

**PHASE I
BROWNFIELDS SITE INVESTIGATION REPORT
FORMER LEWIS CHEMICAL PROPERTY
HYDE PARK, MASSACHUSETTS**

DEP Site Number 3-1616

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CONTENTS

1.0 INTRODUCTION	1
1.1 <i>Background.....</i>	1
1.2 <i>Purpose.....</i>	2
2.0 HISTORICAL INVESTIGATION AND RECORDS REVIEW.....	2
2.1 <i>DEP File Review.....</i>	2
2.2 <i>Site Inspection</i>	4
3.0 GEOPHYSICAL SITE INVESTIGATION	6
3.1 <i>Geophysical Survey Methods</i>	6
3.2 <i>Geophysical Survey Results</i>	6
4.0 SUBSURFACE INVESTIGATION	7
4.1 <i>Soil Boring/ Monitoring Well Installation and Soil Sampling.....</i>	7
4.2 <i>Surveying, Groundwater Gauging and Sampling.....</i>	8
4.3 <i>Trench Drain Soil Sampling</i>	9
4.4 <i>Surface Water and Sediment Sampling.....</i>	9
4.5 <i>Surficial Soil Sampling</i>	10
4.6 <i>Waste Management.....</i>	11
5.0 SITE HYDROGEOLOGICAL CHARACTERISTICS.....	11
5.1 <i>Surficial Features</i>	11
5.2 <i>Soil Classification.....</i>	11
5.3 <i>Bedrock Classification.....</i>	12
5.4 <i>Groundwater Flow Characteristics.....</i>	12
6.0 NATURE AND EXTENT OF CONTAMINATION.....	12
6.1 <i>Soil Sample Analytical Results</i>	12
6.2 <i>Groundwater Analytical Results.....</i>	13
6.3 <i>Trench Drain Analytical Results.....</i>	14
6.4 <i>Surface Water and Sediment Analytical Results</i>	15
6.5 <i>Surficial Soil Sampling Results</i>	16
7.0 EXPOSURE POTENTIAL.....	17
7.1 <i>Potential Receptors.....</i>	17
7.2 <i>Potential Migration Pathways.....</i>	18
7.3 <i>Indoor Air Exposure Potential</i>	19
7.4 <i>Qualitative Imminent Hazard Evaluation.....</i>	20
8.0 IDENTIFICATION OF SOIL AND GROUNDWATER CATEGORIES.....	23
8.1 <i>Soil Classification.....</i>	24
8.2 <i>Groundwater Classification</i>	24
8.2.1 <i>Groundwater Category GW-1</i>	24
8.2.2 <i>Groundwater Category GW-2</i>	26
8.2.3 <i>Groundwater Category GW-3.....</i>	26
9.0 SUMMARY AND CONCLUSIONS	26

CONTENTS (cont'd)

FIGURES

- 1 Site Map
- 2 Water Table Elevation Contour Map
- 3 Site Information Map
- 4 Surficial Soil Sampling Locations

TABLES

- 1 Summary of Water Table Elevation Measurements and Water Quality Parameters
- 2 Summary of Soil Analytical Results
 - Sections 1.1 - 1.5 Volatiles*
 - Sections 2.1 - 2.3 Semi-Volatiles*
 - Section 3 Metals*
 - Sections 4.1 - 4.2 Pesticides*
 - Section 5 PCBs*
- 3 Summary of Groundwater Analytical Results
 - Section 1.1 - 1.6 Volatiles*
 - Sections 2.1 - 2.4 Semi-Volatiles*
 - Section 3 Metals*
- 4 Summary of Trench Drain Analytical Results
 - Sections 1 - 5 Volatiles*
- 5 Summary of Surface Water Analytical Results
 - Section 1 Volatiles*
 - Section 2 Metals*
- 6 Summary of Sediment Analytical Results
 - Sections 1.1 - 1.4 Volatiles*
 - Sections 2.1 - 2.3 Semi-Volatiles*
 - Section 3 Metals*
- 7 Summary of Surficial Soil Analytical Results - Metals

