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MCP PHASE III REMEDIAL ACTION PLAN

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Prepared for:

207 Marston ST

FORMER JOHN C. TOMBARELLO & SONS SITE
Lawrence, Massachusetts

Release Tracking Number 3-18126

Prepared by:

WESTON SOLUTIONS, INC.
One Wall Street
Manchester, New Hampshire 03101-1501

September 2004

W.O. No. 13057.001.002.4100

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Project Manager

September 2004

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LIST OF ACRONYMS

"the Site"	John C. Tombarello & Sons property
American	American Recycling of Massachusetts, Inc.
AULs	Activity and Use Limitations
bgs	below ground surface
COCs	contaminants of concern
CSA	Comprehensive Site Assessment
DOT	Department of Transportation
DQOs	data quality objectives
DRE	destruction and removal efficiency
EPA	U.S. Environmental Protection Agency
EPHs	extractable petroleum hydrocarbons
ft	feet
ft^2	square foot
H&A	Haley & Aldrich, Inc.
HEA	Higgins Environmental Associates, Inc.
IH	Imminent Hazard
IRA	Immediate Response Action
MCP	Massachusetts Contingency Plan
MDEP	Massachusetts Department Environmental Protection
mg/kg	milligrams per kilogram
NOAA TELs	National Ocean and Atmospheric Administration Threshold Effect Levels
NOR	*Notice of Responsibility*
NSR	No Significant Risk
O&M	operations and maintenance
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PPE	personal protection equipment
ppm	parts per million
RAAs	Remedial Action Alternatives
RAP	Remedial Action Plan
RCGW-2	Reportable Concentration Groundwater Standard 2
RCRA	Resource Conservation and Recovery Act
RCS-1	Reportable Concentration Standard
RTN	Release Tracking Number
SVOCs	semi-volatile organic compounds

LIST OF ACRONYMS
(concluded)

Tombarello	Tombarello Recycling, Inc.
TPHs	total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
UCL	Upper Concentration Limit
VOCs	volatile organic compounds
VPHs	volatile petroleum hydrocarbons
WESTON®	Weston Solutions, Inc.
WZB	W.Z. Baumgartner and Associates, Inc.
yd^3	cubic yards
yd^3/day	cubic yards per day

SECTION 1

INTRODUCTION

1. INTRODUCTION

Weston Solutions, Inc. (WESTON®) has prepared the following Remedial Action Plan (RAP) on behalf of First Lawrence Financial, LLC for the John C. Tombarello & Sons property ("the Site"), located in Lawrence, Massachusetts. The Site is currently listed as a Tier 1C Site under the Massachusetts Contingency Plan (MCP) [310 CMR 40.0000], and has been assigned Release Tracking Number (RTN) 3-18126. First Lawrence Financial, LLC is acting as an agent for American Recycling of Massachusetts, Inc. (American) who is the current Potentially Responsible Party and Tier 1C Permitee for the Site.

This RAP was prepared in accordance with 310 CMR 40.0861 under the direction of a Licensed Site Professional, and includes results of the Phase III Identification, Evaluation, and Selection of Comprehensive Remedial Action Alternatives (RAAs) for the Site (310 CMR 40.0850). The Phase III evaluation included the following basic requirements as defined in the MCP:

- An initial screening of RAAs that are reasonably likely to be feasible and achieve a level of No Significant Risk (NSR) [310 CMR 40.0856].
- A detailed evaluation of the RAAs (310 CMR 40.0857) to provide a basis for selection of a RAA (unless detailed evaluation is not required per 310 CMR 40.0857(2)).
- Selection of a RAA, which is a likely Permanent Solution, where a Permanent Solution includes measures that reduce, to the extent feasible, contaminants to levels that achieve or approach background (310 CMR 40.0859). If there is no such feasible Permanent Solution, a Temporary Solution for the elimination of substantial hazard shall be selected and implemented, and the RAP shall be prepared pursuant to 310.40.0861(2)(h) for identification and development of a Permanent Solution.

Results and conclusions of the Phase III evaluation are based on information previously collected and reported in the following documents:

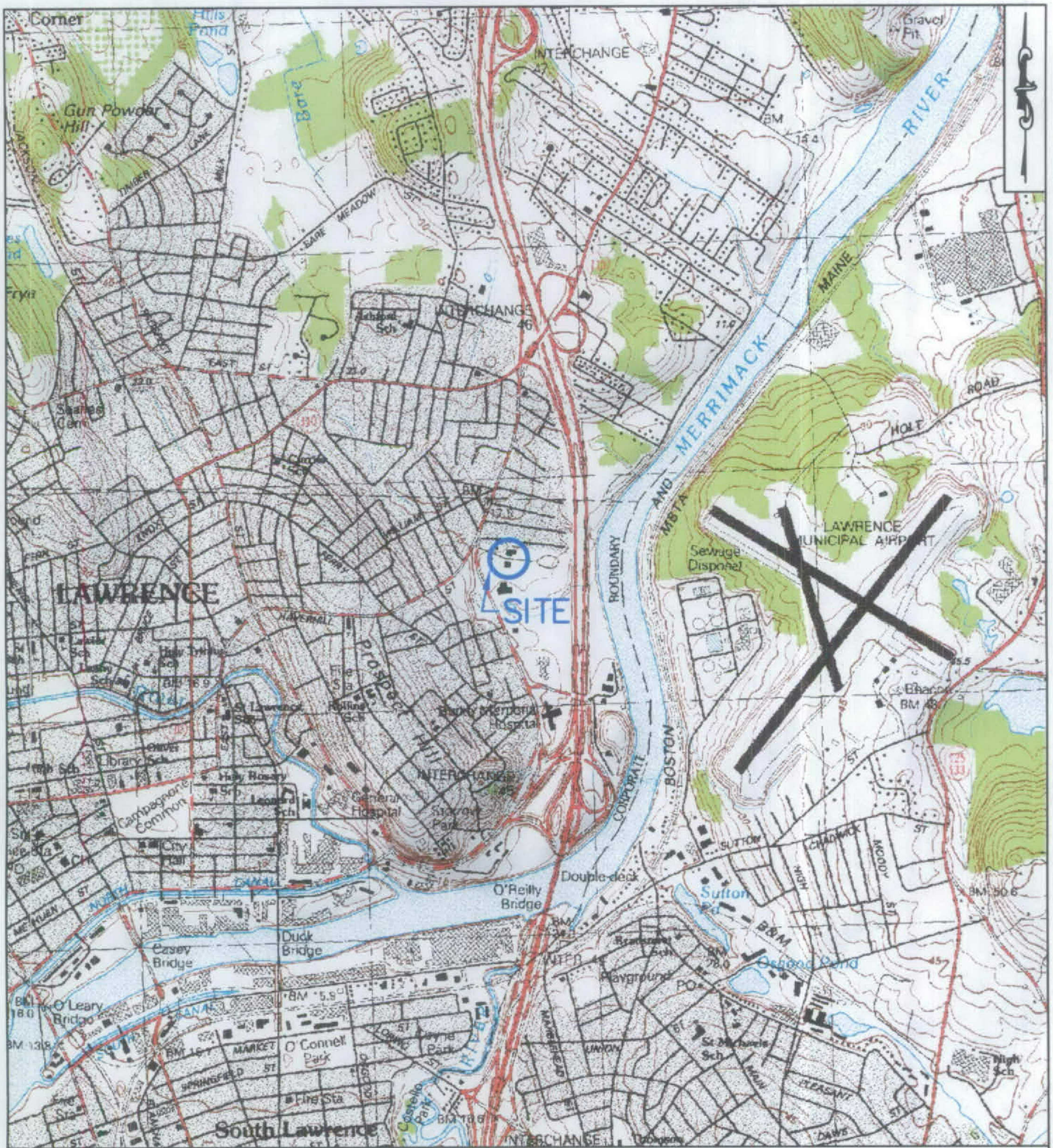
- *Phase I Requirements/Tier Classification* (March 2000)
- *Scope of Work Phase II Comprehensive Site Assessment(CSA)* (April 2001)
- *Immediate Response Action (IRA) Completion Report* (May 2001)
- *MCP Phase II Comprehensive Site Assessment Report* (August 2004)

1.1 SITE DESCRIPTION AND HISTORY

The Site is located at 207 Marston Street in Lawrence, Massachusetts. As shown on the 7.5-minute United States Geological Survey Quadrangle Site Location Map (Figure 1-1), the Site is bounded by Marston Street to the west, Hofmann Avenue to the north, Route 495 to the east, and the Sons of Italy Lodge, a soccer field and a middle school to the south. The Merrimack River is located approximately 400 feet (ft) east of the property boundary.

The Site footprint comprises 14 acres. The northern half of the Site was formerly used for metals recycling, while the southern half was formerly used first for soap manufacturing, and then as a community landfill. A paper recycling transfer station is currently operated on a separate 4-acre parcel in the southwest corner of the Site. The property is occupied by several buildings including: a 3,000 square foot (ft^2) office/scale house; a 24,000 ft^2 metal shop/garage; a 11,000 ft^2 furnace building; a 750 ft^2 press/baler building; two shear buildings (2,500 ft^2 and a 6,500 ft^2, respectively); and a single family dwelling. Numerous sheds and outbuildings are also located on the Site. Other site features include a soil berm adjacent to Route 495, overhead and subsurface utilities (telephone, electric, storm drains, and gas and water lines), and a sanitary sewer easement that bisects the Site from east to west. Reportedly, the soil berms were constructed from shallow site soils in conjunction with earthwork for Route 495. In addition, soil materials intermixed with metal are stockpiled adjacent the berms. These, and all pertinent site features, are shown on the Site Plan (Figure 1-2).

In 1998, the John C. Tombarello & Sons metals recycling facility closed, and American bought the property. In association with the sale of the property, an environmental site assessment was conducted by W.Z. Baumgartner and Associates, Inc. (WZB). Results of the site assessment indicated that concentrations of oil and hazardous material exceeding MCP Reportable Conditions existed at the Site. Consequently on 31 March 1999, Massachusetts Department Environmental Protection (MDEP) assigned RTN 3-18126 to the Site and issued a *Notice of Responsibility* (*NOR*) and *Interim Deadline Letter* (MDEP, 1999) to both the former and new site owners. As a result of the *NOR* (MDEP, 1999), both Tombarello Recycling, Inc. (Tombarello) and American were required to submit an IRA Plan and Imminent Hazard (IH)



SOURCE:
DELORME 3–D TOPOQUADS SOFTWARE;
MASSACHUSETTS, CONNECTICUT, & RHODE
ISLAND 3–D TOPOQUADS CD

GRAPHIC SCALE

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APPROXIMATE SCALE IN FEET

SITE LOCATION MAP
FORMER TOMBARELLO & SONS SITE
MARSTON STREET
LAWRENCE, MASSACHUSETTS

WESTON SOLUTIONS

MANCHESTER — NEW HAMPSHIRE

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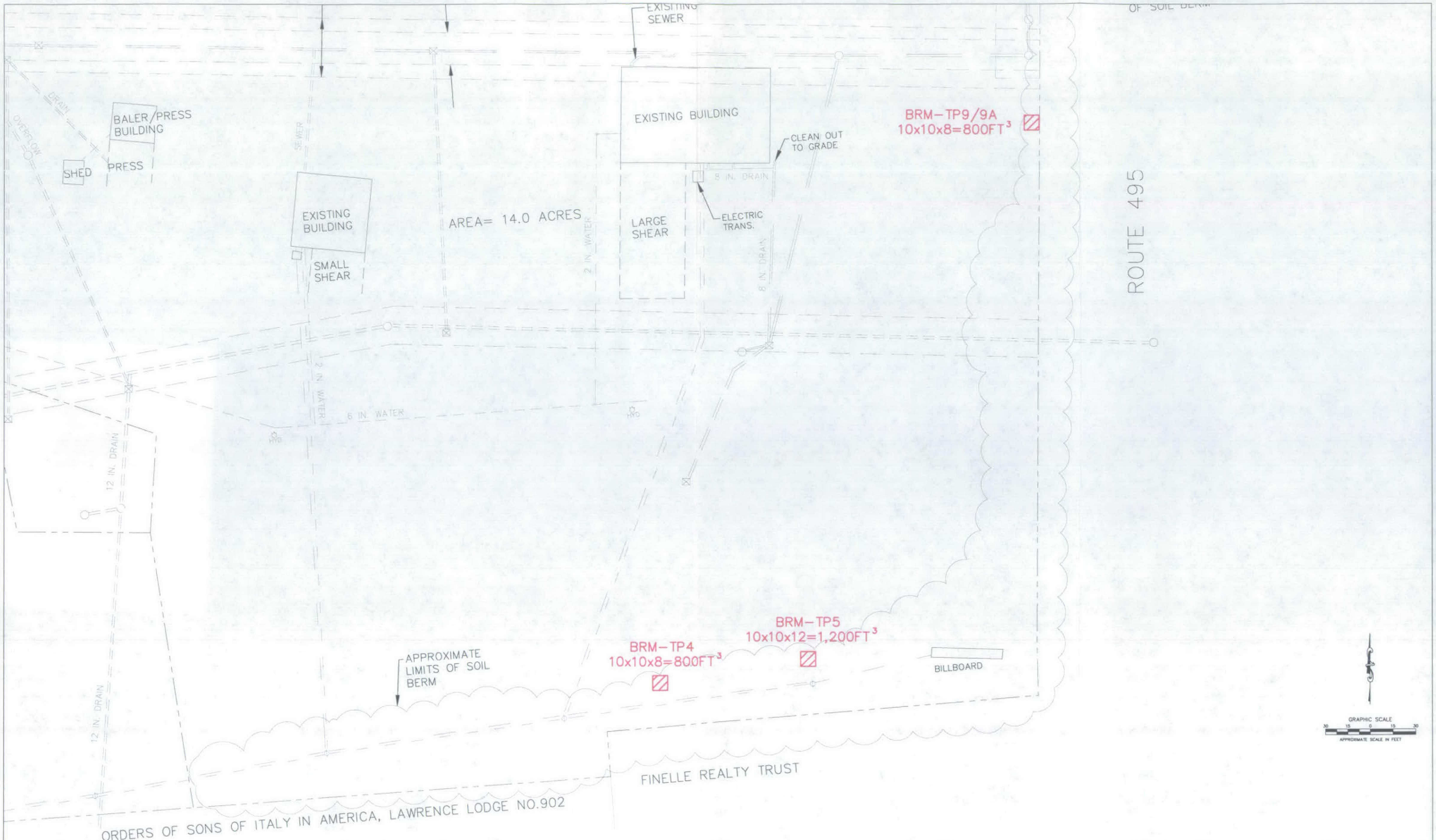

FORMER TOMBARELLO & SONS SITE
MARSTON STREET
LAWRENCE, MASSACHUSETTS

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PROPOSED LIMITS OF EXCAVATION

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BEG	AUG 2004	3-1B	
SCALE	W.O. NO.	SHT. ___ OF ___	
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evaluation to further assess the environmental conditions at the Site. The *IRA Plan* was filed on 21 April 1999 by Higgins Environmental Associates, Inc. (HEA) on behalf of Tombarello and American. The *IRA Plan* (HEA, 1999) included removal of a soil stockpile contaminated with heat transfer oil (RTN 3-16817), collection and analysis of surficial soil samples, and sampling and analysis of existing groundwater monitoring wells for the IH evaluation. The IH conditions were addressed through erection of a barbed-wire perimeter fence to eliminate site access by non-authorized personnel.

