate 2016, Essex County, New Jersey)	4.00	DAY	800	40	843
USR ALLOW-COMM Community Awareness Activities Allowance (Note: Per Estimator)	1.00	LS	500	67	569
04 Mobilization/Demobilization	**1.00**	**LS**	**14,011**	**1,878**	**15,952**
			1,120.83		*1,276.10*
USR MBDM-01 Tractor w/ Lowbed Trailer (Heavy Equipment)	3.00	EA	3,362	451	3,828
			1,086.35		*1,236.85*
USR MBDM-02 Tractor w/ Flatbed Trailer (Large Equipment)	5.00	EA	5,432	728	6,184
			983.41		*1,119.64*
USR MBDM-03 Tractor w/ Flatbed Trailer (Medium Equipment)	5.00	EA	4,917	659	5,598
			100.00		*113.85*
USR Heavy Equipment Permit	3.00	EA	300	40	342

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: **Per Estimator**)					
05 Sediment and Erosion Control	**1.00**	**LS**	**7,988**	**3,999**	**12,035**
Installation	**1.00**	**LS**	**1,786**	**575**	**2,370**
01 Labor	**1.00**	**LS**	**689**	**428**	**1,121**
			0.90		*1.46*
USR SLTFEN-L Silt Fence Installation - L	600.00	LF	539	335	878
(Note: Productivity: CostWorks 2016 - 312514161000)					
			0.75		*1.22*
USR HAYB-L Hay Bales Installation - L	200.00	LF	150	93	243
(Note: Synthetic erosion control, hay bales, staked. Productivity: CostWorks 2016 -312514161250)					
02 Equipment	**1.00**	**LS**	**57**	**8**	**65**
			0.07		*0.08*
USR SLTFEN-E Silt Fence Installation - E	600.00	LF	40	5	45
(Note: Productivity: CostWorks 2016 - 312514161000)					
			0.09		*0.10*
USR HAYB-E Hay Bales Installation - E	200.00	LF	17	2	20
(Note: Synthetic erosion control, hay bales, staked. Productivity: CostWorks 2016 -312514161250)					
03 Material	**1.00**	**LS**	**1,040**	**139**	**1,184**
			0.31		*0.35*
USR SLTFEN-M Silt Fence - M	600.00	LF	186	25	212
(Note: 3' high, polypropylene. Material Cost: CostWorks 2016 - 312514161000)					
			4.27		*4.86*
USR HAYB-M Hay Bales Installation - M	200.00	LF	854	114	972
(Note: Synthetic erosion control, hay bales, staked. Material Cost: CostWorks 2016 -312514161250)					
Maintenance	**1.00**	**LS**	**6,203**	**3,424**	**9,665**
			166.14		*270.49*
USR USR-LE-ES-001-L Inspection and maintenance of erosion and sediment control measures	32.00	HR	5,316	3,305	8,656
			22.68		*25.82*
USR U-LE-ES-001-E Inspection and maintenance of erosion and sediment control measures	32.00	HR	726	97	826
			1.61		*1.83*
USR U-MT-ES-002 Silt Fence - Erosion and sediment control maintenance allowance	100.00	LF	161	22	183
(Note: Assumes a percentage of original silt fence would require replacement.)					
06 Demolition of Structures	**1.00**	**LS**	**735,636**	**74,911**	**810,892**
01 Building Inspection	**1.00**	**LS**	**3,133**	**1,857**	**5,011**
(Note: Assumes 20 hours for structural integrity inspection of buildings.)					
13.01.01 Labor	**1.00**	**LS**	**2,948**	**1,833**	**4,800**

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			147.41		*240.00*
USR BUILD-INS-L Building Inspection - L	20.00	HR	2,948	1,833	4,800
13.01.02 Equipment	**1.00**	**LS**	**185**	**25**	**211**
			9.25		*10.53*
USR BUILD-INS-E Building Inspection - E	20.00	HR	185	25	211
			27.20		*39.45*
02 Demolition	**2,070.00**	**CY**	**56,303**	**25,043**	**81,671**
			17.34		*28.22*
USR SW-BLDG-DEM-L Building Demolition	2,070.00	CY	35,886	22,307	58,426
(Note: Productivity: CostWorks 2016 - 024116130600 and 024116130650 (average of concrete and masonry demolition productivities). Includes water truck for keeping all materials "adequately wet" per NESHAP.)					
			9.86		*11.23*
USR SW-BLDG-DEM-E Building Demolition	2,070.00	CY	20,417	2,736	23,245
(Note: Productivity: CostWorks 2016 - 024116130600 and 024116130650 (average of concrete and masonry demolition productivities). Includes water truck for keeping all materials "adequately wet" per NESHAP.)					
			173.38		*185.69*
03 Transportation and Disposal	**3,900.00**	**TON**	**676,200**	**48,010**	**724,210**
			238.00		*254.90*
USR DSPTSCA-D TSCA C&D - Trasportation and Disposal	1,500.00	TON	357,000	25,347	382,347
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			133.00		*142.44*
USR DSPNH-D Non-Hazardous C&D - Trasportation and Disposal	2,400.00	TON	319,200	22,663	341,863
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			22.01		*24.15*
07 Excavation and Soil Cap within JCMUA Pipeline Easement	**5,040.00**	**SF**	**110,920**	**10,779**	**121,729**
			2.38		*3.48*
01 Excavation	**380.00**	**BCY**	**905**	**411**	**1,322**
			1.57		*2.55*
USR EW-EXC-01A-L Shallow Excavation (0-10 ft)	380.00	BCY	595	370	969
(Note: Refer to Calculation Sheet PD-01A.)					
			0.82		*0.93*
USR EW-EXC-01A-E Shallow Excavation (0-10 ft)	380.00	BCY	310	42	353
(Note: Refer to Calculation Sheet PD-01A.)					
			126.00		*134.95*
02 Trasportation and Disposal	**720.00**	**TON**	**90,720**	**6,441**	**97,161**
			126.00		*134.95*
USR DSPNH-S Non-Hazardous Soil - Trasportation and Disposal	720.00	TON	90,720	6,441	97,161
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
03 Placement of Soil Cap	**5,040.00**	**SF**	*3.83* **19,294**	**3,927**	*4.61* **23,246**
USR FILL-M Common Fill - M (Note: CostWorks 2016 - 31 23 2315 4010)	510.00	LCY	*21.08* 10,750	1,441	*23.90* 12,191
USR TPSL-M Topsoil - M (Note: **Vendor Quote, PC Sand and Gravel, 2015, includes delivery**)	140.00	LCY	*30.50* 4,269	572	*34.58* 4,841
USR SEED-M Seeding - M (Note: **Previous Work/Estimate**)	5,040.00	SF	*0.09* 454	61	*0.10* 516
USR CMP-L Backfill and Compaction - L (Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)	380.00	ECY	*3.26* 1,238	770	*5.31* 2,016
USR TSLPL-L Topsoil Placement - L	140.00	LCY	*8.17* 1,144	711	*13.31* 1,863
USR SEED-L Seeding - L (Note: Seeding athletic fields, seeding rye, annual, 10 lb. per M.S.F., push spreader Productivity: CostWorks 2016 - 329219143300)	5.04	MSF	*73.00* 368	229	*118.85* 599
USR TSLPL-E Topsoil Placement - E	140.00	LCY	*5.20* 728	98	*5.92* 828
USR CMP-E Backfill and Compaction - E (Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)	380.00	ECY	*0.90* 343	46	*1.03* 390
08 Excavation of Contaminated Soils	**26,000.00**	**BCY**	*78.08* **2,030,103**	**200,050**	*86.12* **2,239,074**
01 Excavation Support Installation	**41,300.00**	**SF**	*38.93* **1,607,816**	**48,556**	*40.27* **1,662,997**
01 Labor	**1.00**	**LS**	**250,652**	**7,570**	**259,254**
USR SHT-L Sheet piling, steel, 27 psf, 30' deep - L (Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Productivity: CostWorks 2016 - 314116101500)	41,300.00	SF	*6.07* 250,652	7,570	*6.28* 259,254
02 Equipment	**1.00**	**LS**	**73,857**	**2,230**	**76,392**
USR SHT-E Sheet piling, steel, 27 psf, 30' deep - E (Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Productivity: CostWorks 2016 - 314116101500)	41,300.00	SF	*1.79* 73,857	2,230	*1.85* 76,392
03 Material	**1.00**	**LS**	**1,283,307**	**38,756**	**1,327,351**
USR SHT-M Sheet piling, steel, 27 psf, 30' deep - M	41,300.00	SF	*31.07* 1,283,307	38,756	*32.14* 1,327,351

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Material Cost: CostWorks 2016 - 314116101500)					
			3.13		*4.57*
02 Contaminated Soils Excavation	**26,000.00**	**BCY**	**81,353**	**36,974**	**118,800**
01 Labor	**1.00**	**LS**	**53,470**	**33,238**	**87,054**
			1.57		*2.55*
USR EW-EXC-01A-L Shallow Excavation (0-10 ft)	5,000.00	BCY	7,829	4,866	12,746
(Note: Refer to Calculation Sheet PD-01A.)					
			2.17		*3.54*
USR EW-EXC-01B-L Deep Excavation (>10 ft)	21,000.00	BCY	45,641	28,371	74,308
(Note: Refer to Calculation Sheet PD-01B.)					
02 Equipment	**1.00**	**LS**	**27,883**	**3,736**	**31,746**
			0.82		*0.93*
USR EW-EXC-01A-E Shallow Excavation (0-10 ft)	5,000.00	BCY	4,082	547	4,648
(Note: Refer to Calculation Sheet PD-01A.)					
			1.13		*1.29*
USR EW-EXC-01B-E Deep Excavation (>10 ft)	21,000.00	BCY	23,800	3,189	27,098
(Note: Refer to Calculation Sheet PD-01B.)					
			68,187.00		*91,455.37*
03 Dewatering and Water Treatment	**5.00**	**MO**	**340,935**	**114,520**	**457,277**
25 Dewatering System	**1.00**	**LS**	**19,773**	**6,960**	**26,840**
(Note: Includes an initial pumping rate of 140 gpm for the first 14 days, followed by a maintenance pumping rate of 80 gpm while earthwork is carried out.)					
25.01 Labor	**1.00**	**LS**	**8,840**	**5,495**	**14,392**
			38.43		*62.57*
HTW HO-FLDTCH Field Technician (HTW Projects)	230.00	HR	8,840	5,495	14,392
(Note: Rates are based on the Kearny, New Jersey area. Source: FLCdatacenter.com.)					
25.02 Equipment	**1.00**	**LS**	**10,437**	**1,399**	**11,883**
			68.21		*77.66*
USR SUB-E Submersible Pump and Hoses - E	153.00	DAY	10,437	1,399	11,883
(Note: Includes pump and 300 ft of hose.)					
25.03 Material	**1.00**	**LS**	**497**	**67**	**565**
			0.01		*0.02*
USR TREA-ELE Electrical Consumption	35,700.00	KWH	497	67	565
(Note: U.S. Energy Information Administration, October 2015)					
26 Water Treatment System Installation and Startup Testing	**1.00**	**LS**	**80,028**	**10,724**	**91,115**
(Note: Includes all items required for the design, permitting, mobilization, installation, startup testing, and subsequent demobilization of the temporary water treatment system, Includes installation, startup testing, and first month rental of water treatment system.)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
26.03 Material	**1.00**	**LS**	**80,028**	**10,724**	**91,115**
			77,550.00		*88,293.47*
USR TREA-RENT Water Treatment System Rental Fee (1 Month), including Mobilization, Installation, and Startup (Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))	1.00	MO	77,550	10,392	88,293
			2,478.00		*2,821.29*
USR TREA-WTA 18,000 Gallon Weir Tank & 22,00 Gallon Frac Tank, Rental (Note: Vendor Quote - Rain for Rent, 2012. Rental Cost: $2128/month + $1008.48 for delivery/pick-up. Escalated to 2Q2016.)	1.00	MO	2,478	332	2,821
			80,378.01		*113,107.41*
27 Water Treatment System Operations and Maintenance (Note: Includes water treatment system operations and maintenance. Also includes rental of water treatment system after the first month.)	**3.00**	**MO**	**241,134**	**96,836**	**339,322**
27.01 Labor	**1.00**	**LS**	**132,325**	**82,256**	**215,439**
			38.43		*62.57*
HTW HO-FLDTCH Field Technician (HTW Projects) (Note: Rates are based on the Kearny, New Jersey area. Source: FLCdatacenter.com.)	3,443.00	HR	132,325	82,256	215,439
27.03 Material	**1.00**	**LS**	**108,809**	**14,580**	**123,883**
			40.42		*46.02*
USR TREA-CHL Sodium Hypochlorite (13%) (Note: Vendor Quote - ScienceLab - 2012 (escalated to 2Q2016). $1881.99 / 200 L Drum)	590.00	GAL	23,851	3,196	27,155
			0.01		*0.02*
USR TREA-ELE Electrical Consumption (Note: U.S. Energy Information Administration, October 2015)	99,500.00	KWH	1,384	185	1,576
			12,220.00		*13,912.91*
USR TREA-MON Water Treatment System Rental Fee (after 1 month) (Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))	4.00	MO	48,880	6,550	55,652
			2,478.00		*2,821.29*
USR TREA-WTA 18,000 Gallon Weir Tank & 22,000 Gallon Frac Tank, Rental (Note: Vendor Quote - Rain for Rent, 2012. Rental Cost: $2128/month + $1008.48 for delivery/pick-up. Escalated to 2Q2016.)	4.00	MO	9,912	1,328	11,285
			10,905.00		*12,415.74*
USR TREA-CAR Disposal of Spent Carbon (Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))	1.00	EA	10,905	1,461	12,416
			9,472.00		*10,784.21*
USR TREA-DMB Demobilization of Water Treatment System (Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))	1.00	EA	9,472	1,269	10,784
			123.05		*140.10*
USR LAB-MET Metals Lab Analysis (Note: Lab analysis cost based on previous work.)	3.00	EA	369	49	420
			26.75		*30.46*
USR LAB-HG Mercury, Lab Analysis (Note: Vendor Quote: TestAmerica.)	3.00	EA	80	11	91
			16.05		*18.27*
USR LAB-TSS TSS, Lab Analysis	3.00	EA	48	6	55