APPENDIXES

- A GPR Survey Report
- B Drilling Logs
- C XRF QAP and XRF Analysis Report
- D Waste Documentation
- E Laboratory Analytical Reports

1.0 INTRODUCTION

The Massachusetts Department of Environmental Protection (DEP), under the Site Assessment and Remediation Support Services (SARSS IV) contract, retained Environmental Strategies & Management, Inc. (ES&M) to conduct a Phase I Brownfields Site Assessment at the former Lewis Chemical Site, 12-24 Fairmount Court, Hyde Park, Massachusetts. This project is funded by a Brownfields grant through the United States Environmental Protection Agency (USEPA).

1.1 Background

The site has a history of industrial use, and is the former location of the Lewis Chemical Company (Lewis Chemical). The site consists of a vacant mill building situated on approximately 27,182 square feet of land surface on the banks of the Neponset River in Hyde Park, Massachusetts. Surrounding properties are mixed commercial and residential. Active railroad tracks used by Massachusetts Bay Transit Authority (MBTA) commuter rail and associated with the Penn Central Railroad right-of-way are located adjacent to the site towards the northeast. The Neponset River and bordering Massachusetts District Commission (MDC) property are located to the southeast. A Site Map depicting the subject site is included as Figure 1.

From 1940 until the early 1960s, a leather manufacturing company operated at the site. Lewis Chemical operated at the site from 1963 until 1983. Lewis Chemical was involved in the collection, transportation, storage, and processing of hazardous waste. Numerous violations of Federal, State, and local laws regarding the safe handling, transport, storage, and treatment of hazardous materials were documented, as well as complaints from local residents during its time of operation. Lewis Chemical was forced to terminate operations under a Court Order issued by DEP in 1983.

Several environmental investigations have been conducted at the site. Available reports include "Phase I Preliminary Assessment" completed in 1986 by Wehran Engineering; "Site Report Relative to Hazardous Materials" completed in 1988 by Environmental Impact Services, Inc. (EIS), and "Environmental Assessment" completed in 1991 by HTS Environmental Group. These investigations have identified impacts to soil, groundwater, and surface water at the site from historical uses. In addition, DEP sampling conducted in 1998 also revealed impacts to surface water and sediment in the Neponset River. The City of Boston foreclosed on the property on October 18, 2000, due to failure of payment of back taxes.

The site was first listed by the DEP in 1987, was issued Release Tracking Number (RTN) 3-1616, and is currently classified as default Tier IB. The site was listed with the USEPA under the Comprehensive Environmental Response, Compensation, and Liability System (CERCLIS) as MAD 053455911. A CERCLIS site is an abandoned chemical or petroleum industrial site that has been identified under the Comprehensive Environmental Response, Compensation, and Liability Act

(CERCLA), more commonly known as Superfund, as a potential or confirmed hazardous waste site. The Lewis Chemical site was first listed on May 1, 1983, and

designated archived on September 10, 1986. The archive designation means that assessment has been completed and USEPA has determined that no steps will be taken to designate the site as a priority by listing it on the National Priorities List (NPL). No further action is planned for archived sites under the Superfund program.

The additional investigations described in this report were conducted under Brownfields funding made available by the USEPA.

1.2 Purpose

The purpose of this project is to perform a Phase I Brownfields Site Investigation to evaluate current site conditions, identify environmental conditions that may pose an Imminent Hazard or other time critical condition, and develop an understanding of the work and cost required for a Phase II Comprehensive Site Assessment. The project included review of historical records, completion of a detailed site inspection, and completion of a site investigation program that included collection and analysis of soil, groundwater, sediment, and surface water samples.