On 21 June 1999, MDEP issued another *NOR* (MDEP, 1999) for the Site and assigned RTN 3-18431 for oily sludge that was observed on the baler/press room floor. American Recycling of Massachusetts, Inc. contested that the sludge originated from the sewer and consequently, RTN 3-18431 was retracted pending further evaluation of the sewer as a potential migration pathway.

In April 2000, MDEP linked RTN 3-18431 with RTN 3-18126, and the property has been subsequently classified a Tier 1C Site under the MCP (310 CMR 40.0000). The Site is intended for future redevelopment as a commercial/light-industrial property. A list of major reports and select relevant legal correspondences regarding the Site and associated activities at the Site is included in Appendix A of the *Phase II CSA Report* (WESTON, 2004), which is being submitted to MDEP concurrently with this Phase III RAP.

In 2003, WESTON conducted a Phase II CSA, which included surface and soil boring, groundwater and sediment sampling and analysis in an effort to better delineate the extent of contamination at the Site. This information was also used to perform a detailed Risk Assessment for the Site. Results of the Phase II site investigation and risk assessment are presented in detail in the *Phase II CSA Report* (WESTON, 2004).

1.2 SUMMARY OF THE REMEDIAL INVESTIGATION

A summary of all soil, groundwater, and sediment sampling conducted at the Site between July 1998 and September 2003 is presented in the following subsections. A detailed discussion of these sampling events, including an evaluation of the results, is presented in the *Phase II CSA Report* (WESTON, 2004).

1.2.1 Soil

In July 1998, WZB collected 15 soil samples between 0-11 ft below ground surface (bgs) from nine soil boring locations. The samples were analyzed for semi-volatile organic compounds (SVOCs), metals, volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), and total petroleum hydrocarbons (TPHs). Analytical results, which are presented in the *Phase II CSA Report* (WESTON, 2004), indicated exceedances above the MCP Reportable Concentration Standard (RCS-1) criteria for SVOCs, TPH (diesel range); PCBs, and metals.

On 26 April 1999, HEA collected a total of 45 discreet soil samples from depths of 0-6 inches bgs at previous WZB sample locations. The samples were analyzed for PCBs, extractable petroleum hydrocarbons (EPHs), metals (lead and cadmium only), VOCs, and volatile petroleum hydrocarbons (VPHs). Based on the results of these samples, HEA collected an additional 19 discreet soil samples on 28 April 1999 to better define locations where potential IH conditions might be present. These samples were analyzed for the same analytes listed above and the results indicated exceedances above the MCP RCS-1 criteria for EPHs, metals (lead only), VOCs, and PCBs. Detection of Aroclor 1260 at a concentration of 57 milligrams per kilogram (mg/kg) at sample location SB6-SS1 resulted in identifying this location as a potential IH condition. To further delineate the potential IH condition identified during the April 1999 sampling event, HEA collected five additional discrete soil samples on 2 June 1999 in the approximate location of the previous SB6-SS1 sample location. The samples were analyzed for the same analytes listed above and the results indicated an elevated concentration of Aroclor 1260 (92 mg/kg) detectable at sample location SB6-N1, which was located approximately 10 ft north of the original sample location.

In September 2001, Haley & Aldrich, Inc. (H&A) collected 35 soil samples between 0-15 ft bgs for laboratory analysis. Twelve of these samples were collected from the soil berm and three were collected in the vicinity of the Baler Press Building (refer to Figure 1-2). The samples were analyzed for PCBs only using U.S. Environmental Protection Agency (EPA) Method 8082. Sample results indicated exceedances of MCP RCS-1 criteria of 2 mg/kg for the following PCBs: Aroclor 1016 (average = 4.9 mg/kg; max = 11 mg/kg); Aroclor 1242 (average = 65 mg/kg; max = 66 mg/kg); Aroclor 1254 (average = 5.4 mg/kg; max = 11 mg/kg); and Aroclor 1260 (average = 16.9 mg/kg; 78 mg/kg).

Soil concentrations of PCBs greater than 50 mg/kg have been found at the Site; therefore, the remediation of PCBs at the Site is regulated under both the Toxic Substances Control Act (TSCA) and the MCP. Therefore, throughout the winter and spring of 2003, WESTON solicited input from both MDEP and EPA, New England, on behalf of First Lawrence Financial, LLC with regard to sampling locations, frequencies, and data quality objectives (DQOs) for PCBs in soil at the Site. Initially, it was anticipated that PCBs at the Site would be remediated as a self-implementing cleanup under Subpart O of TSCA. Therefore, during the planning stages of additional site characterization activities to be conducted by WESTON, a cleanup goal of 100 mg/kg for PCB-impacted soils was proposed as an appropriate DQO provided the Site would be subsequently capped with at least 6 inches of asphalt, and future reuse of the Site would be limited to low occupancy use (no more than 16 hours per week). However, U.S. Environmental Protection Agency, Region I mandated a more conservative site-specific action level of 75 mg/kg to account for field and analytical variability.

In February 2003, WESTON collected 28 soil samples between 0-7 ft bgs from 13 boring locations. The samples were analyzed for EPH, metals, and total PCBs. Sample results indicated exceedances of the RCS-1 criteria for all analytes tested, with the exception of selenium and silver. A total of 12 samples had detectable PCB concentrations greater than the RCS-1 criteria of 2 parts per million (ppm), but less than the site-specific criteria of 75 ppm. Only one sample, which was collected at WSB-6 between 0-1 ft bgs, exceeded 75 ppm.

Additional site characterization sampling was conducted by WESTON in July 2003 to further delineate previously identified PCB-contaminated areas. A total of 44 composite samples were collected and analyzed for total PCBs. The analytical results indicated PCB exceedances at 5 of the 22 boring locations where samples were analyzed. During the July 2003 sampling event, WESTON also collected discrete samples from two previously identified PCB "hot spots": WSB-6 (WESTON, February 2003) and SB-6 (HEA, June 1999). A total of 33 discrete samples were collected at depth intervals ranging from 0–3 ft bgs from 11 sample locations surrounding the two "hot spot" locations. Sample results indicated PCB concentrations in exceedance of the 75 ppm action level in two samples collected at "hot spot" WSB-6. There were no detections of PCBs above the site-specific criteria of 75 ppm in any samples collected at "hot spot" SB-6. Both "hot spot" locations were considered satisfactorily delineated by the 75 ppm site-specific criteria following the July 2003 sampling event; however, a total of 15 sample results indicated elevated levels of PCBs above the 2 ppm MCP RCS-1 criteria within the vicinity of both "hot spot" locations.

In September 2003, WESTON collected a total of 44 discrete soil samples from the five composite sample locations where concentrations of PCBs were detected in July 2003 above the 75 ppm site-specific criteria. Samples were analyzed for total PCBs only. The analytical results indicated detectable concentrations of PCBs above the 75 ppm site-specific action level in four samples: WSB-76 (1-2 ft bgs); WSB-77 (2-3 ft bgs); WSB-78 (1-2 ft bgs); and WSB-79 (1-2 ft bgs). Additional samples were collected at depths ranging between 2-3 ft bgs to delineate the PCB concentrations at these locations. Although all September 2003 sample locations were satisfactorily delineated by the 75 ppm site-specific criteria, a total of 22 sample results indicated elevated levels of PCBs above the 2 ppm MCP RCS-1 criteria.

Based on analysis of the sample results obtained by WZB, HEA, H&A, and WESTON between July 1998 and September 2003, a risk assessment was conducted to determine the contaminants of concern (COCs) in soil for the Site. The risk assessment concluded the following COCs exist in soil at the Site: PCBs; carcinogenic polycyclic aromatic hydrocarbons (PAHs); metals (arsenic, lead, and cadmium), VPHs and EPHs. Detailed results of the risk assessment are presented in the *Human Health Risk Assessment* (Sundstrom, 2004).

1.2.2 Groundwater

In July 1998, WZB installed and sampled five groundwater monitoring wells. The samples were analyzed for VOCs, pesticides, metals, SVOCs, VPHs, EPHs, and PCBs. Sample results indicated no exceedance above the Reportable Concentration Groundwater Standard 2 (RCGW-2) criteria for the parameters analyzed.

On 10 June 1999, HEA sampled one of the existing WZB monitoring wells and three new wells using low-flow sampling techniques. Samples from each well were analyzed for VOCs, metals, VPHs, and EPHs. Sample results indicated no exceedances above the RCGW-2 criteria for any of the parameters analyzed.

In February 2003, WESTON planned to redevelop and sample the seven existing monitoring wells previously installed by WZB and HEA. None of the existing wells could be located during the WESTON site reconnaissance; therefore, WESTON installed four new 1.5-inch diameter wells to collect the groundwater samples. The samples were analyzed for VOCs and metals. Sample results indicated that vinyl chloride was detectable in one downgradient well (MW-7) at a concentration that exceeds the RCGW-2 criteria for groundwater at the Site. There were no detections of VOC analytes above the RCGW-2 criteria in the three upgradient monitoring wells. There were no detections of metals at any of the four monitoring well sample locations.

1.2.3 Sediment

In September 2002, H&A collected nine sediment samples from the Merrimack River for PCB analysis. The samples were collected from 0-1 ft from the river bottom using a hand auger. The samples were analyzed for PCBs only and results indicated exceedances above the National Ocean and Atmospheric Administration Threshold Effect Levels (NOAA TELs) for Aroclor 1260 at two sample locations (SED-4 and SED-7). Sample location SED-7 also had an exceedance for Aroclor 1254.

In February 2003, WESTON collected three additional sediment samples to determine if concentrations of COCs leaving the Site are less than or equal to those entering the Site. During this sampling event, two samples were collected upstream of the Site and one sample was collected downstream of the Site. Sample results indicated that levels of PCBs (Aroclor 1242 and

Aroclor 1260) and metals (arsenic, cadmium, chromium, lead, and mercury) are detectable at concentrations that exceed the NOAA TELs in samples collected both upstream and downstream of the Site. With the exception of Aroclor 1242 and cadmium, the concentrations of contaminants are lower at the downstream sample location compared to the two upstream sample locations.

1.3 SUMMARY OF THE HUMAN HEALTH RISK ASSESSMENT

A risk assessment was completed as part of the *Phase II CSA Report* (WESTON, 2004) to evaluate whether COCs detected in groundwater and soil at the Site pose a significant risk of harm to human health, public welfare, or the environment, as defined in the MCP. A Method 3 Human Health Risk Assessment and a Stage I Environmental Screening Risk Assessment were performed to evaluate potential risks under current and reasonably foreseeable future conditions. Results of these assessments are summarized below, and presented in detail in the *Human Health Risk Assessment* (Sundstrom, 2004), which is included as Appendix D of the *Phase II CSA Report* (WESTON, 2004).

The risk assessment identified and evaluated the following primary exposure pathways for COCs at the Site:

- **Trespassers:** Under current conditions, exposure through dermal contact, and/or incidental ingestion of surficial soil could occur.
- **Employees:** Future employees at the Site have minimal risk of contact with COCs.
- **Construction/Utility workers:** Workers could be exposed to impacted soils and/or groundwater through dermal contact, incidental ingestions, and/or inhalation while conducting excavations or other intrusive work at the Site.

As previously discussed, the Site is impacted with PCBs, PAHs, and metals in soil, and VOCs in groundwater. For the purposes of the risk assessment, it was assumed that VOC concentrations detected in groundwater would not result in significant impacts to ambient air or indoor air of future buildings constructed at the Site. Furthermore, VOCs were not detected in soil at significant concentrations; therefore, exposure via inhalation was not evaluated. It was also assumed that future employees at the Site would not be exposed to soil contaminants, because surficial soils will be covered by buildings and asphalt during redevelopment of the Site. However, exposure was assessed for trespassers and construction/utility workers.

Results of the assessment indicate that COCs in the soil do not pose a significant risk to trespassers with the exception of one "hot spot" identified within the vicinity of WSB-6 (refer to Figure 1-3). Risks to construction workers were identified in association with "hot spots" within the vicinity of WSB-6, CD-45, WSB-2, and deeper soils in the berms on the east/southeast side of the property (refer to Figure 1-3). Risks to utility workers were identified in association with "hot spots" within the vicinity of WSB-6 and CD-45 (refer to Figure 1-3). Based on these results it has been concluded that a condition of NSR exists at the Site with the following exceptions:

- Within the vicinity of the WSB-6 and WSB-2 "hot spots".
- Between 1-2 ft bgs at CD-45.
- Subsurface soils associated with berm locations: BRM-TP4; BRM-TP5; and BRM-TP9/9A.