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: Vendor Quote: TestAmerica.)					
			16.05		*18.27*
USR LAB-TDS TDS, Lab Analysis	3.00	EA	48	6	55
(Note: Vendor Quote: TestAmerica.)					
			35.31		*40.20*
USR LAB-TOC TOC, Lab Analysis	3.00	EA	106	14	121
(Note: Vendor Quote: TestAmerica.)					
			968.35		*1,102.50*
USR LAB-WET Chronic Whole Effluent Toxicity, Lab Analysis	3.00	EA	2,905	389	3,308
(Note: Testing, biomonitoring & bioassay, chronic toxicity bioassay ceriodaphnia dubia. Material Cost: MII English Cost Book 2012 - 029110207306 (escalated to 2Q2016))					
			5.35		*6.09*
USR SHP-M Shipping Allowance, per Sample - M	3.00	EA	16	2	18
(Note: **Per Estimator**)					
USR SUPL-M Miscellaneous Sampling Supplies	1.00	LS	268	36	305
(Note: **Per Estimator** Includes paper towels, ziploc bags, and disposable gloves)					
			65.49		*74.56*
USR LAB-624 Volatile Organic Compounds	3.00	EA	196	26	224
(Note: Vendor Quote GSA Test America 2016)					
			122.92		*139.95*
USR LAB-608 Organochlorine Pesticides/PCBs	3.00	EA	369	49	420
(Note: Vendor Quote GSA Test America 2016)					
			186.04		*199.25*
09 Transportation and Disposal of Contaminated Soils	**36,400.00**	**TON**	**6,771,800**	**480,798**	**7,252,598**
			760.00		*813.96*
USR DSPHAZ RCRA/TSCA Soil - Trasportation and Disposal	1,400.00	TON	1,064,000	75,544	1,139,544
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			229.00		*245.26*
USR DSPTSCA-S TSCA Soil - Trasportation and Disposal	12,600.00	TON	2,885,400	204,863	3,090,263
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			126.00		*134.95*
USR DSPNH-S Non-Hazardous Soil - Trasportation and Disposal	22,400.00	TON	2,822,400	200,390	3,022,790
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			195.64		*230.38*
10 Post Excavation Sampling	**88.00**	**EA**	**17,217**	**3,047**	**20,274**
01 Labor	**1.00**	**LS**	**1,518**	**944**	**2,472**
(Note: Assume a crew of 2)					
			42.17		*68.66*
FOP FC-FLDER Field Engineer	36.00	HR	1,518	944	2,472
(Note: Rates are based on the Kearny, New Jersey area. Source: FLCdatacenter.com.)					
02 Material	**1.00**	**LS**	**15,698**	**2,104**	**17,802**
			65.00		*73.71*

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
USR LAB8082 Polychlorinated Biphenyls (PCBs) (soil/solid) (Note: Vendor Quote, Pace Analytical, April 12 2016)	88.00	EA	5,720	766	6,486
			105.00		*119.07*
USR LAB8081 Pesticides, Organochlorine (GC) (Soil) (Note: Vendor Quote, Pace Analytical, April 12 2016)	88.00	EA	9,240	1,238	10,478
			5.35		*6.07*
USR SHP-M Shipping Allowance, per Sample - M (Note: **Per Estimator**)	88.00	EA	471	63	534
USR SUPL-M Miscellaneous Sampling Supplies (Note: **Per Estimator** Includes paper towels, ziploc bags, and disposable gloves)	1.00	LS	268	36	303
			32.55		*38.66*
11 Clean Backfill Placement	**26,000.00**	**ECY**	**846,400**	**154,736**	**1,005,136**
01 Labor	**1.00**	**LS**	**84,735**	**52,673**	**137,957**
			3.26		*5.31*
USR CMP-L Backfill and Compaction - L (Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)	26,000.00	ECY	84,735	52,673	137,957
02 Equipment	**1.00**	**LS**	**23,454**	**3,143**	**26,703**
			0.90		*1.03*
USR CMP-E Backfill and Compaction - E (Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)	26,000.00	ECY	23,454	3,143	26,703
03 Material	**1.00**	**LS**	**738,211**	**98,920**	**840,475**
			21.08		*24.00*
USR FILL-M Common Fill - M (Note: CostWorks 2016 - 31 23 2315 4010)	34,700.00	LCY	731,441	98,013	832,772
			797.15		*907.58*
USR LAB-TCLP TCLP Full Analytical Suite (Note: Lab analysis cost based on previous work.)	7.00	EA	5,580	748	6,353
			65.00		*73.71*
USR LAB8082 Polychlorinated Biphenyls (PCBs) (soil/solid) (Note: Vendor Quote, Pace Analytical, April 12 2016)	7.00	EA	455	61	516
			105.00		*119.07*
USR LAB8081 Pesticides, Organochlorine (GC) (Soil) (Note: Vendor Quote, Pace Analytical, April 12 2016)	7.00	EA	735	98	833
			1.31		*1.63*
12 Topsoil Placement and Revegetation (Note: Includes 6" of topsoil with seeding for surface restoration.)	**46,000.00**	**SF**	**60,138**	**14,479**	**74,750**
01 Labor	**1.00**	**LS**	**13,167**	**8,185**	**21,438**
			8.17		*13.31*
USR TSLPL-L Topsoil Placement - L	1,200.00	LCY	9,810	6,098	15,971
			73.00		*118.85*

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
USR SEED-L Seeding - L	46.00	MSF	3,358	2,087	5,467
(Note: Seeding athletic fields, seeding rye, annual, 10 lb. per M.S.F., push spreader Productivity: CostWorks 2016 - 329219143300)					
02 Equipment	**1.00**	**LS**	**6,237**	**836**	**7,101**
			5.20		*5.92*
USR TSLPL-E Topsoil Placement - E	1,200.00	LCY	6,237	836	7,101
03 Material	**1.00**	**LS**	**40,734**	**5,458**	**46,211**
			30.50		*34.58*
USR TPSL-M Topsoil - M	1,200.00	LCY	36,594	4,904	41,498
(Note: **Vendor Quote, PC Sand and Gravel, 2015, includes delivery**)					
			0.09		*0.10*
USR SEED-M Seeding - M	46,000.00	SF	4,140	555	4,714
(Note: **Previous Work/Estimate**)					
13 Deed Notice	**1.00**	**LS**	**5,593**	**2,989**	**8,613**
			59.67		*97.16*
LGL L-ASP Environmental Lawyer	40.00	HR	2,387	1,484	3,886
			28.67		*46.68*
LGL L-LARE Paralegal	60.00	HR	1,720	1,069	2,801
			24.31		*39.58*
FOP FB-CLTYP Clerks, Typists, Bookkeepers & Receptionist	20.00	HR	486	302	792
USR Miscellaneous Allowance	1.00	LS	1,000	134	1,134
(Note: **Per Estimator**)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
ALT5 Alternative 5 (Note: Building Demolition and Offsite Disposal, Excavation, Onsite Treatment, and Backfill of Treated Material)	**1.00**	**LS**	**9,714,040**	**758,170**	**10,489,606**
CC Capital Costs	**1.00**	**LS**	**9,714,040**	**758,170**	**10,489,606**
01 General Conditions	**13.00**	**MO**	*103,644.87* **1,347,383**	**180,549**	*118,003.42* **1,534,044**
USR GC General Conditions	4.00	MO	*122,113.33* 488,453	65,453	*139,030.43* 556,122
USR GC2 General Conditions (Alt. 5)	9.00	MO	*62,031.67* 558,285	74,810	*70,625.29* 635,628
USR PD Project Planning, Documents, and Submittals	1.00	LS	198,500	26,599	225,999
USR SUR Surveying	1.00	LS	102,145	13,687	116,296
02 Institutional Controls	**1.00**	**LS**	**10,121**	**6,161**	**16,347**
LGL L-ASP Environmental Lawyer	120.00	HR	*59.67* 7,161	4,451	*97.16* 11,659
LGL L-LARE Paralegal	60.00	HR	*28.67* 1,720	1,069	*46.68* 2,801
FOP FB-CLTYP Clerks, Typists, Bookkeepers & Receptionist	40.00	HR	*24.31* 972	604	*39.58* 1,583
USR REPRO-01-M Reproduction Costs for Institutional Controls (Note: Per Estimator)	1.00	LS	268	36	305
03 Community Awareness Activities (Note: Includes 1 community awareness meeting)	**1.00**	**LS**	**4,685**	**2,211**	**6,923**
FOP FA-AGENS General Superintendents (P.M.)	16.00	HR	*90.69* 1,451	902	*147.66* 2,362
FOP FA-PROJM Project Manager	16.00	HR	*120.84* 1,934	1,202	*196.75* 3,148
USR TRAV-01-M Per Diem (Note: Per Diem Rate 2016, Essex County, New Jersey)	4.00	DAY	*200.00* 800	40	*210.84* 843
USR ALLOW-COMM Community Awareness Activities Allowance (Note: Per Estimator)	1.00	LS	500	67	569
04 Mobilization/Demobilization	**1.00**	**LS**	**14,011**	**1,878**	**15,952**
USR MBDM-01 Tractor w/ Lowbed Trailer (Heavy Equipment)	3.00	EA	*1,120.83* 3,362	451	*1,276.10* 3,828
USR MBDM-02 Tractor w/ Flatbed Trailer (Large Equipment)	5.00	EA	*1,086.35* 5,432	728	*1,236.85* 6,184
USR MBDM-03 Tractor w/ Flatbed Trailer (Medium Equipment)	5.00	EA	*983.41* 4,917	659	*1,119.64* 5,598

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			100.00		*113.85*
USR Heavy Equipment Permit	3.00	EA	300	40	342
(Note: **Per Estimator**)					
05 Sediment and Erosion Control	**1.00**	**LS**	**7,988**	**3,999**	**12,035**
Installation	**1.00**	**LS**	**1,786**	**575**	**2,370**
01 Labor	**1.00**	**LS**	**689**	**428**	**1,121**
			0.90		*1.46*
USR SLTFEN-L Silt Fence Installation - L	600.00	LF	539	335	878
(Note: Productivity: CostWorks 2016 - 312514161000)					
			0.75		*1.22*
USR HAYB-L Hay Bales Installation - L	200.00	LF	150	93	243
(Note: Synthetic erosion control, hay bales, staked. Productivity: CostWorks 2016 -312514161250)					
02 Equipment	**1.00**	**LS**	**57**	**8**	**65**
			0.07		*0.08*
USR SLTFEN-E Silt Fence Installation - E	600.00	LF	40	5	45
(Note: Productivity: CostWorks 2016 - 312514161000)					
			0.09		*0.10*
USR HAYB-E Hay Bales Installation - E	200.00	LF	17	2	20
(Note: Synthetic erosion control, hay bales, staked. Productivity: CostWorks 2016 -312514161250)					
03 Material	**1.00**	**LS**	**1,040**	**139**	**1,184**
			0.31		*0.35*
USR SLTFEN-M Silt Fence - M	600.00	LF	186	25	212
(Note: 3' high, polypropylene. Material Cost: CostWorks 2016 - 312514161000)					
			4.27		*4.86*
USR HAYB-M Hay Bales Installation - M	200.00	LF	854	114	972
(Note: Synthetic erosion control, hay bales, staked. Material Cost: CostWorks 2016 -312514161250)					
Maintenance	**1.00**	**LS**	**6,203**	**3,424**	**9,665**
			166.14		*270.49*
USR USR-LE-ES-001-L Inspection and maintenance of erosion and sediment control measures	32.00	HR	5,316	3,305	8,656
			22.68		*25.82*
USR U-LE-ES-001-E Inspection and maintenance of erosion and sediment control measures	32.00	HR	726	97	826
			1.61		*1.83*
USR U-MT-ES-002 Silt Fence - Erosion and sediment control maintenance allowance	100.00	LF	161	22	183
(Note: Assumes a percentage of original silt fence would require replacement.)					
06 Demolition of Structures	**1.00**	**LS**	**735,636**	**74,911**	**810,892**
01 Building Inspection	**1.00**	**LS**	**3,133**	**1,857**	**5,011**
(Note: Assumes 20 hours for structural integrity inspection of buildings.)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
13.01.01 Labor	**1.00**	**LS**	**2,948**	**1,833**	**4,800**
			147.41		*240.00*
USR BUILD-INS-L Building Inspection - L	20.00	HR	2,948	1,833	4,800
13.01.02 Equipment	**1.00**	**LS**	**185**	**25**	**211**
			9.25		*10.53*
USR BUILD-INS-E Building Inspection - E	20.00	HR	185	25	211
			27.20		*39.45*
02 Demolition	**2,070.00**	**CY**	**56,303**	**25,043**	**81,671**
			17.34		*28.22*
USR SW-BLDG-DEM-L Building Demolition	2,070.00	CY	35,886	22,307	58,426
(Note: Productivity: CostWorks 2016 - 024116130600 and 024116130650 (average of concrete and masonry demolition productivities). Includes water truck for keeping all materials "adequately wet" per NESHAP.)					
			9.86		*11.23*
USR SW-BLDG-DEM-E Building Demolition	2,070.00	CY	20,417	2,736	23,245
(Note: Productivity: CostWorks 2016 - 024116130600 and 024116130650 (average of concrete and masonry demolition productivities). Includes water truck for keeping all materials "adequately wet" per NESHAP.)					
			173.38		*185.69*
03 Transportation and Disposal	**3,900.00**	**TON**	**676,200**	**48,010**	**724,210**
			238.00		*254.90*
USR DSPTSCA-D TSCA C&D - Trasportation and Disposal	1,500.00	TON	357,000	25,347	382,347
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			133.00		*142.44*
USR DSPNH-D Non-Hazardous C&D - Trasportation and Disposal	2,400.00	TON	319,200	22,663	341,863
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			22.01		*24.15*
07 Excavation and Soil Cap within JCMUA Pipeline Easement	**5,040.00**	**SF**	**110,920**	**10,779**	**121,729**
			2.38		*3.48*
01 Excavation	**380.00**	**BCY**	**905**	**411**	**1,322**
			1.57		*2.55*
USR EW-EXC-01A-L Shallow Excavation (0-10 ft)	380.00	BCY	595	370	969
(Note: Refer to Calculation Sheet PD-01A.)					
			0.82		*0.93*
USR EW-EXC-01A-E Shallow Excavation (0-10 ft)	380.00	BCY	310	42	353
(Note: Refer to Calculation Sheet PD-01A.)					
			126.00		*134.95*
02 Trasportation and Disposal	**720.00**	**TON**	**90,720**	**6,441**	**97,161**
			126.00		*134.95*
USR DSPNH-S Non-Hazardous Soil - Trasportation and Disposal	720.00	TON	90,720	6,441	97,161
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			3.83		*4.61*

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
03 Placement of Soil Cap	**5,040.00**	**SF**	**19,294**	**3,927**	**23,246**
			21.08		*23.90*
USR FILL-M Common Fill - M	510.00	LCY	10,750	1,441	12,191
(Note: CostWorks 2016 - 31 23 2315 4010)					
			30.50		*34.58*
USR TPSL-M Topsoil - M	140.00	LCY	4,269	572	4,841
(Note: **Vendor Quote, PC Sand and Gravel, 2015, includes delivery**)					
			0.09		*0.10*
USR SEED-M Seeding - M	5,040.00	SF	454	61	516
(Note: **Previous Work/Estimate**)					
			3.26		*5.31*
USR CMP-L Backfill and Compaction - L	380.00	ECY	1,238	770	2,016
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					
			8.17		*13.31*
USR TSLPL-L Topsoil Placement - L	140.00	LCY	1,144	711	1,863
			73.00		*118.85*
USR SEED-L Seeding - L	5.04	MSF	368	229	599
(Note: Seeding athletic fields, seeding rye, annual, 10 lb. per M.S.F., push spreader Productivity: CostWorks 2016 - 329219143300)					
			5.20		*5.92*
USR TSLPL-E Topsoil Placement - E	140.00	LCY	728	98	828
			0.90		*1.03*
USR CMP-E Backfill and Compaction - E	380.00	ECY	343	46	390
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					
			85.21		*95.10*
08 Excavation of Contaminated Soils	**26,000.00**	**BCY**	**2,215,389**	**247,330**	**2,472,569**
			38.93		*40.27*
01 Excavation Support Installation	**41,300.00**	**SF**	**1,607,816**	**48,556**	**1,662,997**
01 Labor	**1.00**	**LS**	**250,652**	**7,570**	**259,254**
			6.07		*6.28*
USR SHT-L Sheet piling, steel, 27 psf, 30' deep - L	41,300.00	SF	250,652	7,570	259,254
(Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Productivity: CostWorks 2016 - 314116101500)					
02 Equipment	**1.00**	**LS**	**73,857**	**2,230**	**76,392**
			1.79		*1.85*
USR SHT-E Sheet piling, steel, 27 psf, 30' deep - E	41,300.00	SF	73,857	2,230	76,392
(Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Productivity: CostWorks 2016 - 314116101500)					
03 Material	**1.00**	**LS**	**1,283,307**	**38,756**	**1,327,351**
			31.07		*32.14*
USR SHT-M Sheet piling, steel, 27 psf, 30' deep - M	41,300.00	SF	1,283,307	38,756	1,327,351
(Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Material Cost: CostWorks 2016 - 314116101500)					
			3.13		*4.57*
02 Contaminated Soils Excavation	**26,000.00**	**BCY**	**81,353**	**36,974**	**118,800**