2.0 HISTORICAL INVESTIGATION AND RECORDS REVIEW

2.1 DEP File Review

On June 28, 2001, files related to the subject site were reviewed at the DEP Northeast Regional Office in Wilmington, Massachusetts. The reports reviewed by ES&M on this date included:

- "Preliminary Assessment Report - Lewis Chemical Corporation" prepared by Wehran Engineering, Methuen, MA, on July 21, 1986;
- "Site Report Relative to Hazardous Materials for Property Located at 16 Fairmount Court (Formerly Lewis Chemical Co.) Hyde Park, MA" prepared by Environmental Impact Services, Inc. (EIS), Newton, MA, on November 30, 1988; and
- "Phase II Environmental Assessment" report for 16 Fairmount Court, Hyde Park, MA, prepared by HTS Risk Management Services, Inc. on June 12, 1991.

Also included in the files were numerous documents and information related to complaints of spills to the Neponset River, fires and explosions that may have released contaminants to the air, and other violations of Federal, State, and local laws regarding the safe handling, transport, storage, and treatment of hazardous materials

at the Lewis Chemical site during its time of operation. The following is a summary of this information:

- *April 1981.* A spill of approximately 75 to 100 gallons of water used to flush a tank reportedly overflowed and spilled to the Neponset River.
- *July 1981.* The Boston Building Commissioner issued a "Cease and Desist" for storage of 60,000 gallons of toxic and flammable materials on site.
- *March 1982.* Approximately 25 to 30 gallons of "waste flammable liquids" overflowed a tank and the containment dike, impacting nearby surface soils.
- *April 22, 1983.* A fire was reported at the site. The fire, reported by a nearby resident, started in a dryer on site while the facility was unmanned.
- *May 25, 1983.* A fire and explosion occurred at the site. As a result of this fire and explosion, a cease and desist order was issued to Lewis Chemical by the Boston Fire Commissioner.

DEP revoked Lewis Chemical's hazardous waste license in June 1983. Lewis Chemical Company was forced to terminate operations under a Court Order issued by DEP in September 1983.

The "Preliminary Assessment Report," prepared by Wehran on behalf of DEP in 1986, concluded that there was likely a continued threat to the Neponset River as a result of documented and undocumented spills to the surface. This report recommended further investigative activities.

In January and March 1988, five groundwater-monitoring wells (B1/OW1 through B5/OW5) were installed by EIS at various locations on the property. Results of groundwater sampling revealed elevated concentrations of chlorinated solvents in groundwater, particularly in wells located downgradient on the property near the Neponset River. The results of this investigation are summarized in the "Site Report Relative to Hazardous Materials" (EIS, November 1988), which concluded that a "significant release of hazardous material has occurred at the subject site."

Eleven soil borings (SB1 through SB11) were completed by HTS on the property as part of a real estate assessment conducted in June 1991. Two groundwater samples and one soil sample submitted for laboratory analysis indicated elevated levels of volatile organic compounds, including 1,2-dichloroethene, ethyl benzene, tetrachloroethene, 1,1,1-trichloroethane, toluene, and xylenes. The results of this investigation are summarized in the "Environmental Assessment" report prepared by HTS Environmental Group in 1991.

In June 1998, the City of Boston Environmental Strike Team (BEST) visited the property and noted code violations and improper storage of flammable materials, and issued enforcement orders. Based on an inquiry by the City of Boston on the status of response actions at the site, DEP conducted sampling in October 1998 that revealed impacts to surface water and sediment in the Neponset River.

2.2 Site Inspection

On November 9, 2001, ES&M conducted a site inspection of the former Lewis Chemical property. The purpose of the site inspection was to identify potential sources, pathways, and receptors that currently exist at the location. Douglas Heely and Joseph Callahan of ES&M, and Lawrence Mach of DEP conducted the inspection. The following observations were made during this site inspection.

Chain-link fencing with locked gates encloses the entire property. The property is bounded by the Penn Central railroad right-of way to the north and west, by the Neponset River to the south, and the Fairmount Avenue roadway overpass to the northeast (Figure 1). A one- to three-story concrete block, wood and brick building is situated on the property. The existing building, which appears to be comprised of several buildings added on at various times, currently stores office furniture, equipment and materials previously abandoned by prior occupants. There is a depression outside the northeast side of the building, indicating the location of another former building. A concrete containment pad exists on the southwest end of the building.