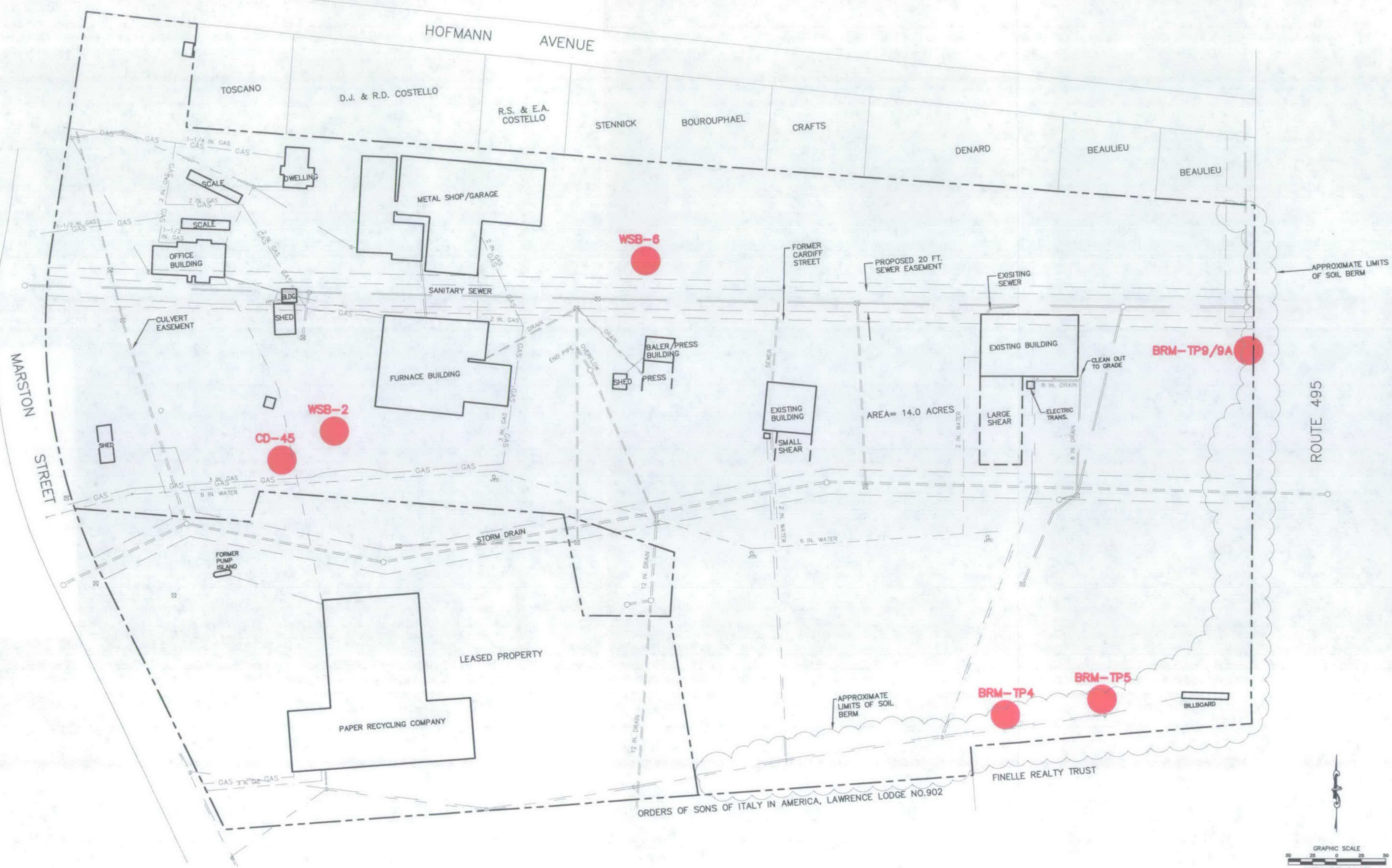
1.4 SITE REMEDIAL OBJECTIVES

The purpose of identifying and implementing appropriate remedial actions is to ensure that a condition of NSR is achieved for the Site. A condition of NSR is defined under 310 CMR 40.0006 as follows:

> *A level of control of each identified substance of concern at a site or in the surrounding environment such that no substance of concern shall present a significant risk of harm to health, safety, public welfare or the environment during any foreseeable period of time.*

Per 310 CMR 40.0869(3), for a disposal site where remedial actions are necessary to meet NSR the MCP requires that an evaluation of the feasibility for achieving or approaching background be conducted. The following is an abbreviated definition of "background" (310 CMR 40.0006):

> *Background means those levels of oil and hazardous material that would exist in the absence of the disposal site of concern.*



NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION

FORMER TOMBARELLO & SONS SITE
MARSTON STREET
LAWRENCE, MASSACHUSETTS

WESTON SOLUTIONS
MANCHESTER NEW HAMPSHIRE

CHECKED	DATE	CLIENT APPROVALS	DATE
DES. ENG.			
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PROJ. MGR.			
APPROVED			
APPROVED		ISSUED FOR	DATE

"HOT SPOT" LOCATION MAP

DRAWN	DATE	FIGURE NO.	REV. NO.
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Based on the requirements of the MCP in conjunction with the findings presented in the *Phase II CSA Report* (WESTON, 2004), the following remedial action objectives have been established for the Site:

- Remove, treat, and/or manage contaminated soil to achieve a condition of NSR.
- Eliminate or mitigate existing sources of contamination for soil, groundwater, and sediment.
- Protect groundwater from further impact of contaminants that could leach from site soil.

In order for the chosen remedial alternative to achieve NSR, wholly or in part, through reduction in contaminant concentrations at the "hot spot" locations outlined in Subsection 1.3, the concentrations of contaminants in these areas must be reduced to the following risk-based concentrations:

- PCBs: 30 mg/kg
- Cadmium: 350 mg/kg

SECTION 2

INITIAL SCREENING OF LIKELY REMEDIAL ACTION ALTERNATIVES (310 CMR 40.0856)

2. INITIAL SCREENING OF LIKELY REMEDIAL ACTION ALTERNATIVES (310 CMR 40.0856)

The purpose of the initial screening of likely RAAs is to identify RAAs for further evaluation that are reasonably likely to achieve a Permanent or Temporary Solution. Permanent and Temporary Solutions are described in 310 CMR 40.0006, respectively, as follows:

> *Permanent Solution means a measure or combination of measures, which will, when implemented, ensure attainment of a level of control of each identified substance of concern at a disposal site or in the surrounding environment such that no substance of concern will present a significant risk of damage to health, safety, public welfare, or the environment during any foreseeable period of time.*
>
> *Temporary Solution means any measure or combination of measures which will, when implemented, eliminate any substantial hazard which is presented by a disposal site or by any oil and/or hazardous material at or from such site in the environment until a Permanent Solution is achieved.*

The initial screening process of likely RAAs includes the following steps:

1. **Development of general response actions, technologies, and process options**: The general response actions identified for the Site are intended to address the isolation, removal, containment, treatment, and/or disposal of the COCs.
2. **Selection of process options:** Of the general response actions considered in Step 1, the technologies and process options that may prove infeasible are eliminated. The remaining technologies are retained.
3. **Development of likely RAAs:** The technologies that were retained for further consideration in Step 2 are selectively combined to form RAAs that are likely to meet the remedial objectives.

General response actions are presented in Subsection 3.1. Identification and screening of remedial technologies and process options are presented in Subsection 3.2. Development of likely RAAs is presented in Subsection 3.3.

2.1 GENERAL RESPONSE ACTIONS

The following general response actions have been identified for the Site to prevent potential direct contact with, and ingestion of, impacted soils, and to minimize migration of COCs from the Site to groundwater:

- No-Action
- Institutional controls
- Containment
- Removal
- Treatment
- Disposal

The general response actions listed above and associated remedial technologies/process options applicable for the Site are presented in Table 2-1.

2.2 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

The primary objective of this subsection is to identify and screen the potential remedial technologies and process options presented in Table 2-1 for further consideration in developing RAAs for the Site. The purpose of this screening process is to eliminate, based on information obtained during the remedial investigation, technologies that are not feasible or have significant limitations that could prevent achievement of the remediation objectives for the Site. Potential technologies and process options for the Site were screened with respect to technical implementability while considering site-specific conditions, the specific medium of concern (soil), and the existing COCs (PCBs, lead, and cadmium). A summary of the screening results with a recommendation whether to retain or eliminate each process from further consideration is included in Table 2-1.

Table 2-1
Evaluation of Remedial Technologies and Process Options for Soil
Former Tombarello and Sons Property
Lawrence, Massachusetts

General Response Action	Remedial Technology	Process Option	Description	Effectiveness	Implementability	Cost	Recommended for RAA
No Action	None	N/A	No Action	Will not achieve remedial action objectives	Easily implemented	None.	No
Institutional Controls	Access Restrictions	Deed Restrictions	Deeds for the property include restrictions to industrial use and prohibit disturbing areas with potential risk.	Effectiveness depends on future use of property. Does not reduce contamination	Easily implemented.	Low	Yes
		Site Fencing	Installation of fences and/or signage around areas with potential risk.	Effective in reducing access by public. Does not reduce contamination	Easily implemented. Periodic inspections and repair required for fences, signs, and vegetative soil cover.	Low	Yes
Containment	Capping	Asphalt	Application of a layer of asphalt to stabilize surface soil, reduce infiltration of surface water, and prevent contact with impacted soil.	Effective in reducing risks of both infiltration and human contact with contaminated soils. Does not reduce contamination.	Easily implemented. Actual operating life is uncertain. Requires long-term O&M. Cannot be installed during frozen or saturated ground conditions.	Moderate	Yes
		Concrete	Application of a layer of concrete to stabilize surface soil, reduce infiltration of surface water, and prevent contact with impacted soil.	Effective in reducing risks of both infiltration and human contact with contaminated soils. Does not reduce contamination.	Easily implemented. Actual operating life is uncertain. Requires long-term O&M. Cannot be installed during frozen or saturated ground conditions.	Moderate	No
		Multilayered Cover System	Construction of a multi-layer, low-permeability, clay and synthetic cover over the waste to stabilize surface soil and reduce surface water infiltration.	Effective insitu containment of soils impacted with VOCs, SVOCs, PCBs, and inorganics.	Low durability and bearing pressure; therefore, restricts future land use. Uncertain operating life. Requires long term O&M.	Moderate	No
	Storage	On-Site Building	Place soil/sediment in a secure building.	Effectiveness depends on future use of property. Does not reduce contamination.	Not applicable for Site conditions.	Low	No
	Erosion Control	Seeding/planting	Vegetation used to maximize runoff and control erosion.	Effectiveness depends on future use of property. Does not reduce contamination	Not compatible with intended future use of the Site.	N/A	No
Removal	Excavation	Excavation	Excavation of affected soils.	Effective and reliable; conventional technology. Reduces contamination.	Easily implemented using conventional equipment and techniques. Excavated material requires treatment and/or disposal.	Low	Yes
Treatment	Thermal Treatment	Rotary Kiln Incinerator	Thermal destruction of organic contaminants to carbon dioxide and water vapor.	Conventional technology for destruction of PCBs.	Mobile units can be easily operated on-site and save transportation costs associated with off-site incineration. Operating permit required for on-site unit. Requires off gas treatment. Incinerator ash requires treatment and/or disposal.	High	Yes
		Fluidized Bed Incinerator	Thermal destruction by fluidized bed incinerator.	Effective and reliable; conventional technology. Successfully demonstrated for PCB contaminated soils.	More difficult and expensive to operate than Rotary Kiln incinerator.	N/A	No
		Infrared Processing System	Thermal destruction by infrared processing system.	Effective and reliable; conventional technology. Successfully demonstrated for PCB contaminated soils	More difficult/expensive than Rotary Kiln incinerator.	N/A	No

Table 2-1
Evaluation of Remedial Technologies and Process Options for Soil
Former Tombarello and Sons Property
Lawrence, Massachusetts

General Response Action	Remedial Technology	Process Option	Description	Effectiveness	Implementability	Cost	Recommended for RAA
Treatment Cont'd	Thermal Treatment	Thermal Desorption	Heat is applied to the soil in a bed under constant agitation. Organic contaminants and water vapor volatilize to the gas phase for treatment.	Effective for treating VOCs at all tempreatur ranges. High temperatures and long residence times are required for treating SVOCs and PCBs.	Proven full-scale capabilities for all types of soil. Off-gas treatment required. Soil characteristics affect duration and cost of treatment.	Moderate	Yes
		Ex-Situ Vitrification	Melting of soils in a thermal reactor to immobilize contaminants in a glass-like matrix.	Demonstrated to destroy organics and immobilize inorganics in contaminated soil.	Not feasible at an active industrial site.	N/A	No
	Ex Situ Treatment	Soil Washing	Removal of soil contaminants using water augmented with surfactants or other chelating agent	Minimally effective for PCBs	N/A	N/A	No
		Solvent Extraction	Removal of soil contaminants by dissolving in an organic solvent	Effective for treatment of organic contaminants (PCBs, VOCs, and petroleum wastes).	Requires treatability study to determine efficiency. Additional treatment and/or disposal may be required. Soil characteristics may impact process efficiency.	Moderate	Yes
		Asphalt Batching	Immobilization of soil contaminants by "batching" (mixing) with an asphalt-based matrix.	Not applicable for materials containing high levels of PCBs.	N/A	N/A	No
		Chemical Dechlorination	Removal of chlorine atoms from chlorinated organic compounds by adding reagents, thereby converting into less toxic substances.	Effectivenss limited by high PCB concentrations.	Not feasible at an active industrial site.	N/A	No
	In Situ Treatment	Soil Volatilization	Removal of site constituents by volatilization under negative pressure. Could also be performed ex-situ under controlled conditions.	Ineffective for removal of PCBs.	N/A	N/A	No
		Soil Flushing	In situ removal of site constituents using solvents and/or surfactants.	Innovative technology used primarily to treat SVOCs and PCBs. Water soluble inorganic contaminants may also be removed through soil flushing.	Significant volume of flushing solution to recover. Limited by Soil characteristics. Extensive pilot testing required to establish effectiveness for Site conditions.	Moderate	No
		Biodegradation	Biodegradation of contaminamnts using microbes. Can be enhanced with addition of nutrients, oxygen, or hydrogen.	Not well proven for PCBs	N/A	N/A	No
		Chemical Treatment	Introduction of oxidizing agents such as hydrogen peroxide to degrade contaminants.	Not well proven for PCBs	N/A	N/A	No
		In Situ Soil Vitrification	Converting soils into a durable glass-like substance at very high temperatures using electrodes.	Innovative technology. Has been tested for treatment of VOCs, SVOCs, and PCBs.	Not feasible at an active industrial site.	N/A	No
		Stabilization	Solidification of soil into large masses using admixture to immobilize contaminants.	PCBs are generally immobile and therefore, the effect is minimal. Ineffective for treatment of VOC compunds.	Long term effectiveness has not been demonstrated. Soil characteristics may affect implementability. Exposure to water or freeze/thaw cycles may limt effectiveness.	N/A	No

Table 2-1
Evaluation of Remedial Technologies and Process Options for Soil
Former Tombarello and Sons Property
Lawrence, Massachusetts

General Response Action	Remedial Technology	Process Option	Description	Effectiveness	Implementability	Cost	Recommended for RAA
Disposal	On-Site Disposal of Untreated Soil	On-Site Secure Landfill	Consolidate contaminated soil in an on-site landfill and cover with an impermeable membrane/cap.	Effective and reliable	Not compatible with intended future use of the Site.	N/A	No
	On-Site Disposal of Treated Soil	Backfilling/On-Site Landfill	Backfill excavated areas with treated material.	Effective and reliable	Easily implemented	Low	Yes
	Off-Site Disposal	TSCA Landfill	Disposal of soil/sediment at a permitted TSCA-approved hazardous waste landfill.	Effective and reliable for soil and sediment containing PCBs > 50 ppm.	Easily implemented. Potential T&D issues.	High	Yes
		Non-TSCA Landfill	Disposal of soil/sediment at a permitted non-TSCA non-hazardous waste landfill.	Effective and reliable for soil and sediment containing PCBs < 50 ppm.	Easily implemented. Potential T&D issues.	High	Yes

Notes:

N/A = Not Applicable
O&M = operations and maintenence
PCB = polychlorinated biphenyl
ppm = parts per million
SVOC = semi-volatile organic compound
TSCA = Toxic Substance Control Act
T&D = transportation and disposal
VOC = volatile organic compound

2.3 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

The remedial technologies retained in Table 2-1 have been used to develop the following three potential RAAs:

Alternative 1:	No-Action
Alternative 2:	Excavation, Off-Site Treatment and Disposal, with On-Site Capping and Access Restrictions
Alternative 3:	Excavation, On-Site Treatment and Disposal, and On-Site Capping with Access Restrictions

The RAAs listed above cover a range of remediation strategies that are feasible and likely permanent solutions for the Site. A detailed description and comparative evaluation of the processes required to implement each RAA is presented in Section 3. Key components, conceptual design information, and a discussion of limitations, assumptions, and uncertainties are included as necessary for each RAA.