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
01 Labor	**1.00**	**LS**	**53,470**	**33,238**	**87,054**
			1.57		*2.55*
USR EW-EXC-01A-L Shallow Excavation (0-10 ft) (Note: Refer to Calculation Sheet PD-01A.)	5,000.00	BCY	7,829	4,866	12,746
			2.17		*3.54*
USR EW-EXC-01B-L Deep Excavation (>10 ft) (Note: Refer to Calculation Sheet PD-01B.)	21,000.00	BCY	45,641	28,371	74,308
02 Equipment	**1.00**	**LS**	**27,883**	**3,736**	**31,746**
			0.82		*0.93*
USR EW-EXC-01A-E Shallow Excavation (0-10 ft) (Note: Refer to Calculation Sheet PD-01A.)	5,000.00	BCY	4,082	547	4,648
			1.13		*1.29*
USR EW-EXC-01B-E Deep Excavation (>10 ft) (Note: Refer to Calculation Sheet PD-01B.)	21,000.00	BCY	23,800	3,189	27,098
			40,478.48		*53,136.30*
03 Dewatering and Water Treatment	**13.00**	**MO**	**526,220**	**161,800**	**690,772**
25 Dewatering System	**1.00**	**LS**	**36,166**	**12,642**	**49,004**
(Note: Includes an initial pumping rate of 140 gpm for the first 14 days, followed by a maintenance pumping rate of 80 gpm while earthwork is carried out.)					
25.01 Labor	**1.00**	**LS**	**15,988**	**9,939**	**26,030**
			38.43		*62.57*
HTW HO-FLDTCH Field Technician (HTW Projects) (Note: Rates are based on the Kearny, New Jersey area. Source: FLCdatacenter.com.)	416.00	HR	15,988	9,939	26,030
25.02 Equipment	**1.00**	**LS**	**18,895**	**2,532**	**21,513**
			68.21		*77.66*
USR SUB-E Submersible Pump and Hoses - E (Note: Includes pump and 300 ft of hose.)	277.00	DAY	18,895	2,532	21,513
25.03 Material	**1.00**	**LS**	**1,283**	**172**	**1,460**
			0.01		*0.02*
USR TREA-ELE Electrical Consumption (Note: U.S. Energy Information Administration, October 2015)	92,200.00	KWH	1,283	172	1,460
26 Water Treatment System Installation and Startup Testing	**1.00**	**LS**	**80,028**	**10,724**	**91,115**
(Note: Includes all items required for the design, permitting, mobilization, installation, startup testing, and subsequent demobilization of the temporary water treatment system, Includes installation, startup testing, and first month rental of water treatment system.)					
26.03 Material	**1.00**	**LS**	**80,028**	**10,724**	**91,115**
			77,550.00		*88,293.47*
USR TREA-RENT Water Treatment System Rental Fee (1 Month), including Mobilization, Installation, and Startup (Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))	1.00	MO	77,550	10,392	88,293
			2,478.00		*2,821.29*
USR TREA-WTA 18,000 Gallon Weir Tank & 22,00 Gallon Frac Tank, Rental	1.00	MO	2,478	332	2,821

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: Vendor Quote - Rain for Rent, 2012. Rental Cost: $2128/month + $1008.48 for delivery/pick-up. Escalated to 2Q2016.)					
			34,168.85		*45,887.79*
27 Water Treatment System Operations and Maintenance	**12.00**	**MO**	**410,026**	**138,433**	**550,653**
(Note: Includes water treatment system operations and maintenance. Also includes rental of water treatment system after the first month.)					
27.01 Labor	**1.00**	**LS**	**171,219**	**106,433**	**278,763**
			38.43		*62.57*
HTW HO-FLDTCH Field Technician (HTW Projects)	4,455.00	HR	171,219	106,433	278,763
(Note: Rates are based on the Kearny, New Jersey area. Source: FLCdatacenter.com.)					
27.03 Material	**1.00**	**LS**	**238,807**	**32,000**	**271,890**
			40.42		*46.02*
USR TREA-CHL Sodium Hypochlorite (13%)	590.00	GAL	23,851	3,196	27,155
(Note: Vendor Quote - ScienceLab - 2012 (escalated to 2Q2016). $1881.99 / 200 L Drum)					
			0.01		*0.02*
USR TREA-ELE Electrical Consumption	99,500.00	KWH	1,384	185	1,576
(Note: U.S. Energy Information Administration, October 2015)					
			12,220.00		*13,912.91*
USR TREA-MON Water Treatment System Rental Fee (after 1 month)	12.00	MO	146,640	19,650	166,955
(Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))					
			2,478.00		*2,821.29*
USR TREA-WTA 18,000 Gallon Weir Tank & 22,000 Gallon Frac Tank, Rental	12.00	MO	29,736	3,985	33,856
(Note: Vendor Quote - Rain for Rent, 2012. Rental Cost: $2128/month + $1008.48 for delivery/pick-up. Escalated to 2Q2016.)					
			10,905.00		*12,415.74*
USR TREA-CAR Disposal of Spent Carbon	1.00	EA	10,905	1,461	12,416
(Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))					
			9,472.00		*10,784.21*
USR TREA-DMB Demobilization of Water Treatment System	1.00	EA	9,472	1,269	10,784
(Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))					
			123.05		*140.10*
USR LAB-MET Metals Lab Analysis	12.00	EA	1,477	198	1,681
(Note: Lab analysis cost based on previous work.)					
			26.75		*30.46*
USR LAB-HG Mercury, Lab Analysis	12.00	EA	321	43	365
(Note: Vendor Quote: TestAmerica.)					
			16.05		*18.27*
USR LAB-TSS TSS, Lab Analysis	12.00	EA	193	26	219
(Note: Vendor Quote: TestAmerica.)					
			16.05		*18.27*
USR LAB-TDS TDS, Lab Analysis	12.00	EA	193	26	219
(Note: Vendor Quote: TestAmerica.)					
			35.31		*40.20*
USR LAB-TOC TOC, Lab Analysis	12.00	EA	424	57	482

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: Vendor Quote: TestAmerica.)					
			968.35		*1,102.50*
USR LAB-WET Chronic Whole Effluent Toxicity, Lab Analysis	12.00	EA	11,620	1,557	13,230
(Note: Testing, biomonitoring & bioassay, chronic toxicity bioassay ceriodaphnia dubia. Material Cost: MII English Cost Book 2012 - 029110207306 (escalated to 2Q2016))					
			5.35		*6.09*
USR SHP-M Shipping Allowance, per Sample - M	12.00	EA	64	9	73
(Note: **Per Estimator**)					
USR SUPL-M Miscellaneous Sampling Supplies	1.00	LS	268	36	305
(Note: **Per Estimator** Includes paper towels, ziploc bags, and disposable gloves)					
			65.49		*74.56*
USR LAB-624 Volatile Organic Compounds	12.00	EA	786	105	895
(Note: Vendor Quote GSA Test America 2016)					
			122.92		*139.95*
USR LAB-608 Organochlorine Pesticides/PCBs	12.00	EA	1,475	198	1,679
(Note: Vendor Quote GSA Test America 2016)					
			162.50		*167.41*
09 Ex-Situ Thermal Treatment (LTTD)	**31,200.00**	**LCY**	**5,070,000**	**153,114**	**5,223,114**
			162.50		*167.41*
USR THEM-EX Ex Situ Thermal Treatment	31,200.00	LCY	5,070,000	153,114	5,223,114
(Note: Vendor Quote: GEO Environmental Remediation Company, Apr/14/2016 (average of budget estimation summary))					
			195.64		*230.38*
10 Post Excavation Sampling	**88.00**	**EA**	**17,217**	**3,047**	**20,274**
01 Labor	**1.00**	**LS**	**1,518**	**944**	**2,472**
(Note: Assume a crew of 2)					
			42.17		*68.66*
FOP FC-FLDER Field Engineer	36.00	HR	1,518	944	2,472
(Note: Rates are based on the Kearny, New Jersey area. Source: FLCdatacenter.com.)					
02 Material	**1.00**	**LS**	**15,698**	**2,104**	**17,802**
			65.00		*73.71*
USR LAB8082 Polychlorinated Biphenyls (PCBs) (soil/solid)	88.00	EA	5,720	766	6,486
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			105.00		*119.07*
USR LAB8081 Pesticides, Organochlorine (GC) (Soil)	88.00	EA	9,240	1,238	10,478
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			5.35		*6.07*
USR SHP-M Shipping Allowance, per Sample - M	88.00	EA	471	63	534
(Note: **Per Estimator**)					
USR SUPL-M Miscellaneous Sampling Supplies	1.00	LS	268	36	303
(Note: **Per Estimator** Includes paper towels, ziploc bags, and disposable gloves)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			4.42		*6.63*
11 Backfill using Treated Soil	**26,000.00**	**ECY**	**114,959**	**56,723**	**172,363**
01 Labor	**1.00**	**LS**	**84,735**	**52,673**	**137,957**
			3.26		*5.31*
USR CMP-L Backfill and Compaction - L	26,000.00	ECY	84,735	52,673	137,957
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					
02 Equipment	**1.00**	**LS**	**23,454**	**3,143**	**26,703**
			0.90		*1.03*
USR CMP-E Backfill and Compaction - E	26,000.00	ECY	23,454	3,143	26,703
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					
03 Material	**1.00**	**LS**	**6,770**	**907**	**7,703**
			797.15		*907.58*
USR LAB-TCLP TCLP Full Analytical Suite	7.00	EA	5,580	748	6,353
(Note: Lab analysis cost based on previous work.)					
			65.00		*73.71*
USR LAB8082 Polychlorinated Biphenyls (PCBs) (soil/solid)	7.00	EA	455	61	516
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			105.00		*119.07*
USR LAB8081 Pesticides, Organochlorine (GC) (Soil)	7.00	EA	735	98	833
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			1.31		*1.63*
12 Topsoil Placement and Revegetation	**46,000.00**	**SF**	**60,138**	**14,479**	**74,750**
(Note: Includes 6" of topsoil with seeding for surface restoration.)					
01 Labor	**1.00**	**LS**	**13,167**	**8,185**	**21,438**
			8.17		*13.31*
USR TSLPL-L Topsoil Placement - L	1,200.00	LCY	9,810	6,098	15,971
			73.00		*118.85*
USR SEED-L Seeding - L	46.00	MSF	3,358	2,087	5,467
(Note: Seeding athletic fields, seeding rye, annual, 10 lb. per M.S.F., push spreader Productivity: CostWorks 2016 - 329219143300)					
02 Equipment	**1.00**	**LS**	**6,237**	**836**	**7,101**
			5.20		*5.92*
USR TSLPL-E Topsoil Placement - E	1,200.00	LCY	6,237	836	7,101
03 Material	**1.00**	**LS**	**40,734**	**5,458**	**46,211**
			30.50		*34.58*
USR TPSL-M Topsoil - M	1,200.00	LCY	36,594	4,904	41,498
(Note: **Vendor Quote, PC Sand and Gravel, 2015, includes delivery**)					
			0.09		*0.10*

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
USR SEED-M Seeding - M	46,000.00	SF	4,140	555	4,714
(Note: **Previous Work/Estimate**)					
13 Deed Notice	**1.00**	**LS**	**5,593**	**2,989**	**8,613**
			59.67		*97.16*
LGL L-ASP Environmental Lawyer	40.00	HR	2,387	1,484	3,886
			28.67		*46.68*
LGL L-LARE Paralegal	60.00	HR	1,720	1,069	2,801
			24.31		*39.58*
FOP FB-CLTYP Clerks, Typists, Bookkeepers & Receptionist	20.00	HR	486	302	792
USR Miscellaneous Allowance	1.00	LS	1,000	134	1,134
(Note: **Per Estimator**)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
ALT6 Alternative 6 (Note: Building Demolition, Targeted Excavation of Soils and Offsite Disposal)	**1.00**	**LS**	**10,401,431**	**969,793**	**11,387,877**
CC Capital Costs	**1.00**	**LS**	**10,401,431**	**969,793**	**11,387,877**
01 General Conditions	**5.00**	**MO**	*169,670.73* **848,354**	**113,679**	*193,176.24* **965,881**
USR GC General Conditions	5.00	MO	*122,113.33* 610,567	81,816	*139,030.43* 695,152
USR PD Project Planning, Documents, and Submittals	1.00	LS	198,500	26,599	225,999
USR SUR Surveying	1.00	LS	39,287	5,264	44,730
02 Institutional Controls	**1.00**	**LS**	**10,121**	**6,161**	**16,347**
LGL L-ASP Environmental Lawyer	120.00	HR	*59.67* 7,161	4,451	*97.16* 11,659
LGL L-LARE Paralegal	60.00	HR	*28.67* 1,720	1,069	*46.68* 2,801
FOP FB-CLTYP Clerks, Typists, Bookkeepers & Receptionist	40.00	HR	*24.31* 972	604	*39.58* 1,583
USR REPRO-01-M Reproduction Costs for Institutional Controls (Note: Per Estimator)	1.00	LS	268	36	305
03 Community Awareness Activities (Note: Includes 1 community awareness meeting)	**1.00**	**LS**	**4,685**	**2,211**	**6,923**
FOP FA-AGENS General Superintendents (P.M.)	16.00	HR	*90.69* 1,451	902	*147.66* 2,362
FOP FA-PROJM Project Manager	16.00	HR	*120.84* 1,934	1,202	*196.75* 3,148
USR TRAV-01-M Per Diem (Note: Per Diem Rate 2016, Essex County, New Jersey)	4.00	DAY	*200.00* 800	40	*210.84* 843
USR ALLOW-COMM Community Awareness Activities Allowance (Note: Per Estimator)	1.00	LS	500	67	569
04 Mobilization/Demobilization	**1.00**	**LS**	**14,011**	**1,878**	**15,952**
USR MBDM-01 Tractor w/ Lowbed Trailer (Heavy Equipment)	3.00	EA	*1,120.83* 3,362	451	*1,276.10* 3,828
USR MBDM-02 Tractor w/ Flatbed Trailer (Large Equipment)	5.00	EA	*1,086.35* 5,432	728	*1,236.85* 6,184
USR MBDM-03 Tractor w/ Flatbed Trailer (Medium Equipment)	5.00	EA	*983.41* 4,917	659	*1,119.64* 5,598
USR Heavy Equipment Permit	3.00	EA	*100.00* 300	40	*113.85* 342