The land surfaces surrounding the building are mostly unpaved and overgrown with brush and small trees. The driveway that enters the site from the northeast is partially asphalt paved. Land surface generally slopes toward the Neponset River to the southeast; however to the east and southwest on the property, the surface elevation rises sharply before dropping toward the Neponset River. There was visual evidence of previous significant filling activities in these areas. Numerous layers of a tar-paper-like material had been deposited in the western end of the property along the banks of the Neponset River. This material has been described in previous assessments conducted at the site as still bottom waste generated from Lewis Chemical distillation and reclamation activities. The fill material located at the southeastern side of the property was observed as mostly metal, wood, and construction-related debris.

The land surface at the banks of the Neponset River drops steeply (approximately 15 feet) to the river. Debris was readily observed in the water, at a depth of about three feet, near sampling location SH. The larger debris included a chair, desk, and a partially buried metal drum. The metal drum was severely corroded, and it was therefore difficult to determine its size or whether there were any hazardous materials within it.

A basement exists beneath the main portion of the building. A concrete-lined trench, approximately 100 feet long, was observed in the floor on the southeast side of the

basement. At two locations within this trench drain, the bottoms were observed breached and are likely locations of infiltration. One of the breached areas was located at the eastern end of the building (see sample location D-1, Figure 1). A separate breach was observed in the trench located approximately 50 feet from the eastern end, just before the wall separating two portions of the basement (near sample location D-2). The western end of the trench drain terminated near well ESM-9. At this location, a six-inch diameter pipe exits the building to the south toward the Neponset River. The pipe exiting the building from the western end of the drain was excavated and found to be broken just outside the building. At the eastern end of the drain (near sample location D-1), an iron pipe also appeared to extend towards the Neponset River. Shallow excavations outside the building were not able to locate this pipe.

Floor drains were also observed in the floor of the former shipping/receiving area in the southwestern side of the building and outside in the floor of the tank farm containment area pad to the southwest. A sample of the sediment from the floor drain in the shipping/receiving area was collected and field-screened with a photo-ionization detector (PID) via the DEP jar headspace procedure, and a reading of 70 ppmv was detected. A sample was also collected from the breached area located at the eastern end of the trench drain (D-1), which indicated PID readings from 2 to 7 ppmv. Samples from the two breached areas of the trench drain and from the drain in the former tank farm containment area pad were also collected in July 2002 for laboratory analysis, as discussed in Section 4.3. PID readings of ambient air within the basement of the building showed no detectable levels.

An aboveground 250-gallon storage tank was observed in the basement along the northeastern wall of the building. The tank appeared to be in good condition and contained a small amount of liquid.

An inspection for the presence of accessible, friable, asbestos-containing materials by a professional contractor was not conducted. However, potential asbestos-containing material (ACM) was observed in the stairwell of the basement (near the aboveground storage tank). This potential ACM visually appeared friable and was part of surfacing material used on the walls beneath the first floor stairwell.

Several underground and overhead utilities service the site. Electrical and telephone overhead lines enter the site from the north and Fairmount Court. Underground water, sewer and gas lines also enter the site from the driveway and Fairmount Court to the north. Manholes were observed on the property in the driveway at the northwestern side near the railroad right-of-way and north of the property near the locations of former historical buildings. The manhole to the northwest was confirmed as part of a Boston Water and Sewer Commission sewer main, that enters the property through the driveway from Fairmount Court and runs laterally across the railroad right-of-way from the manhole. The manhole to the north was inspected and observed to be a dry vault, which appeared to be constructed with an underlying chamber. No pipes were observed entering or exiting the vault.

Only one existing monitoring well (B1/OW1) was located on the property southeast of the building near the Neponset River. None of the other wells installed in 1988 were found.

3.0 GEOPHYSICAL SITE INVESTIGATION

A geophysical survey was conducted by Hager-Richter Geoscience, Inc. (Hager-Richter) on November 8, 2001, using two complementary geophysical methods: ground penetrating radar (GPR) and precision utility location (PUL). A copy of the GPR Survey report is included as Appendix A.