SECTION 3

DETAILED EVALUATION OF REMEDIAL ACTION ALTERNATIVES
(310 CMR 40.0857)

3. DETAILED EVALUATION OF REMEDIAL ACTION ALTERNATIVES (310 CMR 40.0857)

3.1 EVALUATION APPROACH AND CRITERIA [310 CMR 40.0858(1) – (8)]

The objective of the detailed analysis is to further define and compare the seven RAAs identified for the Site by the initial screening process. This analysis provides the basis for final selection of the RAA most appropriate for the Site. Per 310 CMR 40.0858, the following evaluation criteria will be used to compare the applicability of each RAA:

- **Effectiveness** – comparative effectiveness if the RAAs in terms of:

  a) achieving a Permanent or Temporary Solution.
  b) reusing, recycling, destroying, detoxifying, or treating the contaminated material.
  c) reducing the COCs at the Site to levels that achieve or approach background.

- **Short-term and long-term reliability** – comparative short and long term reliability of the RAAs in terms of:

  a) degree of certainty that the alternative will be successful.

  b) effectiveness of measures required to manage any remaining wastes/emissions/discharges.

- **Implementability** – comparative difficulty in implementing the RAAs, including:

  a) technical complexity.
  b) integration with existing Site operations.
  c) monitoring, operations and maintenance (O&M), or site access limitations.
  d) availability of necessary services and materials.
  e) availability, capacity, and location of necessary off-site treatment/storage/disposal.
  f) requirements for approvals, permits, licenses by local/state/federal agencies.

- **Costs** – comparative costs, including:

  a) design, construction, equipment, Site preparation, labor, permits, disposal, and O&M.

  b) restoration, impacts on existing resources, etc.

  c) consumption of energy resources.

- **Risks** – comparative risks, including:

  a) short-term on-site and off-site risks associated with excavation, transportation, disposal, construction, O&M, etc.

  b) potential risk of harm to human health, safety, public welfare, or the environment by levels of COCs remaining at the Site.

- **Benefits** – comparative benefits, including:

  a) restoring natural resources.
  b) providing for productive reuse of the Site.
  c) avoiding costs for relocating people, businesses, water supplies, etc.
  d) avoiding lost value of the Site.

- **Timeliness** – comparative timeliness of the RAAs in terms of eliminating uncontrolled sources of contaminants and achieving NSR for the Site.

- **Effects upon non-pecuniary interests** – relative effect of the RAAs on aesthetic values.

3.2 EVALUATION OF ALTERNATIVE 1: NO ACTION

A No Action alternative is included among the RAAs being assessed in the detailed evaluation as required by the MCP. Inclusion of the No Action alternative in the detailed evaluation ensures that existing site conditions are compared with the conditions that would result from each of the proposed RAAs. This comparison provides a basis for analyzing whether anticipated Site conditions resulting from the implementation of each of the other alternatives warrant the effort and expenditures required to reach these conditions. Such an analysis prevents the unnecessary implementation of costly and energy-intensive remedies that attain little or no improvement in protecting health, safety, public welfare or the environment, when compared to other less costly alternatives. Under the No Action alternative, soils would not be disturbed and no measures would be taken to remediate impacted areas of the Site. Current contaminant migration and exposure pathways would remain and the COCs would be subject to attenuation by natural mechanisms.

3.2.1 Effectiveness [310 CMR 40.0858(1)]

Under the No Action alternative, existing concentrations of COCs present at the Site would not be reduced, destroyed, detoxified, or treated. Therefore, neither a Permanent nor Temporary solution for reducing current levels of the COCs to concentrations that achieve or approach background, or are protective of human health, safety, public welfare or the environment, would be achieved.

3.2.2 Short-term and Long-term Reliability [310 CMR 40.0858(2)]

Under the No Action alternative, existing protective measures would not be maintained and additional measures would not be implemented to protect Site workers and potential trespassers from exposure to Site contaminants. Furthermore, potential off-site migration of the contaminants would not be eliminated or mitigated and the potential risks to human health, safety, public welfare or the environment, as identified in the *Human Health Risk Assessment* (Sundstrom, 2004), would continue indefinitely to exceed acceptable risk goals for the Site.

3.2.3 Implementability [310 CMR 40.0858(3)]

Under the No Action alternative the existing site fence would not be maintained and additional measures would not be implemented to prevent human exposure to, and/or migration of, site contaminants. The No Action alternative is easily implemented both technically and administratively, and does not require additional services, materials, treatment, storage, or permitting.

3.2.4 Costs [310 CMR 40.0858(4)]

There are no additional costs associated with this alternative.

3.2.5 Risks [310 CMR 40.0858(5)]

Currently, public access is restricted to most of the property by an existing site fence. The existing site fence is not contiguous; however, and access to the Site can be attained. Furthermore, there is no barrier on-site to prevent access and/or contact with the localized "hot spots" identified in the vicinity of WSB-6, WSB-2, CD-45 and the soil berms adjacent to Route 495. Under the No Action alternative, existing protective measures would not be maintained and additional measures would not be implemented to protect site workers and potential trespassers from exposure to site contaminants. Given that the No Action alternative does not require any additional work effort at the Site, there are no additional risks associated with its implementation. As a result, the current impacts presented by the Site are not considered to be increasing over the short-term, but long-term risk of potential harm to human health, safety, public welfare, and the environment associated with remaining levels of COCs does exist.

3.2.6 Benefits [310 CMR 40.0858(6)]

The No Action alternative would not result in restoration of natural resources, would not lead to productive reuse of the Site, and would not prevent lost property value.

3.2.7 Timeliness [310 CMR 40.0858(7)]

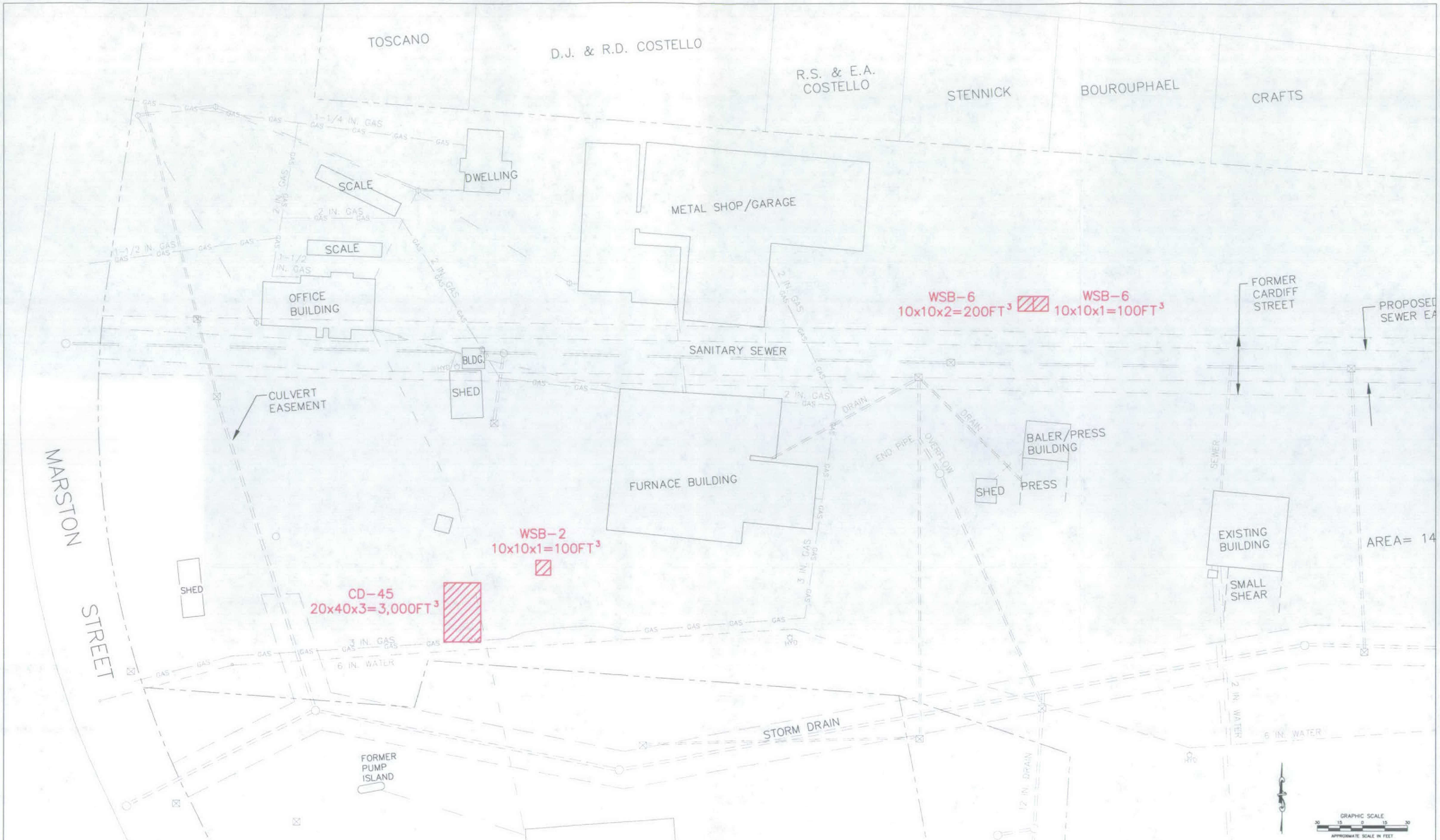
The No Action alternative would not lead to NSR classification for the Site in the foreseeable future.

3.2.8 Effects Upon Non-Pecuniary Interests [310 CMR 40.0858(8)]

This alternative would neither improve nor worsen non-pecuniary interests (aesthetic values) of the Site.

3.3 EVALUATION OF ALTERNATIVE 2: EXCAVATION AND OFF-SITE TREATMENT WITH ON-SITE CAPPING AND ACCESS RESTRICTIONS

Under this alternative, impacted soils would be excavated from the "hot spot" locations as shown on Figures 3-1a and 3-1b. The excavated material would be transported off-site for treatment (incineration) and/or disposal in a TSCA-approved landfill. Following removal of the impacted material, an asphalt cap would be installed over the whole Site to minimize exposure to, and the permeability of, remaining site soils. The objective of the cover is to reduce the potential for direct contact with elevated levels of COCs that remain at the Site, but do not pose a significant risk to human health, safety, public welfare, or the environment. In addition to capping, access restrictions would also be implemented to further control potential exposure to contaminated soils by site workers or trespassers. Access restrictions would include, but are not limited to: fencing; signs; and assignment of appropriate Activity and Use Limitations (AULs).



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PROPOSED LIMITS OF EXCAVATION

DRAWN	DATE	FIGURE NO.	REV. NO.
BEG	AUG 2004	3-1A	
SCALE: AS SHOWN	W.O. NO. 13057.001.002	SHT. ___ OF ___	

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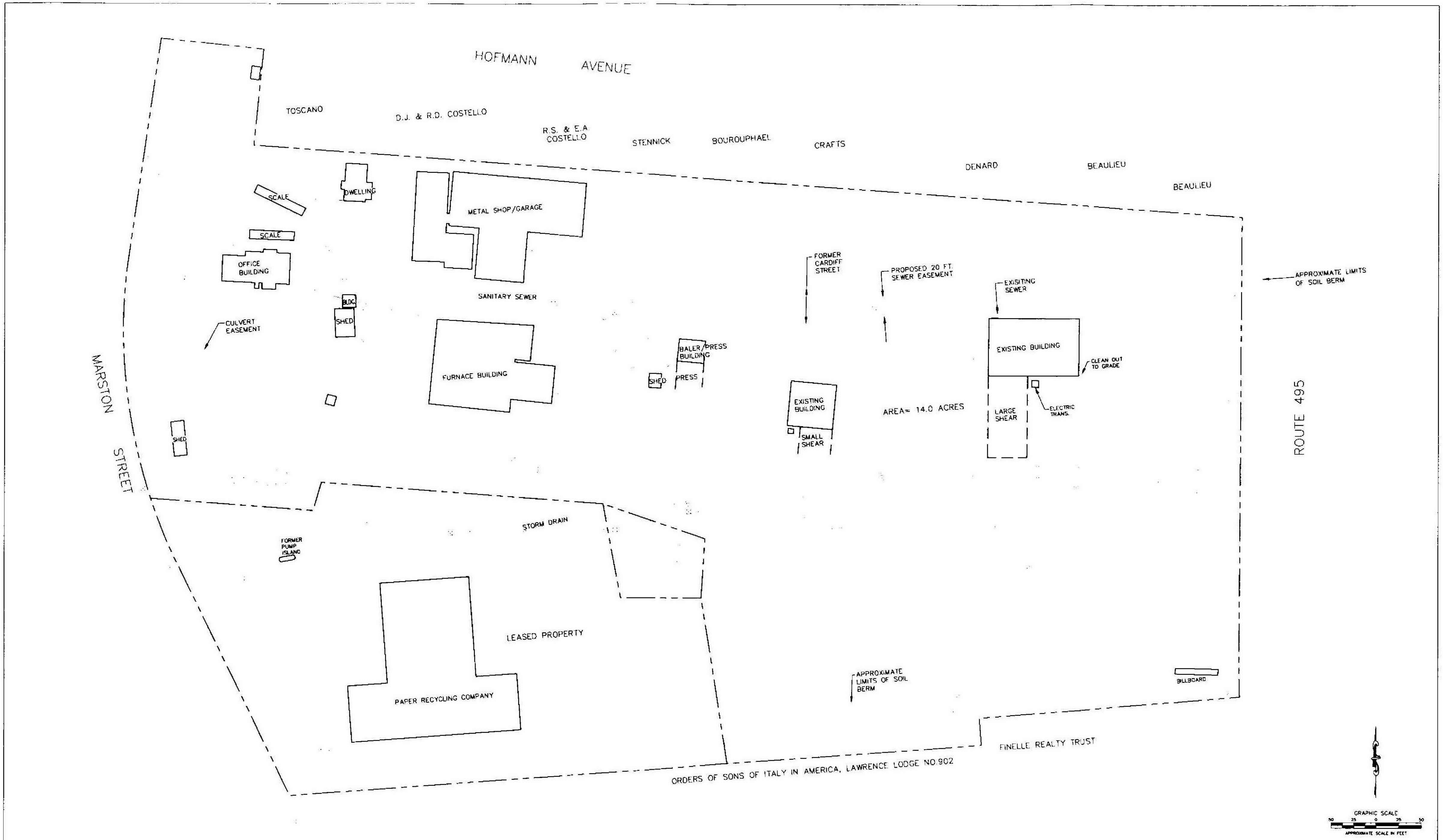

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION

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MANCHESTER NEW HAMPSHIRE

CHECKED	DATE	CLIENT APPROVALS	DATE
DES. ENG.			
PROJ. ENG.			
PROJ. MGR.			
APPROVED			
APPROVED		ISSUED FOR	DATE

SITE PLAN

DRAWN	DATE	FIGURE NO.	REV. NO.
BEG	AUG 2004	1-2	
SCALE AS SHOWN	W.O. NO. 13057.001.002	SHT ___ OF ___	

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Specific activities under this alternative include the following:

- Excavate impacted soils from designated "hot spot" locations.
- Transport excavated materials for off-site treatment at an approved incineration facility and/or disposal at a TSCA-approved hazardous waste landfill.
- Import clean soil for backfilling and grading.
- Install an asphalt cap, and construct new buildings (building construction is not discussed in this report; however, it has been assumed that a minimum of 150,000 ft^2 of the Site will be used for new building construction).
- Install a new contiguous fence around the site perimeter with warning signs to minimize site access by unauthorized personnel.
- Conduct routine inspections and maintenance to ensure the integrity of the asphalt cap, new fence, and signs.
- Require notification and approval (permit) by EPA and MDEP for any future site activities involving the displacement or excavation of site soils.
- Train site workers and contractors on an ongoing basis to make them aware of the impacted site soils and the importance of following appropriate access and excavation control instructions.
- Maintain records of training, Site access, and excavation permits.