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: **Per Estimator**)					
05 Sediment and Erosion Control	**1.00**	**LS**	**7,988**	**3,999**	**12,035**
Installation	**1.00**	**LS**	**1,786**	**575**	**2,370**
01 Labor	**1.00**	**LS**	**689**	**428**	**1,121**
			0.90		*1.46*
USR SLTFEN-L Silt Fence Installation - L	600.00	LF	539	335	878
(Note: Productivity: CostWorks 2016 - 312514161000)					
			0.75		*1.22*
USR HAYB-L Hay Bales Installation - L	200.00	LF	150	93	243
(Note: Synthetic erosion control, hay bales, staked. Productivity: CostWorks 2016 -312514161250)					
02 Equipment	**1.00**	**LS**	**57**	**8**	**65**
			0.07		*0.08*
USR SLTFEN-E Silt Fence Installation - E	600.00	LF	40	5	45
(Note: Productivity: CostWorks 2016 - 312514161000)					
			0.09		*0.10*
USR HAYB-E Hay Bales Installation - E	200.00	LF	17	2	20
(Note: Synthetic erosion control, hay bales, staked. Productivity: CostWorks 2016 -312514161250)					
03 Material	**1.00**	**LS**	**1,040**	**139**	**1,184**
			0.31		*0.35*
USR SLTFEN-M Silt Fence - M	600.00	LF	186	25	212
(Note: 3' high, polypropylene. Material Cost: CostWorks 2016 - 312514161000)					
			4.27		*4.86*
USR HAYB-M Hay Bales Installation - M	200.00	LF	854	114	972
(Note: Synthetic erosion control, hay bales, staked. Material Cost: CostWorks 2016 -312514161250)					
Maintenance	**1.00**	**LS**	**6,203**	**3,424**	**9,665**
			166.14		*270.49*
USR USR-LE-ES-001-L Inspection and maintenance of erosion and sediment control measures	32.00	HR	5,316	3,305	8,656
			22.68		*25.82*
USR U-LE-ES-001-E Inspection and maintenance of erosion and sediment control measures	32.00	HR	726	97	826
			1.61		*1.83*
USR U-MT-ES-002 Silt Fence - Erosion and sediment control maintenance allowance	100.00	LF	161	22	183
(Note: Assumes a percentage of original silt fence would require replacement.)					
06 Demolition of Structures	**1.00**	**LS**	**735,636**	**74,911**	**810,892**
01 Building Inspection	**1.00**	**LS**	**3,133**	**1,857**	**5,011**
(Note: Assumes 20 hours for structural integrity inspection of buildings.)					
13.01.01 Labor	**1.00**	**LS**	**2,948**	**1,833**	**4,800**

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
USR BUILD-INS-L Building Inspection - L	20.00	HR	*147.41* 2,948	1,833	*240.00* 4,800
13.01.02 Equipment	**1.00**	**LS**	**185**	**25**	**211**
USR BUILD-INS-E Building Inspection - E	20.00	HR	*9.25* 185	25	*10.53* 211
02 Demolition	**2,070.00**	**CY**	*27.20* **56,303**	**25,043**	*39.45* **81,671**
USR SW-BLDG-DEM-L Building Demolition (Note: Productivity: CostWorks 2016 - 024116130600 and 024116130650 (average of concrete and masonry demolition productivities). Includes water truck for keeping all materials "adequately wet" per NESHAP.)	2,070.00	CY	*17.34* 35,886	22,307	*28.22* 58,426
USR SW-BLDG-DEM-E Building Demolition (Note: Productivity: CostWorks 2016 - 024116130600 and 024116130650 (average of concrete and masonry demolition productivities). Includes water truck for keeping all materials "adequately wet" per NESHAP.)	2,070.00	CY	*9.86* 20,417	2,736	*11.23* 23,245
03 Transportation and Disposal	**3,900.00**	**TON**	*173.38* **676,200**	**48,010**	*185.69* **724,210**
USR DSPTSCA-D TSCA C&D - Trasportation and Disposal (Note: Vendor Quote: Sea Coast, Apr 07 2016)	1,500.00	TON	*238.00* 357,000	25,347	*254.90* 382,347
USR DSPNH-D Non-Hazardous C&D - Trasportation and Disposal (Note: Vendor Quote: Sea Coast, Apr 07 2016)	2,400.00	TON	*133.00* 319,200	22,663	*142.44* 341,863
07 Excavation and Soil Cap within JCMUA Pipeline Easement	**5,040.00**	**SF**	*22.01* **110,920**	**10,779**	*24.15* **121,729**
01 Excavation	**380.00**	**BCY**	*2.38* **905**	**411**	*3.48* **1,322**
USR EW-EXC-01A-L Shallow Excavation (0-10 ft) (Note: Refer to Calculation Sheet PD-01A.)	380.00	BCY	*1.57* 595	370	*2.55* 969
USR EW-EXC-01A-E Shallow Excavation (0-10 ft) (Note: Refer to Calculation Sheet PD-01A.)	380.00	BCY	*0.82* 310	42	*0.93* 353
02 Trasportation and Disposal	**720.00**	**TON**	*126.00* **90,720**	**6,441**	*134.95* **97,161**
USR DSPNH-S Non-Hazardous Soil - Trasportation and Disposal (Note: Vendor Quote: Sea Coast, Apr 07 2016)	720.00	TON	*126.00* 90,720	6,441	*134.95* 97,161
03 Placement of Soil Cap	**5,040.00**	**SF**	*3.83* **19,294**	**3,927**	*4.61* **23,246**

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			21.08		*23.90*
USR FILL-M Common Fill - M (Note: CostWorks 2016 - 31 23 2315 4010)	510.00	LCY	10,750	1,441	12,191
			30.50		*34.58*
USR TPSL-M Topsoil - M (Note: **Vendor Quote, PC Sand and Gravel, 2015, includes delivery**)	140.00	LCY	4,269	572	4,841
			0.09		*0.10*
USR SEED-M Seeding - M (Note: **Previous Work/Estimate**)	5,040.00	SF	454	61	516
			3.26		*5.31*
USR CMP-L Backfill and Compaction - L (Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)	380.00	ECY	1,238	770	2,016
			8.17		*13.31*
USR TSLPL-L Topsoil Placement - L	140.00	LCY	1,144	711	1,863
			73.00		*118.85*
USR SEED-L Seeding - L (Note: Seeding athletic fields, seeding rye, annual, 10 lb. per M.S.F., push spreader Productivity: CostWorks 2016 - 329219143300)	5.04	MSF	368	229	599
			5.20		*5.92*
USR TSLPL-E Topsoil Placement - E	140.00	LCY	728	98	828
			0.90		*1.03*
USR CMP-E Backfill and Compaction - E (Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)	380.00	ECY	343	46	390
			95.88		*105.47*
08 Excavation of Contaminated Soils	**21,000.00**	**BCY**	**2,013,570**	**192,536**	**2,214,930**
			38.93		*40.27*
01 Excavation Support Installation	**41,300.00**	**SF**	**1,607,816**	**48,556**	**1,662,997**
01 Labor	**1.00**	**LS**	**250,652**	**7,570**	**259,254**
			6.07		*6.28*
USR SHT-L Sheet piling, steel, 27 psf, 30' deep - L (Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Productivity: CostWorks 2016 - 314116101500)	41,300.00	SF	250,652	7,570	259,254
02 Equipment	**1.00**	**LS**	**73,857**	**2,230**	**76,392**
			1.79		*1.85*
USR SHT-E Sheet piling, steel, 27 psf, 30' deep - E (Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Productivity: CostWorks 2016 - 314116101500)	41,300.00	SF	73,857	2,230	76,392
03 Material	**1.00**	**LS**	**1,283,307**	**38,756**	**1,327,351**
			31.07		*32.14*
USR SHT-M Sheet piling, steel, 27 psf, 30' deep - M (Note: Sheet piling, 27 psf, 30' excavation, left in place, excludes wales. 20' productivity adjusted to 30'. Material Cost: CostWorks 2016 - 314116101500)	41,300.00	SF	1,283,307	38,756	1,327,351
			3.09		*4.51*

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
02 Contaminated Soils Excavation	**21,000.00**	**BCY**	**64,819**	**29,460**	**94,656**
01 Labor	**1.00**	**LS**	**42,603**	**26,483**	**69,362**
			1.57		*2.55*
USR EW-EXC-01A-L Shallow Excavation (0-10 ft) (Note: Refer to Calculation Sheet PD-01A.)	5,000.00	BCY	7,829	4,866	12,746
			2.17		*3.54*
USR EW-EXC-01B-L Deep Excavation (>10 ft) (Note: Refer to Calculation Sheet PD-01B.)	16,000.00	BCY	34,774	21,616	56,616
02 Equipment	**1.00**	**LS**	**22,216**	**2,977**	**25,294**
			0.82		*0.93*
USR EW-EXC-01A-E Shallow Excavation (0-10 ft) (Note: Refer to Calculation Sheet PD-01A.)	5,000.00	BCY	4,082	547	4,648
			1.13		*1.29*
USR EW-EXC-01B-E Deep Excavation (>10 ft) (Note: Refer to Calculation Sheet PD-01B.)	16,000.00	BCY	18,134	2,430	20,646
			68,187.00		*91,455.37*
03 Dewatering and Water Treatment	**5.00**	**MO**	**340,935**	**114,520**	**457,277**
25 Dewatering System	**1.00**	**LS**	**19,773**	**6,960**	**26,840**
(Note: Includes an initial pumping rate of 140 gpm for the first 14 days, followed by a maintenance pumping rate of 80 gpm while earthwork is carried out.)					
25.01 Labor	**1.00**	**LS**	**8,840**	**5,495**	**14,392**
			38.43		*62.57*
HTW HO-FLDTCH Field Technician (HTW Projects) (Note: Rates are based on the Kearny, New Jersey area. Source: FLCdatacenter.com.)	230.00	HR	8,840	5,495	14,392
25.02 Equipment	**1.00**	**LS**	**10,437**	**1,399**	**11,883**
			68.21		*77.66*
USR SUB-E Submersible Pump and Hoses - E (Note: Includes pump and 300 ft of hose.)	153.00	DAY	10,437	1,399	11,883
25.03 Material	**1.00**	**LS**	**497**	**67**	**565**
			0.01		*0.02*
USR TREA-ELE Electrical Consumption (Note: U.S. Energy Information Administration, October 2015)	35,700.00	KWH	497	67	565
26 Water Treatment System Installation and Startup Testing	**1.00**	**LS**	**80,028**	**10,724**	**91,115**
(Note: Includes all items required for the design, permitting, mobilization, installation, startup testing, and subsequent demobilization of the temporary water treatment system, Includes installation, startup testing, and first month rental of water treatment system.)					
26.03 Material	**1.00**	**LS**	**80,028**	**10,724**	**91,115**
			77,550.00		*88,293.47*
USR TREA-RENT Water Treatment System Rental Fee (1 Month), including Mobilization, Installation, and Startup (Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))	1.00	MO	77,550	10,392	88,293

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			2,478.00		*2,821.29*
USR TREA-WTA 18,000 Gallon Weir Tank & 22,00 Gallon Frac Tank, Rental	1.00	MO	2,478	332	2,821
(Note: Vendor Quote - Rain for Rent, 2012. Rental Cost: $2128/month + $1008.48 for delivery/pick-up. Escalated to 2Q2016.)					
			80,378.01		*113,107.41*
27 Water Treatment System Operations and Maintenance	**3.00**	**MO**	**241,134**	**96,836**	**339,322**
(Note: Includes water treatment system operations and maintenance. Also includes rental of water treatment system after the first month.)					
27.01 Labor	**1.00**	**LS**	**132,325**	**82,256**	**215,439**
			38.43		*62.57*
HTW HO-FLDTCH Field Technician (HTW Projects)	3,443.00	HR	132,325	82,256	215,439
(Note: Rates are based on the Kearny, New Jersey area. Source: FLCdatacenter.com.)					
27.03 Material	**1.00**	**LS**	**108,809**	**14,580**	**123,883**
			40.42		*46.02*
USR TREA-CHL Sodium Hypochlorite (13%)	590.00	GAL	23,851	3,196	27,155
(Note: Vendor Quote - ScienceLab - 2012 (escalated to 2Q2016). $1881.99 / 200 L Drum)					
			0.01		*0.02*
USR TREA-ELE Electrical Consumption	99,500.00	KWH	1,384	185	1,576
(Note: U.S. Energy Information Administration, October 2015)					
			12,220.00		*13,912.91*
USR TREA-MON Water Treatment System Rental Fee (after 1 month)	4.00	MO	48,880	6,550	55,652
(Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))					
			2,478.00		*2,821.29*
USR TREA-WTA 18,000 Gallon Weir Tank & 22,000 Gallon Frac Tank, Rental	4.00	MO	9,912	1,328	11,285
(Note: Vendor Quote - Rain for Rent, 2012. Rental Cost: $2128/month + $1008.48 for delivery/pick-up. Escalated to 2Q2016.)					
			10,905.00		*12,415.74*
USR TREA-CAR Disposal of Spent Carbon	1.00	EA	10,905	1,461	12,416
(Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))					
			9,472.00		*10,784.21*
USR TREA-DMB Demobilization of Water Treatment System	1.00	EA	9,472	1,269	10,784
(Note: Vendor Quote - Carbonair, 2012 (escalated to 2Q2016))					
			123.05		*140.10*
USR LAB-MET Metals Lab Analysis	3.00	EA	369	49	420
(Note: Lab analysis cost based on previous work.)					
			26.75		*30.46*
USR LAB-HG Mercury, Lab Analysis	3.00	EA	80	11	91
(Note: Vendor Quote: TestAmerica.)					
			16.05		*18.27*
USR LAB-TSS TSS, Lab Analysis	3.00	EA	48	6	55
(Note: Vendor Quote: TestAmerica.)					
			16.05		*18.27*
USR LAB-TDS TDS, Lab Analysis	3.00	EA	48	6	55
(Note: Vendor Quote: TestAmerica.)					