3.1 Geophysical Survey Methods

The GPR survey was conducted using a Sensors & Software Smart Cart Noggin Plus subsurface imaging radar system. A 250 MHz antenna and a 60 ns¹ time window were used for this survey. The unit includes an integrated digital video logger (DVL), an odometer wheel, and battery. The GPR results are displayed in real time on the DVL video screen and are immediately available for field use. The odometer and associated electronics provide for accurate positioning along the established grid. For this project, the grid traverses were spaced five feet apart, and oriented parallel and perpendicular to the buildings.

There are limitations of the GPR technique when used to detect and/or locate targets such as those found at this site. These limitations include: (1) surface conditions; (2) electrical conductivity of the ground; (3) contrast of the electrical properties of the targets and the surrounding soil; and (4) spacing of the traverses (grid lines).

The PUL was completed with the FT-70 magnetic locator in the UST area, located north/northwest of the building. The PUL can only detect magnetic objects. As with any magnetic instrument, it is affected by surface metal objects as well as subsurface metal objects. Therefore, it cannot detect a buried metallic object below a surface metal object.

3.2 Geophysical Survey Results

The site was divided into three areas to complete the GPR study. Plate 2 of Hager-Richter's report (Appendix A) illustrates the location of the GPR traverse lines and Hager-Richter's interpretation of the GPR data. The GPR data from Area 1 indicated the presence of unidentified objects, a flat object, and a short section of possible utility. Area 2 data indicated the presence of several unidentified objects, two possible USTs and a short section of possible utility. The Area 3 data identified the presence of a filled area with many unidentified objects, some of which could possibly be drums, a

¹ns, abbreviation for nanosecond, 1/1,000,000,000 second. Light and the GPR signal require about 1 ns to travel 1 ft in air. The GPR signal requires about 2.5 ns to travel 1 ft in unsaturated sandy soil.

flat object and other unidentified objects. The results of the GPR study were used to help determine the location of proposed monitoring wells at the site.

4.0 SUBSURFACE INVESTIGATION

A subsurface investigation was completed at the site in June and July 2002. The investigation included the completion of soil borings and installation of monitoring wells, the collection of soil and groundwater samples on site, and the collection of surface water and sediment samples in the Neponset River adjacent to the site. The subsurface investigation program was conducted in accordance with the following documents prepared by ES&M:

- Health and Safety Plan (HASP), dated May 22, 2002
- Quality Assurance Project Plan (QAPP), dated May 1, 2002
- Sampling and Analysis Plan (SAP), dated May 7, 2002
- Waste Management Plan (WMP), dated May 7, 2002

These documents were submitted to DEP and USEPA for approval prior to the initiation of field activities. All investigative work was completed in accordance with these documents.

4.1 Soil Boring/ Monitoring Well Installation and Soil Sampling

From June 12 through June 14, 2002, 10 monitoring wells were installed at the subject site. All boring locations were pre-marked on May 31, 2002, and DigSafe utility locator service was notified prior to drilling activities. A Drilling Permit from the City of Boston Department of Inspectional Services was also obtained prior to drilling, as required for all construction activities in accordance with the Massachusetts State Building Code (780 CMR).

AM Drilling Services of Fitchburg, MA, was contracted by ES&M to complete the drilling utilizing a hollow-stem auger drill rig. At each boring location, continuous split-spoon samples were collected at two-foot intervals until auger refusal was encountered. A PID equipped with an 11.7 eV lamp was used to field screen the soil samples utilizing the DEP jar headspace technique. One or more samples from each boring location were selected, based on visual observation and PID field screening results, for laboratory analysis.

All soil samples were properly preserved and submitted under chain of custody to Mitkem Corporation in Warwick, RI, for analysis for volatile organic compounds (VOC) by EPA Method 8260B, semi-volatile organic compounds (SVOC) by EPA Method 8270C, total metals by EPA 6010B, mercury by EPA7470A, cyanide by EPA 9012A, poly-chlorinated biphenyls (PCB) by EPA 8082, and pesticides by EPA 8081A. The soil sampling analytical results are discussed in Section 6.