3.3.1 Effectiveness [310 CMR 40.0858(1)]

Under this alternative, the combination of excavation, off-site disposal/treatment, capping, and access restrictions would result in a reduction of contaminant concentrations to levels that achieve or approach background within the vicinity of the identified "hot spots". All remaining unexcavated soil would contain concentrations of COCs at or below the Upper Concentration Limit (UCL) for each COC. Furthermore, at the completion of this alternative all site soils will be contained beneath the asphalt cap preventing exposure to, and/or migration of remaining COCs. With a diligent inspections and maintenance program, this alternative could provide an effective long-term solution for the Site.

Excavation and off-site incineration of impacted site soils identified to pose a risk to human health, safety, public welfare or the environment would result in destruction of the COCs in this material. The incineration process has been demonstrated to effectively destroy PCBs in soil with destruction and removal efficiency (DRE) up to 99.9999%. The incineration process will also volatilize VOC, SVOC, and volatile metal constituents (i.e., lead) present in the soil, but it will not destroy or detoxify non-volatile metals. Following incineration of PCB-impacted soil, the non-volatile metal constituents will be entrained in the process ash, which can be disposed at an approved facility.

Installation of an asphalt cap over the Site would result in permanent isolation and containment of remaining impacted site soils that do not currently pose a risk to human health, safety, public welfare or the environment. In addition, installation of a new contiguous fence around the site perimeter, in conjunction with assignment of appropriate AULs for the Site, would further reduce the potential for human exposure to remaining low levels of COCs.

3.3.2 Short-term and Long-term Reliability [310 CMR 40.0858(2)]

Under this alternative, excavation of the identified "hot spots", installation of an asphalt cap with site access restrictions, assignment of AULs, and routine inspections and repairs, would provide long-term protection to aboveground receptors from contacting contaminated site soils. To further minimize the potential for future contamination from remaining wastes, emissions, and/or discharges associated with the Site, ongoing groundwater monitoring would be required following completion of this alternative to ensure that residual levels of the COCs remaining in the site soils do not migrate to groundwater receptors.

3.3.3 Implementability [310 CMR 40.0858(3)]

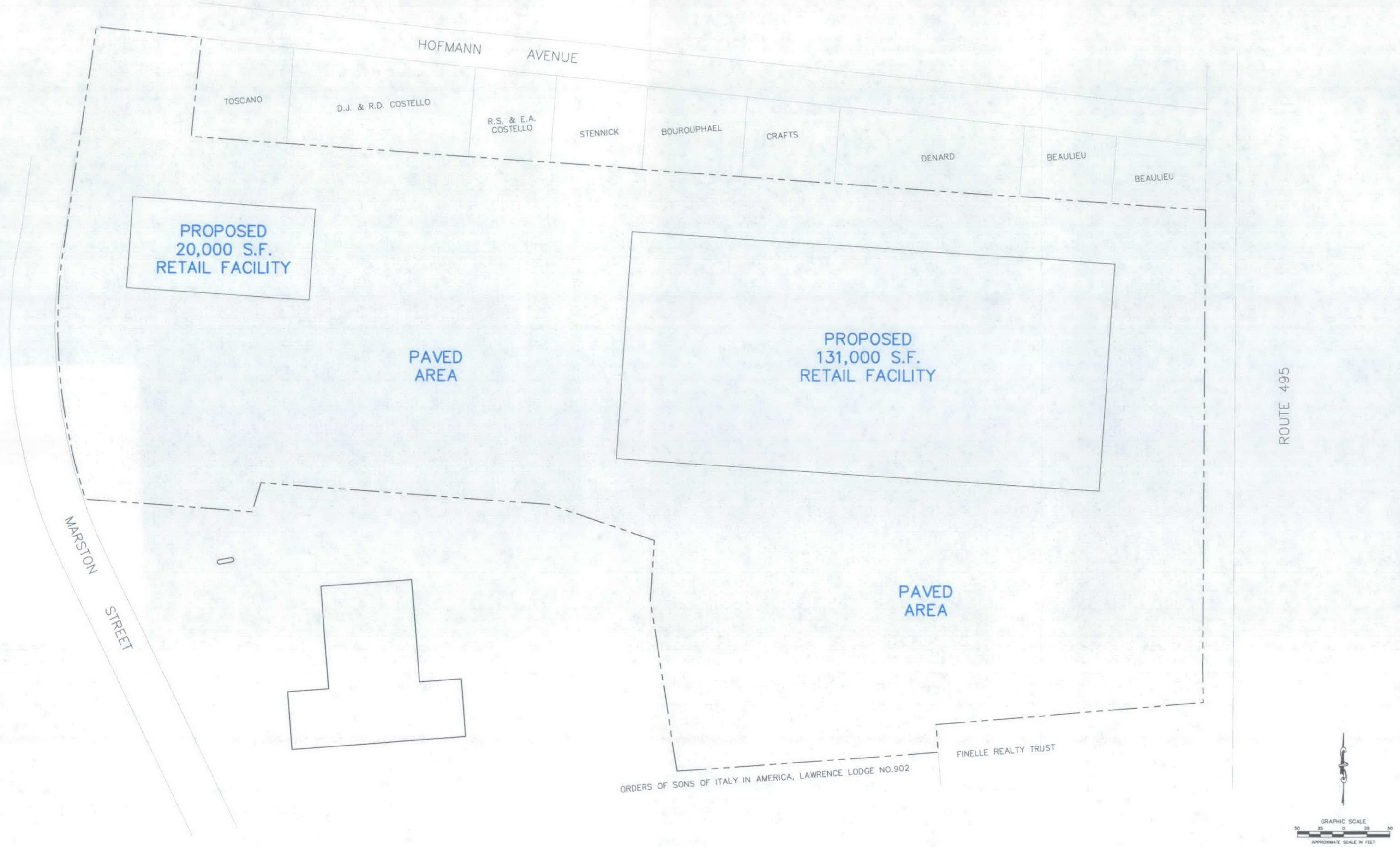
This alternative is easily implemented both technically and administratively. It involves established technologies, few construction materials, and few permitting requirements. The most significant implementability issues involve excavation and off-site transportation of the impacted soil. Excavated materials with PCB concentrations in excess of 50 ppm require incineration at an approved facility or disposal in a TSCA-approved landfill. Excavated materials with PCB concentrations less than 50 ppm can be incinerated at an approved facility or disposed in a non-hazardous Resource Conservation and Recovery Act (RCRA) Subtitle D landfill. Approximately 230 cubic yards (yd^3) of contaminated soils will be excavated and transported for off-site treatment and/or disposal, which presents a significant traffic and materials handling challenge. During excavation, dust suppression, personal protection equipment (PPE), and decontamination procedures will be required. An area to stage the excavated materials prior to transport may also be necessary.

Installation of the asphalt cap can be accomplished using conventional paving equipment and procedures. The asphalt cap will be applied over approximately 54,000 square yards of the Site as shown on the Proposed Site Paving and Property Reuse Plan (Figure 3-2). The remainder of the Site area (minimum 150,000 ft^2) will be covered by construction of new buildings, which are proposed as part of future property redevelopment. The asphalt cap will likely consist of a bituminous base course followed by a surface course that is sufficiently durable to support vehicular traffic. Where the asphalt cap abuts buildings/structures, as shown in Figure 3-2, either an emulsified asphalt or impermeable liner will be used to seal the building/cap interface to prevent infiltration of surface runoff. Paving will be conducted in accordance with all local, state, and federal requirements. Following completion, the asphalt cap will require routine inspection for cracks, excessive wear, and overall condition. To maintain integrity of the cover, small cracks in the asphalt will need to be repaired with sealers, and areas with large cracks would require replacement.

Activity and Use Limitations will be required for the property to note the presence of capped contaminated soil and prohibit any construction or other soil-intrusive activity not specifically approved by the EPA and MDEP.

3.3.4 Costs [310 CMR 40.0858(4)]

The total capital costs of Alternative 2 are estimated to be $5,609,000 and the annual O&M costs are estimated to be $50,000. The total present worth cost calculated for Alternative 2 (assuming 30 years of O&M, 6% interest, and 3% inflation) is $6,115,000. A breakdown of capital and annual costs for this alternative is presented in Table 3-1. The estimated costs assume that approximately 150,000 ft^2 of the Site will be covered by construction of new buildings, which are proposed as part of future property redevelopment. However, it should be noted that the estimated costs do not include the costs associated with construction of these buildings.



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PROPOSED SITE PAVING AND PROPERTY REUSE PLAN

DRAWN	DATE	FIGURE NO.	REV. NO.
BEG	AUG 2004	3-2	
SCALE: AS SHOWN	W.O. NO.: 13057.001.002	SHT. ___ OF ___	

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Table 3-1
Estimated Project Costs
Alternative 2 - Excavation and Off-Site Treatment with On-Site Capping and Access Restrictions
Former Tombarello and Sons Property
Lawrence, Massachusetts

Tasks	Quantity	Unit Cost ($/unit)	Total Cost ($)
Capital Costs			
Excavate "hot spot" locations			
Mobilization/Demobilization	1 LS	$4,000.00 LS	$4,000
[1] Site Preparation	1 LS	$10,000.00 LS	$10,000
Excavate PCB/metals impacted soil	230 yd^3	$20.00 yd^3	$4,600
Soil Confirmation Sampling and Analysis (S&A)			
Confirmation S&A (1/location)	5	$2,000.00 each	$10,000
T&D of excavated material			
Transportation and off-site incineration of excavated material	230 yd^3	$1,500.00 yd^3	$345,000
Import clean backfill			
Soil Cover, Unclassified Fill	230 yd^3	$25.00 yd^3	$5,800
Compact Subgrade	230 yd^3	$0.40 yd^3	$100
Install asphalt cap			
[2,3] Install asphalt cap	54,000 yd^2	$50.00 yd^2	$2,700,000
Install site access restrictions			
Site Fencing (6' galvanized chain link)	3,500 lf	$21.00 lf	$73,500
Site access gate (6' swing gate, 12' double)	1 ea	$710.00 ea	$700
Signs	35 ea	$45.00 ea	$1,600
Deed Notation and Land Use Restriction (legal fees)	1 LS	$50,000.00 LS	$50,000
SUBTOTAL			**$3,205,300**
Construction Management	10%	NA	$320,500
Engineering and Technical Services	25%	NA	$801,300
Contractor Overhead and Profit	15%	NA	$480,800
Contingency	25%	NA	$801,300
Total Capitol Cost			**$5,609,000**
Annual O&M Costs			
Site Monitoring and Maintenance			
Periodic Cover/Fence Inspection (1/mo)	24 hr	$50.00 hr	$1,200
Repair and Resurface Asphalt (1/10 per year)	5400 yd^2	$4.97 yd^2	$26,800
Fence Repair/Replace (1/10 per year)	350 lf	$20.95 lf	$7,300
Sign Replacement	2 ea	$44.82 ea	$100
SUBTOTAL			**$35,400**
Administrative Services	15%	NA	$5,300
Contingency	25%	NA	$8,900
Total Annual O&M Cost			**$50,000**
[4,5] TOTAL ESTIMATED PRESENT WORTH PROJECT COST (assume 30yrs O&M, 6% interest, 3% inflation)			**$6,115,000**

3.3.5 Risks [310 CMR 40.0858(5)]

There are short-term on-site and off-site risks associated with implementation of this alternative; however, these risks do not exceed current risks posed by existing conditions at the Site. Although current impacts to both on-site and off-site receptors associated with the Site are not considered to be increasing over the short-term, there are long-term risks of potential harm to human health, safety, public welfare, and the environment due to current levels of COCs at the Site.

During implementation of this alternative, short-term exposure to contaminated soil could occur primarily through dust generation while performing necessary excavation and materials handling tasks. To mitigate potential exposure by Site workers and/or off-site receptors, engineering controls would be required to govern any activity that might disturb or expose contaminated soils. Ambient air monitoring and. dust suppression would also be required throughout excavation activities to minimize potential off-site migration of airborne contaminants.

Off-site transportation of the excavated materials will be conducted by trained personnel only and will require stringent procedural and administrative controls, including regulatory requirements posed by MDEP, EPA, and the Department of Transportation (DOT).

Soils that have been identified in the *Human Health Risk Assessment* (Sundstrom, 2004) as posing a significant risk to human health or the environment under future site use scenarios will be removed from the Site under this alternative. Soils containing lower levels of COCs will be left in place and immobilized beneath the asphalt cap. Proper maintenance of the asphalt cap in conjunction with site access restrictions and AULs will reduce the potential for the remaining impacted site soils to come in contact with human or environmental receptors. Furthermore, the asphalt cap will provide a barrier to surface runoff that could infiltrate the soil and promote migration of the remaining COCs. Therefore, with diligent ongoing maintenance of the asphalt cap and site access controls, any remaining levels of COCs in site soils will not pose a significant risk of harm to health, safety, public welfare, or the environment during any foreseeable period of time.