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			35.31		*40.20*
USR LAB-TOC TOC, Lab Analysis	3.00	EA	106	14	121
(Note: Vendor Quote: TestAmerica.)					
			968.35		*1,102.50*
USR LAB-WET Chronic Whole Effluent Toxicity, Lab Analysis	3.00	EA	2,905	389	3,308
(Note: Testing, biomonitoring & bioassay, chronic toxicity bioassay ceriodaphnia dubia. Material Cost: MII English Cost Book 2012 - 029110207306 (escalated to 2Q2016))					
			5.35		*6.09*
USR SHP-M Shipping Allowance, per Sample - M	3.00	EA	16	2	18
(Note: **Per Estimator**)					
USR SUPL-M Miscellaneous Sampling Supplies	1.00	LS	268	36	305
(Note: **Per Estimator** Includes paper towels, ziploc bags, and disposable gloves)					
			65.49		*74.56*
USR LAB-624 Volatile Organic Compounds	3.00	EA	196	26	224
(Note: Vendor Quote GSA Test America 2016)					
			122.92		*139.95*
USR LAB-608 Organochlorine Pesticides/PCBs	3.00	EA	369	49	420
(Note: Vendor Quote GSA Test America 2016)					
			200.33		*214.56*
09 Transportation and Disposal of Contaminated Soils	**29,400.00**	**TON**	**5,889,800**	**418,176**	**6,307,976**
			760.00		*813.96*
USR DSPHAZ RCRA/TSCA Soil - Trasportation and Disposal	1,400.00	TON	1,064,000	75,544	1,139,544
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			229.00		*245.26*
USR DSPTSCA-S TSCA Soil - Trasportation and Disposal	12,600.00	TON	2,885,400	204,863	3,090,263
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			126.00		*134.95*
USR DSPNH-S Non-Hazardous Soil - Trasportation and Disposal	15,400.00	TON	1,940,400	137,768	2,078,168
(Note: Vendor Quote: Sea Coast, Apr 07 2016)					
			195.64		*230.38*
10 Post Excavation Sampling	**88.00**	**EA**	**17,217**	**3,047**	**20,274**
01 Labor	**1.00**	**LS**	**1,518**	**944**	**2,472**
(Note: Assume a crew of 2)					
			42.17		*68.66*
FOP FC-FLDER Field Engineer	36.00	HR	1,518	944	2,472
(Note: Rates are based on the Kearny, New Jersey area. Source: FLCdatacenter.com.)					
02 Material	**1.00**	**LS**	**15,698**	**2,104**	**17,802**
			65.00		*73.71*
USR LAB8082 Polychlorinated Biphenyls (PCBs) (soil/solid)	88.00	EA	5,720	766	6,486
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			105.00		*119.07*
USR LAB8081 Pesticides, Organochlorine (GC) (Soil)	88.00	EA	9,240	1,238	10,478

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			5.35		*6.07*
USR SHP-M Shipping Allowance, per Sample - M	88.00	EA	471	63	534
(Note: **Per Estimator**)					
USR SUPL-M Miscellaneous Sampling Supplies	1.00	LS	268	36	303
(Note: **Per Estimator** Includes paper towels, ziploc bags, and disposable gloves)					
			32.54		*38.65*
11 Clean Backfill Placement	**21,000.00**	**ECY**	**683,398**	**124,948**	**811,575**
01 Labor	**1.00**	**LS**	**68,440**	**42,544**	**111,427**
			3.26		*5.31*
USR CMP-L Backfill and Compaction - L	21,000.00	ECY	68,440	42,544	111,427
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					
02 Equipment	**1.00**	**LS**	**18,944**	**2,538**	**21,568**
			0.90		*1.03*
USR CMP-E Backfill and Compaction - E	21,000.00	ECY	18,944	2,538	21,568
(Note: Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller. Productivity: CostWorks 2016 - 312323132200)					
03 Material	**1.00**	**LS**	**596,015**	**79,866**	**678,580**
			21.08		*24.00*
USR FILL-M Common Fill - M	28,000.00	LCY	590,212	79,088	671,978
(Note: CostWorks 2016 - 31 23 2315 4010)					
			797.15		*907.58*
USR LAB-TCLP TCLP Full Analytical Suite	6.00	EA	4,783	641	5,446
(Note: Lab analysis cost based on previous work.)					
			65.00		*73.71*
USR LAB8082 Polychlorinated Biphenyls (PCBs) (soil/solid)	6.00	EA	390	52	442
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			105.00		*119.07*
USR LAB8081 Pesticides, Organochlorine (GC) (Soil)	6.00	EA	630	84	714
(Note: Vendor Quote, Pace Analytical, April 12 2016)					
			1.31		*1.63*
12 Topsoil Placement and Revegetation	**46,000.00**	**SF**	**60,138**	**14,479**	**74,750**
(Note: Includes 6" of topsoil with seeding for surface restoration.)					
01 Labor	**1.00**	**LS**	**13,167**	**8,185**	**21,438**
			8.17		*13.31*
USR TSLPL-L Topsoil Placement - L	1,200.00	LCY	9,810	6,098	15,971
			73.00		*118.85*
USR SEED-L Seeding - L	46.00	MSF	3,358	2,087	5,467
(Note: Seeding athletic fields, seeding rye, annual, 10 lb. per M.S.F., push spreader Productivity: CostWorks 2016 - 329219143300)					
02 Equipment	**1.00**	**LS**	**6,237**	**836**	**7,101**

Description	Quantity	UOM	CostToPrime	PrimeCMU	ProjectCost
			5.20		*5.92*
USR TSLPL-E Topsoil Placement - E	1,200.00	LCY	6,237	836	7,101
03 Material	**1.00**	**LS**	**40,734**	**5,458**	**46,211**
			30.50		*34.58*
USR TPSL-M Topsoil - M	1,200.00	LCY	36,594	4,904	41,498
(Note: **Vendor Quote, PC Sand and Gravel, 2015, includes delivery**)					
			0.09		*0.10*
USR SEED-M Seeding - M	46,000.00	SF	4,140	555	4,714
(Note: **Previous Work/Estimate**)					
13 Deed Notice	**1.00**	**LS**	**5,593**	**2,989**	**8,613**
			59.67		*97.16*
LGL L-ASP Environmental Lawyer	40.00	HR	2,387	1,484	3,886
			28.67		*46.68*
LGL L-LARE Paralegal	60.00	HR	1,720	1,069	2,801
			24.31		*39.58*
FOP FB-CLTYP Clerks, Typists, Bookkeepers & Receptionist	20.00	HR	486	302	792
USR Miscellaneous Allowance	1.00	LS	1,000	134	1,134
(Note: **Per Estimator**)					

Calculations

PROJECT:	Unimatic FS - Final	COMPUTED BY :	AIS	CHECKED BY:	EW
JOB NO.:	107382.6424.023.005.DFFS	DATE :	4/11/2016	DATE CHECKED:	4/14/2016
CLIENT:	US EPA Region 2			PAGE NO. :	GA

Description: General Assumptions for Unimatic FS Detailed Cost Estimate

General Assumptions

Estimated Work Week and Work Day Duration

Days per work week:	**5**		
Hours per workday:	**8**		

Assumed Material Properties

BCY - bank cubic yard - in place volume prior to excavation
LCY - loose cubic yards - volume after excavation
ECY - embankment cubic yards (aka compacted cubic yards) - volume after compaction

Common Earth Bulking Factor:	1.20	*Conversion from BCY to LCY*	*CAT Handbook*
Common Earth Compaction Factor:	0.90	*Conversion from BCY to ECY*	*CAT Handbook*
Common Earth Compaction Factor:	0.75	*Conversion from LCY to ECY*	
Unit weight of common earth, LB/BCY:	2997		
Unit weight of common earth, LB/LCY:	2498		
Concrete Demolition Debris Bulking Factor:	1.30	*Conversion from BCY to LCY*	
Density of Concrete Debris, LB/LCY:	1,855		
Density of Concrete Debris, TON/LCY:	0.93		
Density of Concrete Debris, TON/CY:	2.00		
Density of Asphalt, TON/CY:	2.05		

Assumed Testing Frequency

Assumed Lift Thickness, IN:	**6**
Compaction Testing Frequency, EA/SF/LIFT:	**10,000**

Description: Alternative 2 – Building Demolition, Excavation to Water Table, Offsite Disposal, In Situ Solidification/Stabilization, and Capping. Quantity calculations for Alternative 2

Capital Costs			
Assumed Duration of Alternative 2, MO:	5		
Assumed Duration of Alternative 2, DY:	153		
Assumed Duration of Alternative 2, WK:	22		
General Requirements			
Cost Basis, MO:	12		
Cost Basis, DY:	260		
Cost Basis, HR:	2080		
Cost Basis:	Syncon Resins Superfund Site OU2		
Project Dedicated Supervisory Staff and Equipment:	$735,634	$2,829	
Per Diem:	$156,000	$600	
Safety and Health Requirements:	$107,936	$415	
Temporary Facilities	$174,819	$672	
Perimeter Air Monitoring:	$26,626	$102	
Site Security:	$264,261	$1,016	
		$5,636	per day
Project Deliverables:	$198,500	**$198,500**	Lump Sum
Surveying:	$94,288	**$39,287**	Lump Sum
Institutional Controls			
Environmental Lawyer, HR:	120		
Paralegal, HR:	60		
Admin Clerk, HR:	40		
Reproduction Costs for Institutional Controls, LS:	1		
Community Awareness Activities			
Number of Community Awareness Meetings, EA:	1		
General Superintendent, HR:	16		
Project Manager, HR:	16		
Per Diem, DY:	4		
Community Awareness Activities Allowance, LS:	1		
Mobilization/Demobilization			
Mobilization/Demobilization of Heavy Equipment, EA:	3		
Mobilization/Demobilization of Large Equipment, EA:	5		
Mobilization/Demobilization of Medium Equipment, EA:	5		
Sediment and Erosion Control			
Silt Fence Installation, LF:	600		
Hay Bales Installation, LF:	200		
Inspection and Maintenance, HR:	32		
Demolition of Structures			
Building Inspection, HR:	20		
Demolition			
Assumed Demolition Debris from Buildings, CY:	2070	*Refer Table 2-5*	
Assumed Demolition Debris from Buildings, TON:	3900	*Refer Table 2-5*	
Disposal at Local Landfill	CY	TON	
Demolition Debris for Disposal, TSCA:	800	1500	*Refer Table 2-5*
Demolition Debris for Disposal, Non-TSCA:	1270	2400	*Refer Table 2-5*
		3900	

Description: Alternative 2 – Building Demolition, Excavation to Water Table, Offsite Disposal, In Situ Solidification/Stabilization, and Capping. Quantity calculations for Alternative 2

Excavation and Soil Cap within JCMUA Pipeline Easement

Area of JCMUA Pipeline Easement, SF:	5040	*120' x 42'*
Depth of Excavation, FT:	2	
Total Volume of Excavation, BCY:	380	
Total Volume of Excavation, TON:	720	
Backfill Placement, ECY:	380	
Backfill Placement, LCY:	510	
Thickness of Topsoil, FT:	0.5	
Area of Excavation, SF:	5040	
Total Volume of Topsoil, ECY:	100	
Total Volume of Topsoil, LCY:	140	

Excavation of Contaminated Soils

Excavation Support - Sheeting Installation

	Perimeter (LF)	Depth (FT)	Area (SF)	Note
Excavation Area 1A	240	14	3360	
Excavation Area 1B	195	14	2730	*Shares with Area 2*
Excavation Area 2	910	15	13650	
Excavation Area 3	0	30	0	
Excavation Area 4	60	15	900	*Shares with Area 2*
Excavation Area 5	65	15	975	
Excavation Area 6	0	40	0	
			21700	

Contaminated Soils Excavation

Hazardous Waste Soil, BCY:	1000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (>50 mg/kg), BCY:	6300	*Refer Table 2-5*
Non-hazardous Waste with PCBs (10 to 50 mg/kg), BCY:	2700	*Refer Table 2-5*
Non-hazardous Waste with PCBs (1 to 10 mg/kg), BCY:	0	*Refer Table 2-5*
Total Volume of Contaminated Soil, BCY:	**10000**	
Volume of Excavation at Depths 0-10 Feet, BCY:	**2000**	
Volume of Excavation at Depths >10 Feet, BCY:	**8000**	

Transportation and Disposal of Contaminated Soils

Hazardous Waste Soil, TON:	1400	*Refer Table 2-5*
Non-hazardous Waste with PCBs (>50 mg/kg), TON:	12600	*Refer Table 2-5*
Non-hazardous Waste with PCBs (10 to 50 mg/kg), TON:	4200	*Refer Table 2-5*
Non-hazardous Waste with PCBs (1 to 10 mg/kg), TON:	0	*Refer Table 2-5*
RCRA/TSCA Soil, TON:	1400	
TSCA Soil, TON:	12600	
Non RCRA, Non TSCA Soil, TON:	4200	
	18200	

Post Excavation Sampling

Total Area of Sidewall, SF:	21700	
Total Area of Base of Excavation, SF:	30000	*Refer Table 2-5*
Total Area to be Sampled, SF:	51700	
Assumed Frequency of Sampling, EA/SF:	1000	
Total Number of Samples, EA:	**52**	
Assume Number of Samples per Hr:	5	
Total Number of Hrs:	10	

Description: Alternative 2 – Building Demolition, Excavation to Water Table, Offsite Disposal, In Situ Solidification/Stabilization, and Capping. Quantity calculations for Alternative 2

Consolidated of Contaminated Soil within Excavated Areas

Volume of Soil to be Consolidated, BCY:	8000	*Refer Table 2-5*
Volume of Soil to be Consolidated, LCY:	9600	
Volume of Soil to be Consolidated, ECY:	7200	

Backfill of Excavated Areas

Backfill Placement, ECY:	8000	*Assume 20% less due to Swell during ISS*
Backfill Placement, LCY:	10700	
Assumed Number of Samples, EA/LCY:	5000	
Total Number of Sample, EA:	3	
Marker Barrier Layer, SF:	46000	

Topsoil Placement and Revegetation

Thickness of Topsoil, FT:	0.5
Area of Excavation, SF:	46000
Total Volume of Topsoil, ECY:	860
Total Volume of Topsoil, LCY:	1,200

Deed Notice

Environmental Lawyer, HR:	40
Paralegal, HR:	60
Admin Clerk, HR:	20

Annual O&M Costs

Cap Maintenance

Number of Maintenance Events per Year, EA/YR:	4
Days per Maintenance Event, DY/EA:	1
Maintenance Days per Year, DY:	**4**

Periodic Costs

Long-Term Groundwater Monitoring

Well casing ID assumed, IN: 4

Well ID	Depth (VLF)	Grout (CF)	
MW-1	30.02	2.7	*Table 2-4, RI Report*
MW-3	29.16	2.6	*Table 2-4, RI Report*
MW-4	23.72	2.1	*Table 2-4, RI Report*
MW-4A	36.22	3.2	*Table 2-4, RI Report*
MW-4B	55.1	4.9	*Table 2-4, RI Report*
MW-5	26.53	2.4	*Table 2-4, RI Report*
MW-6	26.43	2.4	*Table 2-4, RI Report*
MW-7	16.81	1.5	*Table 2-4, RI Report*
MW-8	20.06	1.8	*Table 2-4, RI Report*
MW-9	19.19	1.7	*Table 2-4, RI Report*
MW-10	18.03	1.6	*Table 2-4, RI Report*
	310	**30**	

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Description: Alternative 3 – Building Demolition and Offsite Disposal, In Situ Solidification/Stabilization and Capping. Quantity calculations for Alternative 3

Capital Costs				
Assumed Duration of Alternative 3, MO:	4			
Assumed Duration of Alternative 3, DY:	122			
Assumed Duration of Alternative 3, WK:	18			
General Requirements				
Cost Basis, MO:	12			
Cost Basis, DY:	260			
Cost Basis, HR:	2080			
Cost Basis:	Syncon Resins Superfund Site OU2			
Project Dedicated Supervisory Staff and Equipment:	$735,634	$2,829		
Per Diem:	$156,000	$600		
Safety and Health Requirements:	$107,936	$415		
Temporary Facilities	$174,819	$672		
Perimeter Air Monitoring:	$26,626	$102		
Site Security:	$264,261	$1,016		
		$5,636	per day	
Project Deliverables:	$198,500	**$198,500**	Lump Sum	
Surveying:	$94,288	**$31,429**	Lump Sum	
Institutional Controls				
Environmental Lawyer, HR:	120			
Paralegal, HR:	60			
Admin Clerk, HR:	40			
Reproduction Costs for Institutional Controls, LS:	1			
Community Awareness Activities				
Number of Community Awareness Meetings, EA:	1			
General Superintendent, HR:	16			
Project Manager, HR:	16			
Per Diem, DY:	4			
Community Awareness Activities Allowance, LS:	1			
Mobilization/Demobilization				
Mobilization/Demobilization of Heavy Equipment, EA:	3			
Mobilization/Demobilization of Large Equipment, EA:	5			
Mobilization/Demobilization of Medium Equipment, EA:	5			
Sediment and Erosion Control (*Refer CALC-ALT-2*)				
Demolition of Structures				
Building Inspection, HR:	20			
Demolition				
Assumed Demolition Debris from Buildings, CY:	2070	*Refer Table 2-5*		
Assumed Demolition Debris from Buildings, TON:	3900	*Refer Table 2-5*		
Disposal at Local Landfill	CY	TON		
Demolition Debris for Disposal, TSCA:	800	1500	*Refer Table 2-5*	
Demolition Debris for Disposal, Non-TSCA:	1270	2400	*Refer Table 2-5*	
		3900		
Excavation and Soil Cap within JCMUA Pipeline Easement				
Area of JCMUA Pipeline Easement, SF:	5040	*120' x 42'*		
Depth of Excavation, FT:	2			
Total Volume of Excavation, BCY:	380			
Total Volume of Excavation, TON:	720			
Backfill Placement, ECY:	380			
Backfill Placement, LCY:	510			