The monitoring wells were installed to intersect the water table at depths ranging from four to ten feet below ground surface. Since the borings extended to refusal (assumed to be near the bedrock/overburden interface), the wells were screened across the saturated, unconsolidated zone. All of the monitoring wells were constructed with 0.010-slotted polyvinyl chloride (PVC) screen. The annular space between the borehole wall and the screened interval was backfilled with clean, #1 graded sand to a level approximately two feet above the top of the screen. A bentonite seal approximately one to two feet thick was placed above the screen. The remaining annular space was filled with clean native material to approximately four to six inches below surface grade. All wells were completed at surface grade with a gripper and steel road box to protect the wells and to prevent infiltration of surface water. Well construction diagrams and PID screening values are included on the drilling logs contained in Appendix B. The locations of the monitoring wells are shown on Figure 1.

In addition to monitoring wells, one soil boring (TF Drain, Figure 1) was completed within the tank farm floor drain. A split-spoon sample was retrieved from this boring for field screening and laboratory analysis. The boring log for the tank farm drain is also included in Appendix B.

4.2 Surveying, Groundwater Gauging and Sampling

Elevations and locations of the newly installed monitoring wells and existing monitoring well (B1/OW1) were determined by ES&M personnel on July 2, 2002. Top-of-casing (TOC) elevations were established by the differential leveling method. An on-site benchmark was established using a PK nail driven into the pavement above the sewer line north of the building and given an arbitrary datum of 100 feet above mean sea level (MSL). This was done to establish a point on which to base relative well head elevations. The locations of the wells were measured relative to existing site features for placement on the Site Map (Figure 1).

The depth to groundwater in all monitoring wells was measured using an electronic interface probe (IP) on June 25, 2002. The IP detects water and non-aqueous phase liquid (NAPL), if present, using a combination of electrical conductivity and optical sensors, with an accuracy of 0.01 feet. No NAPL or dense non-aqueous phase liquid (DNAPL) was evident based upon IP measurements.

Groundwater samples were collected on June 25, 2002 in accordance with ES&M standard operating procedures, and ES&M's Sampling and Analysis Plan. As part of the groundwater sampling activities, the monitoring wells were first purged by manually removing groundwater with pre-cleaned disposable polyethylene bailers. Well monitoring for *in situ* parameters (pH, conductivity, dissolved oxygen, and temperature) was conducted during purging using a Horiba U22 Water Quality Meter. Water was purged until *in situ* parameters either stabilized or the well was evacuated dry. The purging procedures ensure that groundwater samples are representative of local aquifer conditions. Purge water was managed in accordance with the Waste Management Plan.

Following purging, the individual, disposable polyethylene bailers were then lowered into each well to procure a water sample. The sample was transferred into suitable pre-cleaned laboratory containers, preserved, sealed with Teflon-lined caps, and placed on ice for transport to the laboratory. Each sample was kept chilled until analyzed.

Pertinent sample data and analytical methods were recorded on a chain of custody (COC) form that accompanied the samples to the analytical laboratory. Groundwater samples were analyzed at Mitkem for VOC by EPA Method 8260B, SVOC by EPA Method 8270C, total metals by EPA Method 6010B, mercury by EPA Method 7470A, and cyanide by EPA Method 9012A. One trip blank and one temperature blank (provided by the laboratory) accompanied the samples during shipment to the laboratory.

Water table elevation measurements and water quality parameters are shown on Table 1. Groundwater analytical results are discussed in Section 6.0.

4.3 Trench Drain Soil Sampling

Samples from the two breached areas within the trench drain located in the basement floor of the existing building were collected on July 2, 2002. These areas are located at the eastern end of the building near ESM-3 and approximately 50 feet to the west near ESM-4 (identified as D-1 and D-2, respectively). The locations of D-1 and D-2 are shown on Figure 1.