3.3.6 Benefits [310 CMR 40.0858(6)]

Under this alternative, the combination of excavation, off-site disposal/treatment, capping, and access restrictions would result in a reduction of contaminant concentrations to levels that achieve or approach background within the vicinity of the identified "hot spots". To achieve or approach background for the whole Site, would require excavation of all impacted soils and material throughout the Site. Under this alternative, levels of COCs that do not pose a significant risk to human heath, safety, public welfare, or the environment would remain at the Site, but would be contained by the asphalt cap. Natural resources at the Site would not be restored; however, the Site would be sufficiently remediated for NSR classification, and to provide for productive reuse and improved property value.

3.3.7 Timeliness [310 CMR 40.0858(7)]

With ongoing inspection and maintenance following removal of the "hot spots" from the Site and installation of the asphalt cap, this alternative would eliminate the potential for worker and/or trespasser exposure to site contaminants, and would minimize the potential for off-site migration of the contaminants. A condition of NSR through excavation and installation of an asphalt cap could likely be achieved within an estimated 16 working days of site mobilization.

3.3.8 Effects Upon Non-Pecuniary Interests [310 CMR 40.0858(8)]

Excavation of the identified "hot spot" locations followed by construction of an asphalt cap would improve non-pecuniary interests (aesthetic values) of the Site.

3.4 EVALUATION OF ALTERNATIVE 3: EXCAVATION WITH ON-SITE TREATMENT AND DISPOSAL

This alternative involves excavation of the identified "hot spots", as previously described for Alternative 2, followed by on-site treatment of the excavated material. The treated material would then be used as backfill material on-site prior to installation of an asphalt cap as describe for Alternative 2. On-site treatment could be achieved using one of the following three technologies:

- Alternative 3A: Incineration
- Alternative 3B: Thermal Desorption
- Alternative 3C: Solvent Extraction

The following activities are associated with implementation of this alternative, and are common to the three potential on-site treatment technologies listed above:

- Excavate and transport impacted soils to the on-site treatment area.

- Prepare material for treatment.

- Feed prepared material through the on-site treatment system.

- Treat all process and residual wastes (i.e., off-gases and condensate) prior to discharge or disposal.

- Backfill excavated areas with the treated material and supplement with clean backfill as necessary.

- Grade backfilled areas for drainage, install asphalt cap, and construct new buildings (building construction is not discussed in this report; however, it has been assumed that a minimum of 150,000 ft^2 of the Site will be used for new building construction).

- Install a new contiguous fence around the site perimeter with warning signs to minimize site access by unauthorized personnel.

- Conduct routine inspections and maintenance to ensure the integrity of the asphalt cap, new fence, and signs.

- Require notification and approval (permit) by EPA and MDEP for any future site activities involving the displacement or excavation of site soils.

- Train site workers and contractors on an ongoing basis to make them aware of the impacted site soils and the importance of following appropriate access and excavation control instructions.

- Maintain records of training, site access, and excavation permits.

3.4.1 Effectiveness [310 CMR 40.0858(1)]

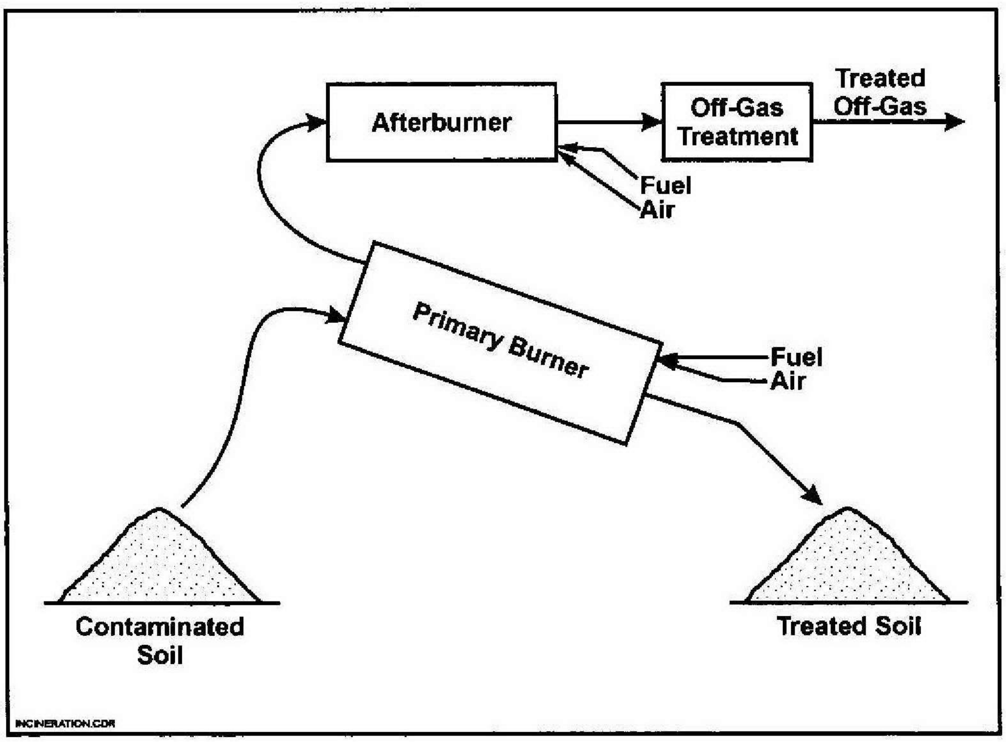
3.4.1.1 Alternative 3A: On-Site Incineration

Incineration has been demonstrated to effectively destroy PCBs in soil with a DRE of up to 99.9999%. The incineration process will also volatilize VOC, SVOC, and volatile metal constituents (i.e., lead) in contaminated soil. The process will not; however, destroy non-volatile metal constituents. These constituents will end up entrained in the incinerator process ash, which can be transported for off-site disposal at an approved facility.

Incineration is achieved by subjecting contaminated soils to high temperatures (1,400–1,550 °F), which cause thermal decomposition of the organic constituents contained in the soil. The organic contaminants are consequently converted to carbon dioxide and water vapor. A typical on-site incineration process is shown in Figure 3-3.

Figure 3-3 Typical On-Site Incineration Process

http://enviro.nfesc.navy.mil/erb/



The incineration process produces off-gas that requires treatment to remove particulates and neutralize acid gases (hydrochloric, oxides of nitrogen, and oxides of sulfur). Treatment of incinerator off-gas can be achieved using air pollution control equipment (i.e., scrubbers). Incinerator ash is another process residual of this treatment technology. Once cooled, the ash can be disposed off-site at an approved facility.

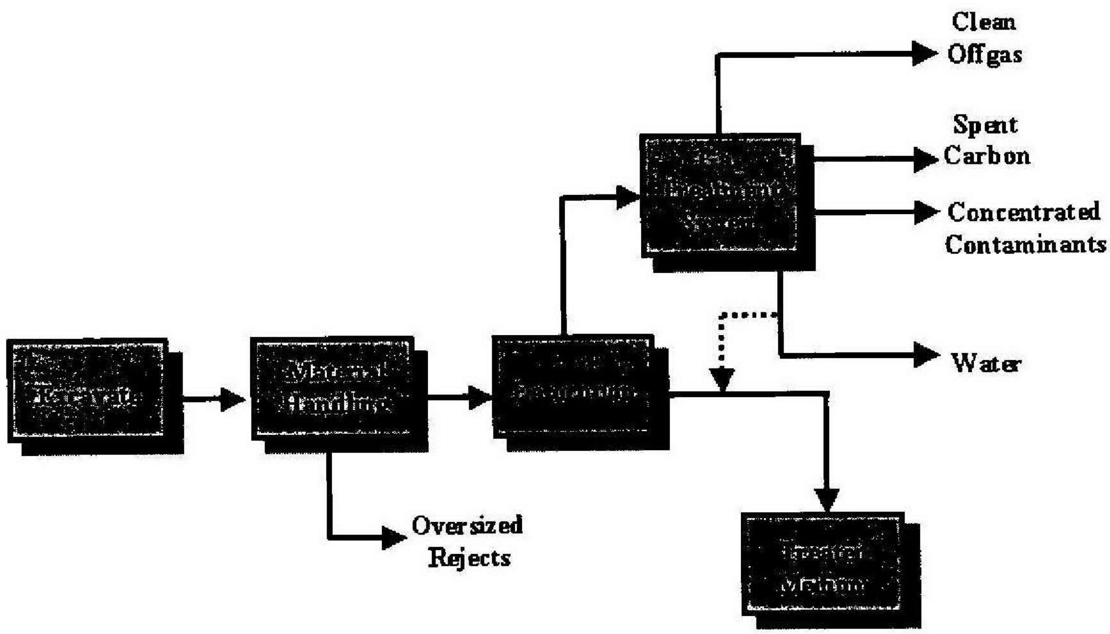
Under this alternative, excavation and incineration of the identified "hot spots", followed by transportation and off-site disposal of the process ash, would be an effective process for destroying site contaminants in the targeted high risk areas. This alternative would not; however, result in restoring levels of COCs detected in all site soils to levels that approach or achieve background. To achieve or approach background would require excavation of all impacted soils and material throughout the Site. Therefore, under this alternative, levels of COCs that do not pose a significant risk to human heath, safety, public welfare, or the environment would remain at the Site. Natural resources at the Site would not be restored; however, the Site would be sufficiently remediated to provide for productive reuse and improved property value.

3.4.1.2 Alternative 3B: On-Site Thermal Desorption

Thermal desorption is an ex-situ treatment process that uses either indirect or direct fired heat to volatilize contaminants and remove moisture from soil. Depending on the nature and type of contamination, thermal desorption can either be a high temperature process (600–1,000 °F), or a low temperature process (200–600 °F). Higher operating temperatures and longer residence times are more effective for removal of less volatile compounds, such as PCBs. Thermal desorption has been demonstrated to effectively destroy VOCs and SVOCs, fuel hydrocarbons, and pesticides in contaminated soil and will also remove volatile metals, such as lead.

Treatment of contaminated soil using thermal desorption results in the generation of treated soil, oversized and/or reject material, condensed contaminants, water/condensate, and off-gas. As shown in Figure 3-4, the excavated material is passed through the thermal desorption unit where the entrained contaminants volatilize to the gas phase. The resulting gas stream is directed from the desorber to an off-gas treatment system where particulates are removed using a scrubber and

Figure 3-4
Typical Thermal Desorption Process
(http://www.frtr.gov/matrix2/section4/4-26.html)



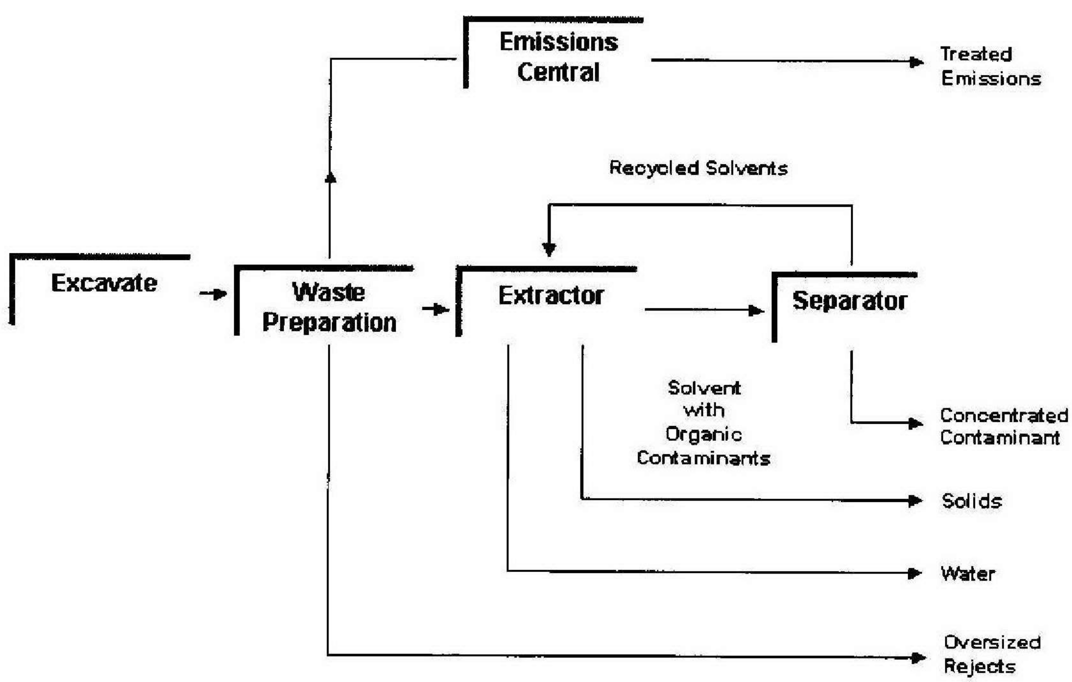
organics are recovered using activated carbon or condensation. Treated soil can be reused on-site as backfill or disposed off-site as non-hazardous material. Debris and reject material may require off-site disposal.

Under this alternative, excavation of the identified "hot spots" followed by treatment using thermal desorption would be an effective process for destroying site contaminants in the high risk areas. As previously stated, this alternative would not; however, result in restoring all levels of COCs detected at the Site to levels that approach or achieve background. To achieve or approach background for the whole Site would require excavation of all impacted site soils and materials. Under this alternative, levels of COCs that do not pose a significant risk to human heath, safety, public welfare, or the environment would remain at the Site. Natural resources at the Site would not be restored; however, the Site would be sufficiently remediated to provide for productive reuse and improved property value.

3.4.1.3 Alternative 3C: On-Site Solvent Extraction

Solvent extraction is an ex-situ treatment technology that results in separation of organic contaminants from soil matrices by solubilizing the contaminants in a chemical solvent (i.e., propane, butane, etc.). As shown in Figure 3-5, the excavated material is loaded into the system where it mixes with the solvent. The organic contaminants entrained in the soil matrix dissolve into the solvent, and the clean soil and solvent are then separated using a gravity separator or centrifuge process. The recovered solvent is regenerated using a distillation process for reuse in subsequent extraction cycles. The concentrated contaminant mixture is transported off-site for treatment and/or disposal at an approved facility. The treated soil can either be used on-site as backfill or transported off-site for disposal at an approved facility.

Figure 3-5
Typical Solvent Extraction Process
(http://www.frtr.gov/matrix2/section4/4-15.html)



In addition to the list of common activities associated with on-site treatment, the following activities are associated specifically with implementation of the solvent extraction technology:

- A treatability study is required to determine the type, effectiveness, and volume of chemical solvent required.
- Recovery of chemical solvent for reuse.
- Transportation of concentrated liquid waste for off-site disposal at an approved facility.