Description: Alternative 3 – Building Demolition and Offsite Disposal, In Situ Solidification/Stabilization and Capping. Quantity calculations for Alternative 3

Thickness of Topsoil, FT:	0.5	
Area of Excavation, SF:	5040	
Total Volume of Topsoil, ECY:	100	
Total Volume of Topsoil, LCY:	140	

Placement for Soil Cap

Thickness of Soil Cap, FT:	0.84	*10-inch*
Area of Cap, SF:	46000	
Backfill Placement, ECY:	1500	
Backfill Placement, LCY:	2000	
Assumed Number of Samples, EA/LCY:	5000	
Total Number of Sample, EA:	1	
Marker Barrier Layer, SF:	46000	

Topsoil Placement and Revegetation

Thickness of Topsoil, FT:	0.5
Area of Cap, SF:	46000
Total Volume of Topsoil, ECY:	860
Total Volume of Topsoil, LCY:	1,200

Deed Notice

Environmental Lawyer, HR:	40
Paralegal, HR:	60
Admin Clerk, HR:	20

Annual O&M Costs

Cap Maintenance

Number of Maintenance Events per Year, EA/YR:	4
Days per Maintenance Event, DY/EA:	1
Maintenance Days per Year, DY:	**4**

Description: Alternative 4 – Building Demolition, Excavation and Offsite Disposal. Quantity calculations for Alternative 4

Capital Costs

Assumed Duration of Alternative 4, MO:	5		
Assumed Duration of Alternative 4, DY:	153		
Assumed Duration of Alternative 4, WK:	22		
General Requirements			
Cost Basis, MO:	12		
Cost Basis, DY:	260		
Cost Basis, HR:	2080		
Cost Basis:	Syncon Resins Superfund Site OU2		
Project Dedicated Supervisory Staff and Equipment:	$735,634	$2,829	
Per Diem:	$156,000	$600	
Safety and Health Requirements:	$107,936	$415	
Temporary Facilities	$174,819	$672	
Perimeter Air Monitoring:	$26,626	$102	
Site Security:	$264,261	$1,016	
		$5,636	per day
Project Deliverables:	$198,500	**$198,500**	Lump Sum
Surveying:	$94,288	**$39,287**	Lump Sum
Institutional Controls			
Environmental Lawyer, HR:	120		
Paralegal, HR:	60		
Admin Clerk, HR:	40		
Reproduction Costs for Institutional Controls, LS:	1		
Community Awareness Activities			
Number of Community Awareness Meetings, EA:	1		
General Superintendent, HR:	16		
Project Manager, HR:	16		
Per Diem, DY:	4		
Community Awareness Activities Allowance, LS:	1		
Mobilization/Demobilization			
Mobilization/Demobilization of Heavy Equipment, EA:	3		
Mobilization/Demobilization of Large Equipment, EA:	5		
Mobilization/Demobilization of Medium Equipment, EA:	5		
Sediment and Erosion Control (Refer CALC-ALT-2)			
Demolition of Structures Building Inspection, HR:	20		
Demolition			
Assumed Demolition Debris from Buildings, CY:	2070	*Refer Table 2-5*	
Assumed Demolition Debris from Buildings, TON:	3900	*Refer Table 2-5*	
Disposal at Local Landfill	CY	TON	
Demolition Debris for Disposal, TSCA:	800	1500	*Refer Table 2-5*
Demolition Debris for Disposal, Non-TSCA:	1270	2400	*Refer Table 2-5*
		3900	
Excavation and Soil Cap within JCMUA Pipeline Easement			
Area of JCMUA Pipeline Easement, SF:	5040	*120' x 42'*	
Depth of Excavation, FT:	2		
Total Volume of Excavation, BCY:	380		
Total Volume of Excavation, TON:	720		
Backfill Placement, ECY:	380		
Backfill Placement, LCY:	510		
Thickness of Topsoil, FT:	0.5		
Area of Excavation, SF:	5040		
Total Volume of Topsoil, ECY:	100		
Total Volume of Topsoil, LCY:	140		

Description: Alternative 4 – Building Demolition, Excavation and Offsite Disposal. Quantity calculations for Alternative 4

Excavation of Contaminated Soils

Excavation Support - Sheeting Installation

	Perimeter (LF)	Depth (FT)	Area (SF)	Note
Excavation Area 1A	240	14	3360	
Excavation Area 1B	195	14	2730	*Shares with Area 2*
Excavation Area 2	910	22	20020	
Excavation Area 3	100	30	3000	
Excavation Area 4	210	32	6720	*Shares with Area 2*
Excavation Area 5	65	34	2210	
Excavation Area 6	80	40	3200	
			41300	

Contaminated Soils Excavation

Hazardous Waste Soil, BCY:	1000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (>50 mg/kg), BCY:	9000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (10 to 50 mg/kg), BCY:	3000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (1 to 10 mg/kg), BCY:	13000	*Refer Table 2-5*
Total Volume of Contaminated Soil, BCY:	**26000**	
Volume of Excavation at Depths 0-10 Feet, BCY:	**5000**	
Volume of Excavation at Depths >10 Feet, BCY:	**21000**	

Dewatering

Total Pumping

Total Duration, DAY:	153	
Total Duration, WK:	22	
Total Duration, MO:	5	
Hours of Operation, HR:	**3,672**	

Electrical Use

Energy equivalent, HP-HR to kW-HR:	0.746	
Assumed pump efficiency, %:	50%	
Number of sump pumps, EA:	1	
HP for sump pumps, HP:	6.5	
Submersible pump, HP-HR:	**23,868**	
Equivalent electrical consumption, kW-HR:	**35,700**	

Operator Oversight

Dewatering Operation, DAY:	153	
Operator for Dewatering, HR/DAY:	1.5	*Assumed, for fueling pumps, moving lines, etc.*
Operator for Treatment System Operation, HR/DAY:	22.5	*Operator present for 24hr. minus time for dewatering*
Operator / Tech (for Dewatering), HR:	**230**	

Water Treatment System Installation and Startup Testing

Water Treatment System Rental, MO:	1	*Includes installation and first month rental*
18,000 Gallon Weir Tank Rental, MO:	1	*Includes first month rental*
22,000 Gallon Frac Tank Rental, MO:	1	*Includes first month rental*
Water Treatment System Rental, MO:	4	*Includes rental after first month*
18,000 Gallon Weir Tank Rental, MO:	4	*Includes rental after first month*
22,000 Gallon Frac Tank Rental, MO:	4	*Includes rental after first month*

Operator Oversight

Treatment System Operation, DAY:	153	
Operator for Dewatering, HR/DAY:	1.5	*Assumed, for fueling pumps, moving lines, etc.*
Operator for Treatment System Operation, HR/DAY:	22.5	
Operator / Tech, HR:	**3,443**	

Description: Alternative 4 – Building Demolition, Excavation and Offsite Disposal. Quantity calculations for Alternative 4

Transportation and Disposal of Contaminated Soils

Hazardous Waste Soil, TON:	1400	*Refer Table 2-5*
Non-hazardous Waste with PCBs (>50 mg/kg), TON:	12600	*Refer Table 2-5*
Non-hazardous Waste with PCBs (10 to 50 mg/kg), TON:	4200	*Refer Table 2-5*
Non-hazardous Waste with PCBs (1 to 10 mg/kg), TON:	18200	*Refer Table 2-5*
RCRA/TSCA Soil, TON:	1400	
TSCA Soil, TON:	12600	
Non RCRA, Non TSCA Soil, TON:	22400	
	36400	

Post Excavation Sampling

Total Area of Sidewall, SF:	41300	
Total Area of Base of Excavation, SF:	46000	*Refer Table 2-5*
Total Area to be Sampled, SF:	87300	
Assumed Frequency of Sampling, EA/SF:	1000	
Total Number of Samples, EA:	**88**	
Assume Number of Samples per Hr:	5	
Total Number of Hrs:	18	

Backfill of Excavated Areas

Backfill Placement, ECY:	26,000
Backfill Placement, LCY:	34,700
Assumed Number of Samples, EA/LCY:	5000
Total Number of Sample, EA:	7

Topsoil Placement and Revegetation

Thickness of Topsoil, FT:	0.5
Area of Excavation, SF:	46000
Total Volume of Topsoil, ECY:	860
Total Volume of Topsoil, LCY:	1,200

Deed Notice

Environmental Lawyer, HR:	40
Paralegal, HR:	60
Admin Clerk, HR:	20

CDM Smith

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Description: Alternative 5 – Building Demolition and Offsite Disposal, Excavation, Onsite Treatment, and Backfill of Treated Material. Quantity calculations for Alternative 5

Capital Costs

Total Volume of Contaminated Soil to be Treated, BCY:	**26000**		
Number of Stockpiles that can be used for Treatment, EA:	**2**	*Per treatment cycle*	
Capacity of One Stockpile, CY:	2,150		
Total Capacity of On-Site Stockpiles, CY:	4300		
Assumed Number of Months per Treatment Cycle, MO:	2		
Total Number of Months Required for On-Site Treatment, MO:	**13**		
Assumed Duration of Alternative 5, MO:	13		
Assumed Duration of Alternative 5, DY:	396		
Assumed Duration of Alternative 5, WK:	57		
General Requirements			
Cost Basis, MO:	12		
Cost Basis, DY:	260		
Cost Basis, HR:	2080		
Cost Basis:	Syncon Resins Superfund Site OU2		
Project Dedicated Supervisory Staff and Equipment:	$735,634	$990	*Assume 35%*
Per Diem:	$156,000	$210	*Assume 35%*
Safety and Health Requirements:	$107,936	$208	*Assume 50%*
Temporary Facilities	$174,819	$336	*Assume 50%*
Perimeter Air Monitoring:	$26,626	$102	
Site Security:	$264,261	$1,016	
		$2,863	*per day*
Project Deliverables:	$198,500	**$198,500**	Lump Sum
Surveying:	$94,288	**$102,145**	Lump Sum
Institutional Controls			
Environmental Lawyer, HR:	120		
Paralegal, HR:	60		
Admin Clerk, HR:	40		
Reproduction Costs for Institutional Controls, LS:	1		
Community Awareness Activities			
Number of Community Awareness Meetings, EA:	1		
General Superintendent, HR:	16		
Project Manager, HR:	16		
Per Diem, DY:	4		
Community Awareness Activities Allowance, LS:	1		
Mobilization/Demobilization			
Mobilization/Demobilization of Heavy Equipment, EA:	3		
Mobilization/Demobilization of Large Equipment, EA:	5		
Mobilization/Demobilization of Medium Equipment, EA:	5		
Sediment and Erosion Control (Refer CALC-ALT-2)			
Demolition of Structures			
Building Inspection, HR:	20		
Demolition			
Assumed Demolition Debris from Buildings, CY:	2070	*Refer Table 2-5*	
Assumed Demolition Debris from Buildings, TON:	3900	*Refer Table 2-5*	
Disposal at Local Landfill	CY	TON	
Demolition Debris for Disposal, TSCA:	800	1500	*Refer Table 2-5*
Demolition Debris for Disposal, Non-TSCA:	1270	2400	*Refer Table 2-5*
		3900	

Description: Alternative 5 – Building Demolition and Offsite Disposal, Excavation, Onsite Treatment, and Backfill of Treated Material. Quantity calculations for Alternative 5

Excavation and Soil Cap within JCMUA Pipeline Easement

Area of JCMUA Pipeline Easement, SF:	5040	*120' x 42'*
Depth of Excavation, FT:	2	
Total Volume of Excavation, BCY:	380	
Total Volume of Excavation, TON:	720	
Backfill Placement, ECY:	380	
Backfill Placement, LCY:	510	
Thickness of Topsoil, FT:	0.5	
Area of Excavation, SF:	5040	
Total Volume of Topsoil, ECY:	100	
Total Volume of Topsoil, LCY:	140	

Excavation of Contaminated Soils

Excavation Support - Sheeting Installation

	Perimeter (LF)	Depth (FT)	Area (SF)	Note
Excavation Area 1A	240	14	3360	
Excavation Area 1B	195	14	2730	*Shares with Area 2*
Excavation Area 2	910	22	20020	
Excavation Area 3	100	30	3000	
Excavation Area 4	210	32	6720	*Shares with Area 2*
Excavation Area 5	65	34	2210	
Excavation Area 6	80	40	3200	
			41300	

Contaminated Soils Excavation

Hazardous Waste Soil, BCY:	1000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (>50 mg/kg), BCY:	9000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (10 to 50 mg/kg), BCY:	3000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (1 to 10 mg/kg), BCY:	13000	*Refer Table 2-5*
Total Volume of Contaminated Soil, BCY:	**26000**	
Volume of Excavation at Depths 0-10 Feet, BCY:	**5000**	
Volume of Excavation at Depths >10 Feet, BCY:	**21000**	

Dewatering

Total Pumping

Total Duration, DAY:	396	
Total Duration, WK:	57	
Total Duration, MO:	13	
Hours of Operation, HR:	**9,504**	

Electrical Use

Energy equivalent, HP-HR to kW-HR:	0.746	
Assumed pump efficiency, %:	50%	
Number of sump pumps, EA:	1	
HP for sump pumps, HP:	6.5	
Submersible pump, HP-HR:	**61,776**	
Equivalent electrical consumption, kW-HR:	**92,200**	

Operator Oversight

Dewatering Operation, DAY:	277	*Assume 70%*
Operator for Dewatering, HR/DAY:	1.5	*Assumed, for fueling pumps, moving lines, etc.*
Operator for Treatment System Operation, HR/DAY:	22.5	*Operator present for 24hr. minus time for dewatering*
Operator / Tech (for Dewatering), HR:	**416**	

CDM Smith

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Description: Alternative 5 – Building Demolition and Offsite Disposal, Excavation, Onsite Treatment, and Backfill of Treated Material. Quantity calculations for Alternative 5

Water Treatment System Installation and Startup Testing

Water Treatment System Rental, MO:	1	*Includes installation and first month rental*
18,000 Gallon Weir Tank Rental, MO:	1	*Includes first month rental*
22,000 Gallon Frac Tank Rental, MO:	1	*Includes first month rental*
Water Treatment System Rental, MO:	12	*Includes rental after first month*
18,000 Gallon Weir Tank Rental, MO:	12	*Includes rental after first month*
22,000 Gallon Frac Tank Rental, MO:	12	*Includes rental after first month*
Operator Oversight		
Treatment System Operation, DAY:	198	*Assume 50%*
Operator for Dewatering, HR/DAY:	1.5	*Assumed, for fueling pumps, moving lines, etc.*
Operator for Treatment System Operation, HR/DAY:	22.5	
Operator / Tech, HR:	**4455**	

Ex-Situ Thermal Treatment (LTTD)

Hazardous Waste Soil, BCY:	1000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (>50 mg/kg), BCY:	9000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (10 to 50 mg/kg), BCY:	3000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (1 to 10 mg/kg), BCY:	13000	*Refer Table 2-5*
Total Contaminated Soil, BCY:	**26000**	
Total Contaminated Soil, LCY:	**31200**	

Post Excavation Sampling

Total Area of Sidewall, SF:	41300	
Total Area of Base of Excavation, SF:	46000	*Refer Table 2-5*
Total Area to be Sampled, SF:	87300	
Assumed Frequency of Sampling, EA/SF:	1000	
Total Number of Samples, EA:	**88**	
Assume Number of Samples per Hr:	5	
Total Number of Hrs:	18	