Samples were collected from the two breached areas of the trench drain at a depth of approximately six to eight inches below the bottom of the trench (approximately three feet below ground surface). The samples were collected using clean stainless steel hand tools, and transferred to appropriate containers for PID field screening and laboratory analysis. Drain 1 (D-1) recorded a PID measurement of 75 parts per million (ppmv) and was classified as gray, moist, medium to fine sand and silt containing a trace of a non-native greenish colored granular material. Drain 2 (D-2) was classified as black, moist, medium to fine sand that indicated a PID measurement of 10 ppmv.

The samples collected for laboratory analysis (D-1 and D-2) were properly preserved and submitted under a chain of custody to Mitkem for analysis of VOC by EPA Method 8260B, SVOC by EPA Method 8270C, total metals by EPA 6010B, mercury by EPA 7470A, cyanide by EPA 9012A, PCB by EPA 8082, and pesticides by EPA 8081A. Trench drain sample analytical results are discussed in Section 6.0.

4.4 Surface Water and Sediment Sampling

Surface water samples were collected from the Neponset River on July 8, 2002. Discrete surface water samples were collected at a depth of 1.5 feet from four locations (upstream, downstream, mid-channel, and shoreline) in the river adjacent to the former Lewis Chemical site using a Kemmerer-type water bottle sampler. At each sampling location, a depth to bottom measurement was taken using a surveyor's rod. Recorded

depths to bottom ranged from four feet at the shoreline (SH) location nearest to ESM-5, to seven feet in the mid-channel (MC) location. Depths of six feet were measured at both the upstream (US) and downstream (DS) locations. The sampling locations are shown on Figure 1.

Conductivity, temperature, pH, and dissolved oxygen measurements were recorded for each surface water sample with a Horiba U-22 Water Quality Meter. Surface water samples were properly preserved and submitted under a chain of custody to Mitkem for analysis for VOC by EPA Method 8260B, SVOC by EPA Method 8270C, total metals by EPA 6010B, and mercury by EPA 7470A. Surface water analytical results are discussed in Section 6.0.

Sediment samples were also collected in the Neponset River on July 8, 2002. An Ekman Dredge-type bottom grab sampler was used to retrieve sediment samples at locations US, DS, MC, and SH at varying depths to six inches below the bottom of the river (Figure 1).

Sediment samples were properly preserved and submitted under a chain of custody to Mitkem for analysis for VOC by EPA Method 8260B, SVOC by EPA Method 8270C, total metals by EPA 6010B, and mercury by EPA 7470A. Sediment analytical data are discussed in Section 6.0.

4.5 Surficial Soil Sampling

Surficial soil samples were collected across the property on June 13 and June 18, 2002 for field screening, and select samples were submitted for laboratory analysis. Surface soil samples were collected from an approximate 4-inch x 4-inch area to a depth of 1 inch. Field-screening support utilizing a Niton X-Ray Fluorescence (XRF) Multi-Element Analyzer was provided by the DEP in accordance with the Quality Assurance Plan (QAP) - XRF Analysis - dated June 10, 2002. The Niton XRF Multi-Element Analyzer has a Cadmium-109, 10 mCi (370 MBq) radioactive source that can detect arsenic, cobalt, copper, chromium, iron, mercury, molybdenum, manganese, nickel, lead, rubidium, selenium, zinc, and zirconium in soil. A copy of the QAP is included in Appendix C.

All soil samples were transported to the DEP-NERO laboratory for XRF screening. Six soil samples were selected for laboratory analysis for total metals (arsenic, barium, cadmium, chromium, lead, selenium, and silver) by EPA 6010B and mercury by EPA 7470A at Mitkem. XRF sampling methodology and analytical results are summarized in the Niton XRF Analysis report (prepared by DEP) included in Appendix C. XRF laboratory analytical results are discussed in Section 6.0.

4.6 Waste Management

Drill cuttings (soil) generated during the drilling activities were managed as investigation-derived waste (IDW) in accordance with the Waste Management Plan prepared for this project. The drums were properly labeled and stored in a designated staging area on the property. The drill cuttings were removed on August 23, 2002 and transported by Enviro-Safe Corporation of East Sandwich, Massachusetts under a Uniform Hazardous Waste Manifest. A copy of the manifest is provided in Appendix D.