Solvent extraction has been shown effective for treating sediments, sludges, and soils containing organic contaminants such as, PCBs; VOCs; halogenated solvents; and petroleum wastes. Organically bound metals can also be extracted using solvent extraction. Solvent extraction will dissolve the majority of target compounds in soil, but will not destroy them; therefore, additional treatment by other means may be required prior to using the treated material as backfill on-site. Alternatively, the solids can be transported for off-site disposal at an approved facility.

Under this alternative, excavation of the identified "hot spots" followed by treatment using solvent extraction would be an effective process for reducing the concentration of site contaminants in the high risk areas. This alternative would not; however, result in restoring all levels of COCs detected at the Site to levels that approach or achieve background. As previously described, to achieve or approach background for the whole Site would require excavation of all impacted site soils and material. Under this alternative, levels of COCs that do not pose a significant risk to human heath, safety, public welfare, or the environment would remain at the Site. Natural resources at the Site would not be restored; however, the Site would be sufficiently remediated to provide for productive reuse and improved property value.

3.4.2 Short-term and Long-term Reliability [310 CMR 40.0858(2)]

Under Alternative 3, contaminated soils containing levels of COCs that could pose a risk to human health, safety, public welfare or the environment would be excavated and treated on-site using one of the three treatment technologies described (incineration, thermal desorption, or solvent extraction). On-site treatment would result in minimizing the potential for future contamination from wastes, emissions, and/or discharges currently associated with the Site. Backfilling and grading the Site with clean soil, followed by future paving or seeding the area, would provide long-term protection to aboveground receptors from contacting residual contaminated site soils, and would also minimize off-site contaminant transport that could occur through run-off, erosion, and/or groundwater migration. Ongoing groundwater monitoring would be required following completion of this alternative to ensure that residual levels of the COCs remaining in the site soils do not migrate to groundwater receptors.

3.4.3 Implementability [310 CMR 40.0858(3)]

Implementation of Alternative 3, using one of the three on-site treatment technologies previously described, is both technically and administratively feasible. Excavation of the contaminated soils can be performed using standard heavy equipment and construction techniques. Specific requirements applicable to excavation activities at this Site may include, but are not limited to: dust suppression; appropriate PPE; equipment decontamination; and ambient air monitoring. An excavation control program would also be required to govern any activity that might disturb or expose contaminated soils. Implementation of an on-site treatment technology would require the following additional ongoing activities:

- Ambient air monitoring to ensure the process is operating in accordance with performance standards.
- Periodic sampling of treated soil to verify attainment of cleanup criteria.
- Around-the-clock equipment repairs and maintenance as required.

Implementation of on-site treatment could result in opposition from citizens of the community who may express concerns about fugitive stack emissions and off-site migration of contaminants. Appropriate permitting (local, state, and federal), as well as coordination with neighboring property owners and local residents, would be required prior to executing any on-site treatment technology.

On-site treatment could also be hindered by a low cost to benefit ratio associated with each of the three technologies being considered. The financial return realized for treatment of the estimated 230 yd^3 may not sufficiently off-set the costs to mobilize treatment equipment and conduct preliminary pilot testing. This could lead to difficulty in identifying a vendor who is willing to perform on-site treatment of the relatively small volume of soil anticipated. Specific costs associated with each treatment technology are discussed in detail in Subsection 3.4.4.

Additional implementability issues specific to each of the three potential on-site treatment technologies identified for this Site are presented in Subsections 3.4.3.1 through 3.4.3.3.

3.4.3.1 Alternative 3A: On-Site Incineration

Operation of an on-site incinerator requires space for staging contaminated soil prior to incineration, process-generated materials following incineration, and the treatment equipment (including ash collection, solids handling, emissions control, and water treatment). Other requirements include fuel, electric service, and a continuous water supply. Materials storage capacity requirements will depend on the volume of soil treated and equipment feed rates.

Prior to implementing full-scale on-site incineration, start-up testing and a trial burn are required.

Following on-site incineration of the excavated materials, the process ash generated by the system will require transportation for off-site disposal at an approved facility. Safe and efficient loading and transport of the process ash is an important implementation issue associated with this technology.

Permitting to operate an on-site incinerator can be difficult to obtain. The incineration process is subject to the performance and monitoring requirements of 40 CFR 761.70(b), and multiple technology-specific regulations including: the Clean Air Act; RCRA; the National Pollutant Discharge Elimination System Permitting Program; the Noise Control Act; and TSCA.

3.4.3.2 Alternative 3B: On-Site Thermal Desorption

Excluding space requirements for materials handling and decontamination, space requirements for staging thermal desorption equipment is generally less than that required for an incineration process. Similar to the incineration process, other requirements for operation of this technology include fuel, electrical service, and water supply.

Prior to implementing full-scale treatment using on-site thermal desorption, start-up and treatability testing are required.

Following on-site treatment using thermal desorption, process residuals, including the treated soil and process condensate, will require disposal and/or treatment. As previously described, the treated material can be used as backfill on-site. The thermal desorption process also generates concentrated condensate that will be treated on-site; likely using activated carbon. Depending on the quality of the treated condensate, the liquid waste can be discharged either to the local water treatment plant or to the Merrimack River located adjacent to the Site.

3.4.3.3 Alternative 3C: On-Site Solvent Extraction

As with the other technologies described for the on-site treatment alternative, in addition to space requirements for materials handling and decontamination processes, space is required for staging the process equipment, which also includes solvent storage capacity. Also similar to the other on-site processes previously described, additional requirements for operation of this technology include fuel, electrical service, and water supply.

Prior to implementing the solvent extraction alternative, a treatability study is required to establish a suitable chemical solvent (i.e., propane, butane, supercritical carbon dioxide, etc.) to treat the Site COCs, and to verify effectiveness of the technology.

Following on-site treatment of the excavated materials using solvent extraction, process residuals including the treated soil and process condensate will require disposal and/or treatment. As previously described, the treated material can be used as backfill on-site. The solvent extraction process also generates a concentrated solvent/contaminants liquid waste stream that will be separated on-site using a gravity separator. Following separation, the recovered solvent can be purified using a distillation process and reused during subsequent treatment batches. The concentrated liquid contaminants will require off-site treatment and/or disposal at an approved facility. Safe and efficient loading and transport of the liquid waste is an important implementation issue associated with this technology.

3.4.4 Costs [310 CMR 40.0858(4)]

For Alternative 3A (on-site incineration), capital costs are estimated to be $6,259,000 and annual O&M costs are estimated to be $50,000. The total present worth cost calculated for

Alternative 3A is $6,765,000. A breakdown of estimated costs for Alternative 3A is presented in Table 3-2.

For Alternative 3B (thermal desorption), capital costs are estimated to be $5,335,000 and annual O&M costs are estimated to be $50,000 The total present worth cost calculated for Alternative 3B is $5,841,000. A breakdown of estimated costs for Alternative 3B is presented in Table 3-3.

For Alternative 3C (solvent extraction), capital costs are estimated to be $5,417,000 and annual O&M costs are estimated to be $50,000. The total present worth cost calculated for Alternative 3C is $5,923,000. A breakdown of estimated costs for Alternative 3C is presented in Table 3-4.

The estimated costs described above, and presented in the associated tables, assume that approximately 150,000 ft^2 of the Site will be covered by construction of new buildings, which are proposed as part of future property redevelopment. However, it should be noted that the estimated costs do not include the costs associated with construction of these buildings.

3.4.5 Risks [310 CMR 40.0858(5)]

There are short-term on-site and off-site risks associated with implementation of Alternative 3; however, these risks do not exceed current risks posed by existing conditions at the Site. Although, current impacts to both on-site and off-site receptors associated with the Site are not considered to be increasing over the short-term, there are long-term risks of potential harm to human health, safety, public welfare, and the environment due to current levels of COCs at the Site.

During implementation of this alternative, short-term exposure to contaminated soil could occur primarily through dust generation while performing necessary excavations and materials handling tasks. To mitigate potential exposure by site workers and/or off-site receptors, an excavation control program would need to be established and permitting would be required to govern any activity that might disturb or expose contaminated soils. Ambient air monitoring and dust suppression would also be required during excavation activities to minimize potential off-site migration of airborne contaminants.

Table 3-2
Estimated Project Costs
Alternative 3A - On-Site Incineration
Former Tombarello and Sons Property
Lawrence, Massachusetts

Tasks	Quantity	Unit Cost ($/unit)	Total Cost ($)
Capital Costs			
Excavate "hot spot" locations			
Mobilization/Demobilization	1 LS	$4,000.00 LS	$4,000
[1]Site Preparation	1 LS	$10,000.00 LS	$10,000
Excavate PCB/metals impacted soil	230 yd^3	$20.00 yd^3	$4,600
Soil Confirmation Sampling and Analysis (S&A)			
Confirmation S&A (1/location)	5 each	$2,000.00 each	$10,000
On-Site Incineration			
Mobilization/Demobilization	1 LS	$500,000.00 LS	$500,000
Permitting/Trial Burn/Engineering	1 LS	$100,000.00 LS	$100,000
[2]Rotary Kiln Incinerator, Operation Costs	230 yd^3	$500.00 yd^3	$115,000
Import clean backfill			
Soil Cover, Unclassified Fill	230 yd^3	$30.00 yd^3	$6,900
Compact Subgrade	230 yd^3	$0.40 yd^3	$100.00
Install asphalt cap			
[3,4] Install asphalt cap	54,000 yd^2	$50.00 yd^2	$2,700,000
Install site access restrictions			
Site Fencing (6' galvanized chain link)	3,500 lf	$21.00 lf	$73,500
Site access gate (6' swing gate, 12' double)	1 ea	$710.00 ea	$700
Signs	35 ea	$45.00 ea	$1,600
Deed Notation and Land Use Restriction (legal fees)	1 LS	$50,000.00 LS	$50,000
SUBTOTAL			**$3,576,400**
Construction Management	10%	NA	$357,600
Engineering and Technical Services	25%	NA	$894,100
Contractor Overhead and Profit	15%	NA	$536,500
Contingency	25%	NA	$894,100
Total Capitol Cost			**$6,259,000**
Annual O&M Costs			
Site Monitoring and Maintenance			
Periodic Cover/Fence Inspection (1/mo)	24 hr	$50.00 hr	$1,200
Repair and Resurface Asphalt (1/10 per year)	5400 yd^2	$4.97 yd^2	$26,800
Fence Repair/Replace (1/10 per year)	350 lf	$20.95 lf	$7,300
Sign Replacement	2 ea	$44.82 ea	$100
SUBTOTAL			**$35,400**
Administrative Services	15%	NA	$5,300
Contingency	25%	NA	$8,900
Total Annual O&M Cost			**$50,000**
[5,6] **TOTAL PRESENT WORTH PROJECT COSTS (assume 30yrs O&M, 6% interest, 3% inflation)**			**$6,765,000**

Notes:

LS = Lump Sum   lf = linear feet yd^3 = cubic yards   ea = each   O&M - operation and maintenance

1. Includes construction of staging/support areas
2. Cost includes equipment, labor, utilities, process control sampling and analysis, off-gas treatment, and off-site disposal of incinerator ash
3. Cost includes equipment, labor, surface preparation, and paving
4. The quantity of aphalt cover has been estimated assuming a minimum of 150,000 ft^2 of the Site will be covered by new buildings that will be constructed as part of the proposed property development.
5. Total present worth project cost is an estimate based on budgetary capital and O&M pricing.
6. Cost does not include construction of any buildings.

Table 3-3
Estimated Project Costs
Alternative 3B - On-Site Thermal Desorption
Former Tombarello and Sons Property
Lawrence, Massachusetts

Tasks	Quantity	Unit Cost ($/unit)	Total Cost ($)
Capital Costs			
Excavate "hot spot" locations			
Mobilization/Demobilization	1 LS	$4,000.00 LS	$4,000
[1]Site Preparation	1 LS	$10,000.00 LS	$10,000
Excavate PCB/metals impacted soil	230 yd^3	$20.00 yd^3	$4,600
Soil Confirmation Sampling and Analysis (S&A)			
Confirmation S&A (1/location)	5 each	$2,000.00 ea	$10,000
On-Site Thermal Desorption			
Mobilization/Demobilization	1 LS	$40,000.00 LS	$40,000
Permitting, Start-up, and Treatability Testing	1 LS	$100,000.00 LS	$100,000
[2]Thermal Desorption Operating Costs	230 yd^3	$195.00 yd^3	$44,900
On-Site Disposal of treated soil			
[3]Backfill Clean Soil	230 yd^3	$40.00 yd^3	$9,200
Compact Subgrade	230 yd^3	$0.40 yd^3	$100
Install asphalt cap			
[4,5] Install asphalt cap	54,000 yd^2	$50.00 yd^2	$2,700,000
Install site access restrictions			
Site Fencing (6' galvanized chain link)	3,500 lf	$20.95 lf	$73,300
Site access gate (6' swing gate, 12' double)	1 ea	$710.14 ea	$700
Signs	35 ea	$44.82 ea	$1,600
Deed Notation and Land Use Restriction (legal fees)	1 LS	$50,000.00 LS	$50,000
SUBTOTAL			**$3,048,400**
Construction Management	10%		$304,800
Engineering and Technical Services *	25%		$762,100
Contractor Overhead and Profit *	15%		$457,300
Contingency	25%		$762,100
Total Capital Cost			**$5,335,000**
Annual O&M Costs			
Site Monitoring and Maintenance			
Periodic Cover/Fence Inspection (1/mo)	24 hr	$50.00 hr	$1,200
Repair and Resurface Asphalt (1/10 per year)	5,400 yd^2	$4.97 yd^2	$26,800
Fence Repair/Replace (1/10 per year)	350 lf	$20.95 lf	$7,300
Sign Replacement	2 ea	$44.82 ea	$100
SUBTOTAL			**$35,400**
Administrative Services	15%	NA	$5,300
Contingency	25%	NA	$8,900
Total Annual O&M Cost			**$50,000**
[6,7] **TOTAL PRESENT WORTH PROJECT COSTS (assume 30yrs O&M, 6% interest, 3% inflation)**			**$5,841,000**

Notes:

LS = Lump Sum   lf = linear feet yd^3 = cubic yards   ea = each   O&M - operation and maintenance

1. Includes construction of staging/support areas
2. Cost includes equipment, labor, utilities, sampling and analysis for process control, and off-gas treatment.
3. Cost includes addition of soil amendments and/or blending with clean fill material
4. Cost includes equipment, labor, surface preparation and grading, and placement of base course and intermediate course.
5. The quantity of aphalt cover has been estimated assuming a minimum of 150,000 ft^2 of the Site will be covered by new buildings that will be constructed as part of the proposed property development.
6. Total present worth project cost is an estimate based on budgetary capital and O&M pricing.
7. Cost does not include construction of any buildings.