Backfill using Treated Soil

Backfill Placement, ECY:	26000
Backfill Placement, LCY:	34700
Assumed Number of Samples, EA/LCY:	5000
Total Number of Sample, EA:	7

Topsoil Placement and Revegetation

Thickness of Topsoil, FT:	0.5
Area of Excavation, SF:	46000
Total Volume of Topsoil, ECY:	860
Total Volume of Topsoil, LCY:	1,200

Deed Notice

Environmental Lawyer, HR:	40
Paralegal, HR:	60
Admin Clerk, HR:	20

Description: Alternative 6 – Building Demolition, Targeted Excavation of Soils and Offsite Disposal. Quantity calculations for Alternative 6

Capital Costs			
Assumed Duration of Alternative 6, MO:	5		
Assumed Duration of Alternative 6, DY:	153		
Assumed Duration of Alternative 6, WK:	22		
General Requirements			
Cost Basis, MO:	12		
Cost Basis, DY:	260		
Cost Basis, HR:	2080		
Cost Basis:	Syncon Resins Superfund Site OU2		
Project Dedicated Supervisory Staff and Equipment:	$735,634	$2,829	
Per Diem:	$156,000	$600	
Safety and Health Requirements:	$107,936	$415	
Temporary Facilities	$174,819	$672	
Perimeter Air Monitoring:	$26,626	$102	
Site Security:	$264,261	$1,016	
		$5,636	per day
Project Deliverables:	$198,500	**$198,500**	Lump Sum
Surveying:	$94,288	**$39,287**	Lump Sum
Institutional Controls			
Environmental Lawyer, HR:	120		
Paralegal, HR:	60		
Admin Clerk, HR:	40		
Reproduction Costs for Institutional Controls, LS:	1		
Community Awareness Activities			
Number of Community Awareness Meetings, EA:	1		
General Superintendent, HR:	16		
Project Manager, HR:	16		
Per Diem, DY:	4		
Community Awareness Activities Allowance, LS:	1		
Mobilization/Demobilization			
Mobilization/Demobilization of Heavy Equipment, EA:	3		
Mobilization/Demobilization of Large Equipment, EA:	5		
Mobilization/Demobilization of Medium Equipment, EA:	5		
Sediment and Erosion Control (Refer CALC-ALT-2)			
Demolition of Structures Building Inspection, HR:	20		
Demolition			
Assumed Demolition Debris from Buildings, CY:	2070	*Refer Table 2-5*	
Assumed Demolition Debris from Buildings, TON:	3900	*Refer Table 2-5*	
Disposal at Local Landfill	CY	TON	
Demolition Debris for Disposal, TSCA:	800	1500	*Refer Table 2-5*
Demolition Debris for Disposal, Non-TSCA:	1270	2400	*Refer Table 2-5*
		3900	
Excavation and Soil Cap within JCMUA Pipeline Easement			
Area of JCMUA Pipeline Easement, SF:	5040	*120' x 42'*	
Depth of Excavation, FT:	2		
Total Volume of Excavation, BCY:	380		
Total Volume of Excavation, TON:	720		
Backfill Placement, ECY:	380		
Backfill Placement, LCY:	510		
Thickness of Topsoil, FT:	0.5		
Area of Excavation, SF:	5040		
Total Volume of Topsoil, ECY:	100		
Total Volume of Topsoil, LCY:	140		

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Description: Alternative 6 – Building Demolition, Targeted Excavation of Soils and Offsite Disposal. Quantity calculations for Alternative 6

Excavation of Contaminated Soils

Excavation Support - Sheeting Installation

	Perimeter (LF)	Depth (FT)	Area (SF)	Note
Excavation Area 1A	240	14	3360	
Excavation Area 1B	195	14	2730	*Shares with Area 2*
Excavation Area 2	910	22	20020	
Excavation Area 3	100	30	3000	
Excavation Area 4	210	32	6720	*Shares with Area 2*
Excavation Area 5	65	34	2210	
Excavation Area 6	80	40	3200	
			41300	

Contaminated Soils Excavation

Hazardous Waste Soil, BCY:	1000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (>50 mg/kg), BCY:	9000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (10 to 50 mg/kg), BCY:	3000	*Refer Table 2-5*
Non-hazardous Waste with PCBs (1 to 10 mg/kg), BCY:	8000	*Refer Table 2-5*
Total Volume of Contaminated Soil, BCY:	**21000**	
Volume of Excavation at Depths 0-10 Feet, BCY:	**5000**	
Volume of Excavation at Depths >10 Feet, BCY:	**16000**	

Dewatering

Total Pumping

Total Duration, DAY:	153	
Total Duration, WK:	22	
Total Duration, MO:	5	
Hours of Operation, HR:	**3,672**	

Electrical Use

Energy equivalent, HP-HR to kW-HR:	0.746	
Assumed pump efficiency, %:	50%	
Number of sump pumps, EA:	1	
HP for sump pumps, HP:	6.5	
Submersible pump, HP-HR:	**23,868**	
Equivalent electrical consumption, kW-HR:	**35,700**	

Operator Oversight

Dewatering Operation, DAY:	153	
Operator for Dewatering, HR/DAY:	1.5	*Assumed, for fueling pumps, moving lines, etc.*
Operator for Treatment System Operation, HR/DAY:	22.5	*Operator present for 24hr. minus time for dewatering*
Operator / Tech (for Dewatering), HR:	**230**	

Water Treatment System Installation and Startup Testing

Water Treatment System Rental, MO:	1	*Includes installation and first month rental*
18,000 Gallon Weir Tank Rental, MO:	1	*Includes first month rental*
22,000 Gallon Frac Tank Rental, MO:	1	*Includes first month rental*
Water Treatment System Rental, MO:	4	*Includes rental after first month*
18,000 Gallon Weir Tank Rental, MO:	4	*Includes rental after first month*
22,000 Gallon Frac Tank Rental, MO:	4	*Includes rental after first month*

Operator Oversight

Treatment System Operation, DAY:	153	
Operator for Dewatering, HR/DAY:	1.5	*Assumed, for fueling pumps, moving lines, etc.*
Operator for Treatment System Operation, HR/DAY:	22.5	
Operator / Tech, HR:	**3,443**	

CDM Smith

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Description: Alternative 6 – Building Demolition, Targeted Excavation of Soils and Offsite Disposal. Quantity calculations for Alternative 6

Transportation and Disposal of Contaminated Soils

Hazardous Waste Soil, TON:	1400	*Refer Table 2-5*
Non-hazardous Waste with PCBs (>50 mg/kg), TON:	12600	*Refer Table 2-5*
Non-hazardous Waste with PCBs (10 to 50 mg/kg), TON:	4200	*Refer Table 2-5*
Non-hazardous Waste with PCBs (1 to 10 mg/kg), TON:	11200	*Refer Table 2-5*
RCRA/TSCA Soil, TON:	1400	
TSCA Soil, TON:	12600	
Non RCRA, Non TSCA Soil, TON:	15400	
	29400	

Post Excavation Sampling

Total Area of Sidewall, SF:	41300	
Total Area of Base of Excavation, SF:	46000	*Refer Table 2-5*
Total Area to be Sampled, SF:	87300	
Assumed Frequency of Sampling, EA/SF:	1000	
Total Number of Samples, EA:	**88**	
Assume Number of Samples per Hr:	5	
Total Number of Hrs:	18	

Backfill of Excavated Areas

Backfill Placement, ECY:	21,000
Backfill Placement, LCY:	28,000
Assumed Number of Samples, EA/LCY:	5000
Total Number of Sample, EA:	6

Topsoil Placement and Revegetation

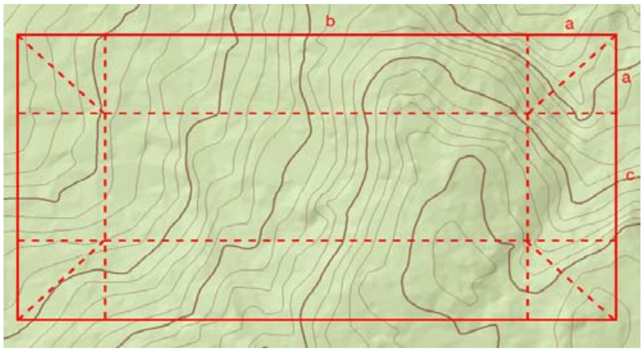
Thickness of Topsoil, FT:	0.5
Area of Excavation, SF:	46000
Total Volume of Topsoil, ECY:	860
Total Volume of Topsoil, LCY:	1,200

Deed Notice

Environmental Lawyer, HR:	40
Paralegal, HR:	60
Admin Clerk, HR:	20

OnsiteStockpile Capacity

1. Capacity of Onsite Stockpile for Ex-Situ Treatment



Assume:

1. Number of Stockpiles:		**2**	
2. Maximum height of Waste Material:		**10**	ft
3. Maximum slope < 40%	Current:	40%	
	Total Length, FT:	70	(L)
	Total Width, FT:	150	(W)
	Total Foot Print, SF:	10,500	

Total Capacity

Calculations:

a=	25 FT
b=	20 FT
c=	100 FT
h=	10 FT

a. Pyramid

V= (2*a)^2*h/3

V= 8,333 ft^3

b. Large Wedge X2

V= 0.5*a*h*b*2

V= 5,000 ft^3

c. Small Wedge X2

V= 0.5*a*h*c*2

V= 25,000 ft^3

d. Rectangular Prism

V= b*c*h

V= 20,000 ft^3

V = 116,700 CF

V = 4,300 CY

Description: Productivity determination calculations for excavation of soils (both contaminated soils and clean fill)

Excavator Productivity - Soil Excavation

Assumed Bucket Capacity, CY:	**2.5**
Soil Bulking factor:	**1.20**
Hours per Shift, HR:	**8**
Bucket Fill Factor, %:	**80%**
Work Efficiency, %:	**90%**
Operator Ability Correction Factor:	**0.9**

Excavator Needed (Y or N)		Y
Bucket Size	CY	2.5
Bucket Fill Factor	%	80%
Bucket Payload	CY	2
Work Efficiency	%	90%
Operator Ability Correction Factor		0.9
Load Time	SEC	15
Dump Time	SEC	3
Swing Time Loaded	SEC	6
Swing Time Unloaded	SEC	4
Cycle Time	SEC/cycle	28
	MIN/cycle	0.47
Ideal Loader Productivity	BCY/HR	212.8
Ideal Loader Productivity	LCY/HR	255.4
Adj Loader Productivity	**BCY/HR**	**172.4**
Adj Loader Productivity	**LCY/HR**	**206.9**
Number of Excavators Anticipated		**1**
Total Productivity	**BCY/HR**	**172.4**
	BCY/DY	1379.2

Description: Productivity determination calculations for excavation of soils (both contaminated soils and clean fill)

Excavator Productivity - Soil Excavation

Assumed Bucket Capacity, CY:		**2.5**
Soil Bulking factor:		**1.20**
Hours per Shift, HR:		**8**
Bucket Fill Factor, %:		**80%**
Work Efficiency, %:		**80%**
Operator Ability Correction Factor:		**0.9**
Excavator Needed (Y or N)		Y
Bucket Size	CY	2.5
Bucket Fill Factor	%	80%
Bucket Payload	CY	2
Work Efficiency	%	80%
Operator Ability Correction Factor		0.9
Load Time	SEC	20
Dump Time	SEC	3
Swing Time Loaded	SEC	7
Swing Time Unloaded	SEC	5
Cycle Time	SEC/cycle	35
	MIN/cycle	0.58
Ideal Loader Productivity	BCY/HR	172.5
Ideal Loader Productivity	LCY/HR	206.9
Adj Loader Productivity	**BCY/HR**	**124.2**
Adj Loader Productivity	**LCY/HR**	**149**
Number of Excavators Anticipated		**1**
Total Productivity	**BCY/HR**	**124.2**
	BCY/DY	993.6

PROJECT:	Unimatic FS - Final	COMPUTED BY :	AIS	CHECKED BY:	EW
JOB NO.:	107382.6424.023.005.DFFS	DATE :	4/11/2016	DATE CHECKED:	4/14/2016
CLIENT:	US EPA Region 2			PAGE NO. :	PD-01

Description: Productivity determination calculations for loading broken concrete and asphalt for hauling and disposal off-site.

Loader Productivity Determination - Broken Concrete/Asphalt

	Assumed Bucket Capacity, CY:	**3**
	Concrete/Asphalt Bulking Factor:	**1.30**
	Hours per Shift, HR:	**8**
	Bucket Fill Factor, %:	**50%**
	Work Efficiency, %:	**75%**
	Operator Ability Correction Factor:	**0.8**
Bucket Size	CY	3
Bucket Fill Factor	%	50%
Bucket Payload	CY	1.5
Work Efficiency	%	75%
Operator Ability Correction Factor		0.8
Load Time	SEC	**20**
Dump Time	SEC	**3**
Swing Time Loaded	SEC	**6**
Swing Time Unloaded	SEC	**4**
Cycle Time	SEC/cycle	33
	MIN/cycle	0.55
Ideal Loader Productivity	BCY/HR	125.9
Ideal Loader Productivity	LCY/HR	163.7
Adjusted Loader Productivity	BCY/HR	75.5
Adjusted Loader Productivity	LCY/HR	98.2
Number of Loaders Anticipated		**1**
Total Loader Productivity	**LCY/HR**	**98.2**
	LCY/DY	785.6

Description: Productivity determination calculations for backfill of excavated ares with dozer

Productivity Determinations - Dozer

Dozer w/Universal Blade

Type of dozer (make and model): **CAT - D6N XL**

Hours per Shift, HR: 8

Work Efficiency, %: **80%**

Dozer Productivity Determination	***Units***		
Work Efficiency	%	80%	
Operator Type		**Average**	
Operator Ability Correction Factor	Factor	0.75	*(Ref: CAT Performance Handbook-33, Page 1-42)*
Grade	% Slope	**1%**	
Grade Factor		**1.00**	*(Ref: CAT Performance Handbook-33, Page 1-42)*
Material Type		**Loose**	
Material Correction Factor	Factor	1.2	*(Ref: CAT Performance Handbook-33, Page 1-42)*
Slot Dozing Correction Factor	Factor	1.2	*(Ref: CAT Performance Handbook-33, Page 1-42)*
Visibility Correction Factor	Factor	0.8	*(Ref: CAT Performance Handbook-33, Page 1-42)*
Weight Correction Factor	Factor	0.90	
Combined Prod. Correction Factor	Factor	**0.63**	
Average Dozing Distance	FT	**100**	
Ideal Dozer Productivity	LCY/HR	**350.0**	*(Ref: CAT Performance Handbook-33, Page 1-40)*
Dozer Usage:		**70%**	
Adjusted Dozer Productivity	LCY/HR	**154.4**	
	ECY/HR	**128.7**	

TABLE SPV-ADRFT

ANNUAL REAL DISCOUNT RATE FACTORS TABLE

Site: Unimatic Mfg. Corp. Superfund Site
Location: Fairfield, New Jersey
Phase: Feasibility Study - Final
Base Year: 2016

Real Discount Rate (Percent): **7.00%**

Year	Discount Factor[1]	Year	Discount Factor[1]
0	1.0000	31	0.1228
1	0.9346	32	0.1147
2	0.8734	33	0.1072
3	0.8163	34	0.1002
4	0.7629	35	0.0937
5	0.7130	36	0.0875
6	0.6663	37	0.0818
7	0.6227	38	0.0765
8	0.5820	39	0.0715
9	0.5439	40	0.0668
10	0.5083	41	0.0624
11	0.4751	42	0.0583
12	0.4440	43	0.0545
13	0.4150	44	0.0509
14	0.3878	45	0.0476
15	0.3624	46	0.0445
16	0.3387	47	0.0416
17	0.3166	48	0.0389
18	0.2959	49	0.0363
19	0.2765	50	0.0339
20	0.2584	51	0.0317
21	0.2415	52	0.0297
22	0.2257	53	0.0277
23	0.2109	54	0.0259
24	0.1971	55	0.0242
25	0.1842	56	0.0226
26	0.1722	57	0.0211
27	0.1609	58	0.0198
28	0.1504	59	0.0185
29	0.1406	60	0.0173
30	0.1314		

Notes:
1 As outlined in EPA's *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study*, a real discount rate of 7 percent should generally be used for all non-Federal facility sites, and real discount rates from Appendix C of Office of Management and Business (OMB) Circular A-94 should generally be used for all federal facility sites.