Table 3-4
Estimated Project Costs
Alternative 3C - Solvent Extraction
Former Tombarello and Sons Property
Lawrence, Massachusetts

Tasks	Quantity	Unit Cost ($/unit)	Total Cost ($)
Capital Costs			
Excavate "hot spot" locations			
Mobilization/Demobilization	1 LS	$4,000.00 LS	$4,000
[1]Site Preparation	1 LS	$10,000.00 LS	$10,000
Excavate PCB/metals impacted soil	230 yd^3	$20.00 yd^3	$4,600
Soil Confirmation Sampling and Analysis (S&A)			
Confirmation S&A (1/location)	5 each	$2,000.00 ea	$10,000
On-Site Treatment - Soil Washing			
Equipment Mobilization and Assembly	1 LS	$40,000.00 LS	$40,000
Permitting, Start-up, and Treatability Testing	1 LS	$100,000.00 LS	$100,000
[2] On-Site Soil Washing Treatment	230 yd^3	$400.00 cy	$92,000
Equipment Demobilization	1 LS	LS	$0
On-Site Disposal of treated soil			
[3] Backfill Clean Soil	230 yd^3	$40.00 yd^3	$9,200
Compact Subgrade	230 yd^3	$0.40 yd^3	$100
Install asphalt cap			
[4,5] Install asphalt cap	54,000 yd^2	$50.00 yd^2	$2,700,000
Install site access restrictions			
Site Fencing (6' galvanized chain link)	3,500 lf	$20.95 lf	$73,300
Site access gate (6' swing gate, 12' double)	1 ea	$710.14 ea	$700
Signs	35 ea	$44.82 ea	$1,600
Deed Notation and Land Use Restriction (legal fees)	1 LS	$50,000.00 LS	$50,000
SUBTOTAL			**$3,095,500**
Construction Management	10%		$309,600
Engineering and Technical Services *	25%		$773,900
Contractor Overhead and Profit *	15%		$464,300
Contingency	25%		$773,900
Total Capitol Cost			**$5,417,000**
Annual O&M Costs			
Site Monitoring and Maintenance			
Periodic Cover/Fence Inspection (1/mo)	24 hr	$50.00 hr	$1,200
Repair and Resurface Asphalt (1/10 per year)	5,400 yd^2	$4.97 yd^2	$26,800
Fence Repair/Replace (1/10 per year)	350 lf	$20.95 lf	$7,300
Sign Replacement	2 ea	$44.82 ea	$100
SUBTOTAL			**$35,400**
Administrative Services	15%	NA	$5,300
Contingency	25%	NA	$8,900
Total Annual O&M Cost			**$50,000**
[6,7] **TOTAL PRESENT WORTH PROJECT COSTS (assume 30yrs O&M, 6% interest, 3% inflation)**			**$5,923,000**

Notes:

LS = Lump Sum lf = linear feet yd^3 = cubic yards ea = each O&M - operation and maintenance

1. Includes construction of staging/support areas
2. Cost includes equipment, extraction solvent, labor, utilities, sampling and analysis for process control, and off-site disposal of treatment residuals
3. Cost includes addition of soil amendments and/or blending with clean fill material
4. Cost includes equipment, labor, surface preparation and grading, and placement of base course and intermediate course.
5. The quantity of aphalt cover has been estimated assuming a minimum of 150,000 ft^2 of the Site will be covered by new buildings that will be constructed as part of the proposed property development.
6. Total present worth project cost is an estimate based on budgetary capital and O&M pricing.
7. Cost does not include construction of any buildings.

Operation of an on-site treatment process could result in the generation of fugitive emissions that could cause short-term exposure by on-site and off-site receptors to airborne process residuals. Emissions treatment equipment will be used to mitigate the risk of exposure to airborne contaminants, and ongoing air monitoring would be required throughout treatment.

On-site treatment of the impacted site soils has additional risks associated with handling and managing high volumes of soil (both treated and untreated) and process residuals (i.e., ash, liquid waste, reject material, etc.), which could result in a low-level, short-term spill hazard. Engineering controls for containment of the process area will help mitigate short-term risks posed by on-site treatment processes. Off-site transportation of treated materials and/or process residuals will be conducted by trained personnel only, and will require stringent procedural and administrative controls, including additional regulatory requirements posed by MDEP, EPA, and DOT.

Any soils that have been identified to pose a significant risk to human health or the environment will be excavated and treated on-site under this alternative. Soils containing levels of COCs below the UCL for each COC will be left in place and backfilled with clean soil. The Site will also likely be paved in to facilitate future use of the Site. Therefore, following implementation of this alternative there is minimal potential risk of harm, in the foreseeable future, to human health, safety, public welfare, or the environment by remaining levels of COCs at the Site.

3.4.6 Benefits [310 CMR 40.0858(6)]

Through implementation of Alternative 3, the combination of excavation followed by on-site treatment by incineration, thermal desorption, or solvent extraction would result in a reduction of contaminant concentrations to levels that do not pose significant risk to human health or the environment and could possibly achieve or approach background within the vicinity of the identified "hot spots". As previously described, to achieve or approach background for the whole Site would require excavation of all impacted soils and material throughout the Site. Under this alternative, levels of COCs that do not pose a significant risk, under reasonably foreseeable future use scenarios, to human heath, safety, public welfare, or the environment, would remain at the Site, but would be contained by clean backfill and future paving. Natural resources at the

Site would not be restored; however, the Site would be sufficiently remediated for NSR classification, and to provide for productive reuse and improved property value.

3.4.7 Timeliness [310 CMR 40.0858(7)]

Under this alternative, the time required to treat the excavated soils will depend on the processing rate of the on-site treatment system. Typical processing rates for the three on-site technologies under consideration for Alternative 3, are discussed in the following subsections.

3.4.7.1 Alternative 3A: On-Site Incineration

The time required to treat contaminated soils using an on-site mobile incineration unit depends on the processing rate of the unit and the volume of soil to be treated. It is estimated that approximately 230 yd^3 of impacted soils will require treatment at the Site. Throughput for a mobile incinerator can range between 30–200 cubic yards per day (yd^3/day); therefore, total treatment time could range between 2–8 days. Additional time would be required for mobilization, equipment assembly and start-up testing, excavation, backfilling, paving, site restoration, and demobilization activities.

3.4.7.2 Alternative 3B: On-Site Thermal Desorption

The time required to treat contaminated soils using an on-site thermal desorption unit depends on the processing rate of the unit and the volume of soil to be treated. It is estimated that approximately 230 yd^3 of impacted soils will require treatment at the Site. Throughput for an on-site thermal desorption system can range between 50–400 yd^3/day; therefore, total treatment time could range between 1–5 days. Additional time would be required for mobilization, equipment assembly and start-up testing, excavation, backfilling, paving, site restoration, and demobilization activities.

3.4.7.3 Alternative 3C: On-Site Solvent Extraction

The time required to treat contaminated soils solvent extraction will be influenced by the volume, characteristics, and degree of contamination of the soil to be treated. It is estimated that approximately 230 yd^3 of impacted soils will require treatment at the Site. Solvent extraction can treat between 20–200 yd^3/day of contaminated soils. Therefore, total treatment time could range between 2–12 days. Additional time would be required for mobilization, equipment assembly and start-up testing, excavation, backfilling, paving, site restoration, and demobilization activities.

3.4.8 Effects Upon Non-Pecuniary Interests [310 CMR 40.0858(8)]

Excavation of the identified "hot spot" locations followed by backfilling with clean soil and future paving of the Site would improve non-pecuniary interests (aesthetic values) of the property.

SECTION 4

SELECTION OF REMEDIAL ACTION ALTERNATIVE
(310 CMR 40.0859)

4. SELECTION OF REMEDIAL ACTION ALTERNATIVE [310 CMR 40.0859]

Based on the detailed evaluation presented in Section 3, WESTON recommends Alternative 2 (Excavation and Off-Site Treatment/Disposal with On-Site Capping and Access Restrictions) as the RAA that is most reasonably likely to achieve a Permanent Solution for this Site. Rationale for this recommendation is summarized in the following subsections, and supported by the detailed information previously presented in Subsection 3.3 of this report.

4.1 ACHIEVEMENT OF NO SIGNIFICANT RISK [310 CMR 40.0853(1)(a)]

Remedial Action Alternative 2, Excavation and Off-Site Treatment/Disposal with On-Site Capping and Access Restrictions, as described in Subsection 3.3, is likely to achieve NSR for the Site. It has been concluded that a condition of NSR does not exist at the Site under current and reasonably foreseeable future use scenarios due to the following localized "hot spots" (Sundstrom, 2004):

- WSB-6
- WSB-2
- CD-45
- Subsurface soils associated with berm locations: BRM-TP4; BRM-TP5; and BRM-TP9/9A

In addition, EPH (C19-C36 Aliphatics) were detected in one of the 1999 WZB samples at a concentration of 23,800 mg/kg (0-6 inches bgs), which exceeds the UCL of 20,000 mg/kg for the substance. As such, this localized area petroleum hydrocarbons will be removed to satisfy MCP requirements. While no other similar concentrations of petroleum hydrocarbons have been detected at the Site at concentrations of this magnitude, the area has not been designated as an additional "hot spot". Rather, the upper six inches of soil will be excavated from the Site during the excavation and off-site disposal of the soil in the "hot spot" locations. In accordance with 310 CMR 40.0860(4), all oil and hazardous materials in soil at the disposal site within 15 ft of the surface will be reduced to levels at or below applicable UCLs.

In order to achieve a condition of NSR, concentrations of the COCs (PCBs, lead, and cadmium) at these locations must be reduced to below risk-based goals established for the Site in the *Human Health Risk Assessment* (Sundstrom, 2004) for the COCs. The risk-based goals are as follows:

- PCBs: 30 mg/kg
- Cadmium: 350 mg/kg

Excavation of the "hot spot" locations listed above and shown in Figure 3-1 would result in a reduction of site-wide concentrations of these COCs to levels that meet the risk-based criteria for the construction worker and utility worker scenarios.

Following removal of the impacted material, an asphalt cap installed over the Site, as shown in Figure 3-2, would further minimize exposure to, and the permeability of, remaining levels of COCs in site soils that could pose a significant risk to human health, safety, public welfare, or the environment. In addition to capping, implementation of access restrictions including, but not limited to, fencing, signs, and AULs, restricting future use of the Site so as to prevent residential or recreational/open space reuses, would further control potential exposure by site workers or trespassers to impacted site soils. Ongoing maintenance of the asphalt cap and site access restrictions would ensure a condition of NSR could be maintained at the Site over the long term.

4.2 FEASABILITY OF ACHIEVING OR APPROACHING BACKGROUND

The selected alternative will, to the extent feasible, reduce the concentrations of COCs in the identified "hot spots" to levels that achieve a condition of NSR and could possibly achieve or approach background in the localized "hot spot" areas. Under this alternative, levels of COCs that could, in the presence of a complete exposure pathway, pose a significant risk to human heath, safety, public welfare, or the environment would remain at the Site, but would be contained by an asphalt cap. This containment would render the potential exposure pathways to future receptors incomplete. To achieve or approach background for the whole Site would require excavation of all impacted soils and material throughout the Site (a total of 14 acres in a highly developed area).

In accordance with Subsection 9.3 of MDEP's recently finalized *Guidance for Conducting Feasibility Evaluations Under the MCP* (MDEP WSC-04-160, July 2002), site conditions were evaluated to determine whether any of the conditions for categorical infeasibility to achieve or approach background were met: These categorical exclusions are:

- Achievement or approaching of background would require excavating under permanent structures.
- Achieving or approaching background would require substantial interruption of public services or threaten public safety.
- Achieving or approaching background would require remediation of degradable or non-persistent substances.
- Achieving or approaching background would require remediation of persistent substances located in areas with lower exposure potential (S-2 or S-3) soils.

Due to current site conditions, the requirements listed above for establishing categorical infeasibility to achieve or approach background were not met. Accordingly, a site-specific evaluation of the feasibility to achieve or approach background was conducted. As a result of the site-specific evaluation, it was concluded that it is not feasible to achieve background concentrations for COCs in all site soils for the following reasons:

1. Site-specific background conditions are not known, and due to the extremely developed nature of the Site and surrounding properties, would be difficult to determine.
2. Historic operations at the Site have led to widespread impact by COCs to the majority of the 14-acre site. To remove/treat/dispose of this amount of soil would be financially infeasible, and would not be warranted due to the low incremental benefits achieved considering the highly industrialized nature of the surrounding area.

4.3 IMPLEMENTABILITY

As previously described in Subsection 3.3.2, excavation and off-site disposal of the identified "hot spots" followed by construction of a site-wide asphalt cap can be conducted using conventional procedures, and requires minimal permitting, resources, materials, or utilities. Although this alternative has higher costs associated with its implementation compared to the other alternatives evaluated (i.e., no action or excavation with on-site treatment), the higher costs are off-set by the following potentially significant obstacles associated with the no action and/or on-site treatment alternatives:

- No action would not lead to a condition of NSR for the Site.
- Implementation of on-site treatment could result in opposition from citizens of the community.
- Appropriate permitting (local, state, and federal), as well as coordination with neighboring property owners and local residents, would be required.
- The financial return realized for on-site treatment of the estimated 230 yd^3 may not sufficiently off-set the costs to mobilize treatment equipment and conduct preliminary pilot testing.

4.4 SCHEDULE FOR IMPLEMENTATION

The proposed schedule for implementation of Alternative 2, Excavation and Off-Site Treatment/Disposal with On-Site Capping and Access Restrictions, is presented in Table 4-1.

Table 4-1

Proposed Schedule for Implementation of Preferred Alternative - Excavation and Off-Site Treatment/Disposal with On-Site Capping and Access Restrictions

Task	Approximate Duration (days)	Start	Finish
Excavation Activities			
Mobilization	2	7-Mar -05	8-Mar-05
Site Prep	2	7-Mar -05	8-Mar 05
Excavation	2	8-Mar 05	9-Mar 05
Demobilization	1	9-Mar 05	9-Mar 05
Paving Activities			
Mobilization	2	21-Mar 05	22-Mar-05
Site Prep	10	22-Mar-05	4-Apr-05
Pave	10	4-Apr-05	15-Apr-05
Demobilization	2	18-Apr-05	19-Apr-05
Building Construction			
Mobilization	5	TBD	TBD
Site Prep	10	TBD	TBD
Construction and Fit Out	160	TBD	TBD
Landscaping			
Mobilization	2	TBD	TBD
Site Work	10	TBD	TBD
Demobilization			
Install Fencing & Signs	3	20-Apr-05	22-Apr-05

TBD = to be determined

SECTION 5

REFERENCES

5. REFERENCES

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