Vendor Quote

April 14, 2016 *Via E-Mail*

Grace Chen
Engineer
CDM Smith
cheng@cdmsmith.com

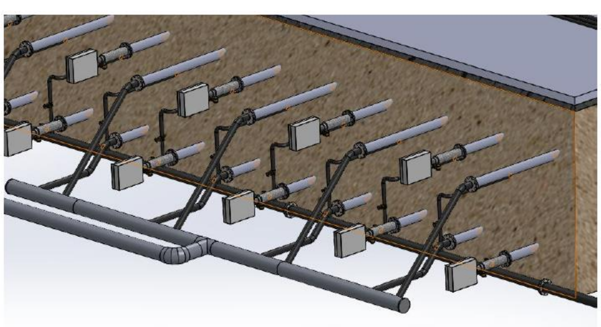
Subject: **Remedial Approach & Budget Metrics**
Ex Situ Indirect Batch Thermal Desorption
Confidential Location in Fairfield, New Jersey

Hello Grace,

This Conceptual Approach for Ex Situ Thermal Desorption sets forth the technical approach metrics and budgetary estimations for the use of GTR™ thermal conduction heating at your project in Fairfield, New Jersey. Excavated soil would be treated in three separate batch piles onsite, depending on the category (profile) of wastes:

1. 900 yds^3 soils with moderate to high levels of PCBs, dieldrin, lindane, DDE, DDT, Aldrin, Chlordane, Heptachlor, Heptachlor epoxide;
2. 8,400 yds^3 soils with PCBs from 50 to 100 mg/kg; and
3. 15,000 yds^3 soils with PCBs from 10 to 49 mg/kg

The estimated budget includes relevant costs, such as fuel, electricity, well materials, equipment, project management and oversight, vapor and liquid extraction and treatment, and shipping of materials. The estimated budget excludes costs for excavation, repositioning of soils to form the batch pile; these scopes of work being provided by others. Soil moisture content is estimated to be approximately 15%.




Grant Geckeler, Executive Vice President
1612 Jenks Drive, Corona, CA 92880
1.714.312.6863 grant@georemco.com

Budget Estimation Summary 900 + 8,400 yds³ = $1,627,500	
Project Phase	**Amount**
Design; Pre-Construction Procurement	$325,500
Thermal Equipment Mobilization	$569,625
Thermal Operations	$651,000
Demobilization, Final Reporting	$81,375

Budget Estimation Summary 900 + 8,400 + 15,400 yds³ = $3,705,000	
Project Phase	**Amount**
Design; Pre-Construction Procurement	$741,000
Thermal Equipment Mobilization	$1,296,750
Thermal Operations	$1,482,000
Demobilization, Final Reporting	$185,250

GA Footprint of Batch Piles			
Volume (yd^3)	Length (ft)	Width (ft)	Height (ft)
900	100	45	9
8,400	100	351	9
15,000	100	621	9

Remedial target is assumed as 95% reduction in contaminant levels (by mass) at the 95% UCL demonstrated by "hot" soil sampling and analyses.

Estimated active heating duration is assumed to be 90 to 100 days.

Estimate includes natural gas used at $5.00/MMBTU and electricity used at $0.15/KWh.

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1.714.312.6863 grant@georemco.com

General Information: GEO's Proposed Thermal Treatment

Figure: Sample three dimensional drawing for non-technical reference (not to scale, not to size).

Efficacy & Physical Principles of Ex Situ Thermal Desorption

When soil is heated, the organic contaminants evaporate or are destroyed by several methods which depend on the soil temperature. Concentrations of contaminants in soil can be removed by 99.99% or greater, and are most reliably remediated from the soil matrix at temperatures between 200 and 275°C by the following mechanisms:

- **Steam stripping** of saturated NAPL at 100°C,
- Evaporation (**volatilization**) from 100°C to 275°C,
- **Oxidation** from 100°C to 275°C , and
- **Pyrolysis** (thermal decomposition in the absence of oxygen) from 100°C to 275°C.

Ex Situ Thermal Desorption ("ESTD") is a reliable and proven technology for the remediation of contaminated soil. ESTD is used in conjunction with conventional soil vapor extraction ("SVE"). By definition, ESTR is the introduction of heat (energy) into the soil mass to mobilize, volatilize, and recover volatile and semi-volatile organic compounds (VOCs and SVOCs) from soil. ESTD has been successfully applied to a wide range of Contaminants of Concern (COCs) and soil types to reduce residual contamination to very low levels.

The proposed ESTD treatment design for this project utilizes thermal conduction heating ("TCH"). TCH is carried out by placing closed-loop TCH wells in a grid like pattern throughout the target treatment volume ("TTV"). The closed-loop "heater wells" consist of a hybrid stainless/carbon steel tube construction. Heat circulated in the heater wells is provided by the controlled combustion of natural gas. The ex situ soils are then remediated as follows:

- Thermal energy provided by the TCH heaters wells heat the soil, soil moisture, and COCs in soil by means of thermal conduction, and, to a limited extent, radiation and convection. As the TCH heater wells reach temperatures between 100°C and 600°C, temperature gradients are created throughout the target treatment volume (TTV).
- Since the thermal conductivity of soil varies over a very narrow range - only by a factor of 3 - TCH is effective and predictable, regardless of the permeability of the soil or its degree of heterogeneity.
- The propagation of heat from the TCH heater wells results in a relatively uniform temperature gradient from each TCH heater well. This heat flux propagates throughout the TTZ, until the desired target treatment temperature (TTT) is reached throughout the soil mass. Temperature is measured by thermocouples placed at the centroid locations (center points between thermal conductive heating wells).
- As soil temperatures increase, COCs and a portion of water contained in the soil matrix are vaporized. Locations closer to TCH heater wells will be the first to achieve superheated temperatures (above the boiling point of water).
- SVE is used to maintain negative pneumatic pressure on the TTV during the heating process. In this configuration, soil vapor and steam are extracted from the soil mass through extraction wells. The extracted off-gas and condensed liquids are routed to the aboveground dedicated vapor and liquid treatment systems.

Gas Thermal Remediation

<u>GEO is the sole provider of its patented GTR™ system</u> used to carry out ESTD projects. GTR™ is a method of TCH in which individual heaters are used to raise the temperature of the remediated soils. The individual heaters are fueled by natural gas (for this project) to provide heat to the TCH wells. Hot combustion air is circulated throughout the enclosed steel tubing of each TCH well. The hot combustion air is completely isolated from the soil and heating of the soils occurs primarily through conduction.

Throughout the heating process, the individual heaters and proximate temperature/pressure recording points are monitored via a wireless data system. Real-time data can be accessed remotely via a web-enabled site. Subzones within the batch soil pile can be individually controlled, so that temperature gradients and energy consumptions may be optimized.

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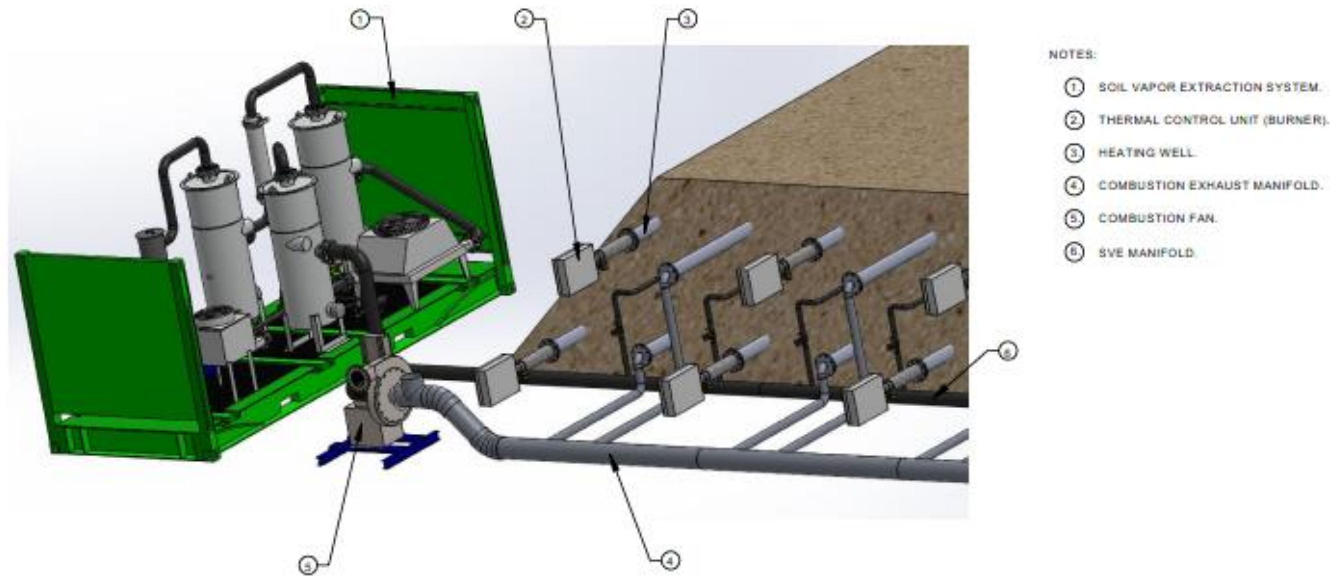
1.714.312.6863 grant@georemco.com



The GTR™ system proposed includes the following equipment:

- GTR™ -type heaters and their respective TCH well;
- Vapor extraction wells;
- Mobile control center and programmable logic controller (PLC) data collection system;
- Wireless monitoring, control, and communications system;
- Thermocouples and their respective borings;
- Pressure monitoring within the TTZ;
- Vacuum induction blowers for combustion air;
- Vapor extraction system to extract soil vapor by applying vacuum to the well field;
- Vapor treatment system to treat soil vapor; and,
- Condensate and liquid treatment system.

Continued on Next Page.

A laboratory (bench scale) study using representative site soils may be required by GEO as part of the Final Design Report required prior to contracting. Thank you for your inquiry, and I hope we may speak soon regarding the potential application of thermal remediation at this project.

My Best Regards,

Grant Geckeler
Executive Vice President
Co-Inventor of GTR^{TM} Thermal Treatment

From: Daniel Ruffing [mailto:DRuffing@geo-solutions.com]
Sent: Thursday, April 07, 2016 10:28 AM
To: Chen, Grace <ChenG@cdmsmith.com>
Subject: RE: Quote

Oh, ok. I think I understand now.

Scenario 1 – ISS to various depths

Mob/Demob	$150,000 - $250,000
Soil Mixing	$1,050,000 - $1,850,000
Total	**$1,200,000 - $2,100,000**

Scenario 2 – remove 7', ISS from 7' to 22'

Mob/Demob	$150,000 - $250,000
Excavation	$50,000 - $150,000
Soil Mixing	$550,000 - $950,000
Total	**$750,000 - $1,350,000**

Scenario 1 schedule would be 2 to 4 months, Scenario 2 would be 1 to 2 months.

Soil mixed material tends to be around 20% to 40% of the initial volume, so I would expect the swell to fill 3' to 6' of the initial excavation. I would recommend a 2' cap of clean material anyway.

The soil mixed mass will have a strength that is equal to or greater than the soils alone so it should be easily developed. My main concerns from a development standpoint would be deed restrictions (may limit the types of structures allowed at the location) and potential vapor issues (can be managed with vapor barriers under structures). If the development is for industrial warehouse, I wouldn't see an issue as long as appropriate engineering controls are put in place.

Dan Ruffing
M: 724-554-5268

From: Eugene Streiter [mailto:streiterseacoast@gmail.com]
Sent: Thursday, April 07, 2016 5:35 PM
To: Chen, Grace <ChenG@cdmsmith.com>
Subject: Unimatic

This is the best guess since we have no other data:

RCRA/TSCA waste: About $760.00/ton T&D. Utah or Texas.

TSCA Soil: $229.00/ton T&D
TSCA Debris: $238.00/ton T&D

Nonhazardous soil: $126.00/ton T&D
Nonhazardous debris $133.00/ton T&D

RCRA/TSCA waste must be incinerated. That's why the high price.

I'm working on nonhazardous debris recycle and the possibility that the nonhaz soil can be used as cover to save money.

Gene

Pace Analytical Services, Inc.
9608 Loiret Boulevard
Lenexa, KS 66219
Phone: 913-599-5665
Fax: 913-599-1759

Contact Information

Contact Name	Abhay Sonawane	Quote Number	00027271
Account Name	CDM Smith	Prepared By	Anna Custer
Phone	(816) 412-3165	Phone	(816) 550-7359
Email	sonawaneai@cdmsmith.com	Email	anna.custer@pacelabs.com

Project Information

Quote Name	160413_CDM_Budget_27271	Created Date	4/13/2016
Turn Around Time	Standard TAT 7-10 business days 3-5 day TAT- 50% rush surcharge 1-2 day TAT- 100% rush surcharge	Shipping Information	Pace local courier available to pick up samples in KC Metro area at no additional charge
		Report Level	Level II
		Certification Requirements	NELAP

Address Information

Bill To Name	CDM Smith	Ship To Name	CDM Smith
Bill To	9200 Ward Parkway, Ste 500 Kansas City, MO 64114		

Quote Details

Quantity	Method	Product	Sales Price	Sub-Total	Total-Price
1.00	EPA 8081	Pesticides, Organochlorine (GC) (Soil)	$105.00	$105.00	$105.00
1.00	EPA 8082	Polychlorinated Biphenyls (PCBs) (soil/solid)	$65.00	$65.00	$65.00

Grand-Total $170.00

Additional Pricing Considerations:

If you have specific questions about any conditions noted below, please contact your Pace Analytical Representative.

•Proposal expires 60 days from created date above, unless accepted, signed and returned.
• Quoted prices include standard Pace Analytical QA/QC, reporting limits, compound lists and standard report format unless noted otherwise.
• If project specific MS/MSD samples are submitted, they may be billable.
• TAT (Turn Around Time) is in working days unless otherwise specified above.
• TCLP/SPLP Rotations will incur a surcharge of $100 per fraction for Rush TAT requests.
• To ensure requested TAT is available, please coordinate with your Pace Analytical representative at time of sample submittal.
• Any deviation from the above quoted scope of work, including sample arrival date and volume, may result in adjustment of prices.
• Please include Quote Number on Chain-of-custody to ensure proper billing.
• Pricing includes standard delivery of bottle/sample kits and coolers.
• Charges will apply for non-standard shipping and for projects where shipping exceeds 10% of the total analytical costs of the shipment.

_______________________________ _______________
Client Signature Date

Terms and Conditions