Purge water generated during groundwater sampling was reintroduced into the monitoring wells following sample collection in accordance with the Sampling and Analysis Plan.

5.0 SITE HYDROGEOLOGICAL CHARACTERISTICS

5.1 Surficial Features

Drainage patterns at, and in the vicinity of the site, were determined by reviewing topographic maps of the area and by field reconnaissance. The land surface is mostly unpaved and overgrown with brush and small trees. A driveway enters the site from the northeast and is partially asphalt paved. Land surface generally slopes toward the Neponset River to the southeast; however to the east and southwest on the property, the surface elevation rises sharply before dropping toward the Neponset River where surface water from precipitation appears to drain.

5.2 Soil Classification

Overburden material has been characterized and classified based upon soil samples recovered during drilling activities conducted across the site. Based on soil boring logs, the overburden material consists of widely graded fill material including medium to fine sand and gravel with traces of cobble, wood, ash, and concrete debris, ranging from 4 to 8 feet below grade on the southeastern portion near the river, to 8 to 13 feet in soil borings on the northern portion of the property. Extensive filling was observed in the borings for ESM-2 (to 14 feet) at the western end of the property and ESM-7 (to 11 feet) at the southern end. Below the fill material, overburden material consists of a clayey silt material transitioning to organic silt and clay ranging from 5 feet below grade in borings ESM-4 and ESM-5 to approximately 14 to 15 feet below grade at ESM-2. Below the silt material, overburden material consisted of coarse to fine sands transitioning to a dense fine sand material encountered at the bottom of each boring. Completed drilling logs are contained in Appendix B.

5.3 Bedrock Classification

Characterization of bedrock in the vicinity of the site was based upon review of the "Bedrock Geologic Map of Massachusetts" (E-an Zen, editor; 1983). The bedrock in this region is part of the Boston Basin, described as "Mattapan Volcanic Complex" of Proterozoic Z or younger age consisting of rhyolite, melaphyre, agglomerate, and tuff. Depth to bedrock beneath the site was not confirmed during these subsurface activities or previous investigations conducted at the site. While it is possible that boring refusals during drilling were caused by bedrock, no rock cuttings or fragments were recovered to confirm the presence of bedrock to a maximum depth of 22 feet.

5.4 Groundwater Flow Characteristics

On June 25, 2002, the depth to groundwater in monitoring wells was measured using an electronic oil/water interface probe. Non-aqueous phase liquids (NAPL) were not detected in any site-related monitoring well during this monitoring event. The depth to groundwater beneath the site on June 25, 2002 ranged from 7 to 12.5 feet below grade. Groundwater monitoring data for the site are included in Table 1.

Groundwater elevations were determined by using top-of-casing survey data and the water table depth measurements collected on June 25, 2002. Based upon water table elevations, groundwater flows generally toward the Neponset River in a southeastern direction across the site, with an approximate horizontal gradient of 0.022 feet/foot. A map showing the approximate configuration of the water table surface on June 25, 2002 is included as Figure 2.

6.0 NATURE AND EXTENT OF CONTAMINATION

Investigations conducted at the site since 1986 indicate the source of volatile organic compounds and other contaminants detected in soil, groundwater, surface water, and sediment were from historical site uses. From 1940 until the early 1960s, a leather manufacturing company operated at the site. Lewis Chemical, involved in the collection, transportation, storage, and processing of hazardous waste, operated at the site from 1963 until 1983. It was the intent of this investigation to better understand the type and distribution of contaminants in the subsurface and in the Neponset River.

6.1 Soil Sample Analytical Results

Eleven soil borings (ESM-1 through ESM-10; TF Drain) were drilled across the site from June 12 through June 14, 2002. Ten of the borings were completed as monitoring wells. Split-spoon samples were collected at continuous depth intervals during the drilling. Jar headspace results indicated readings ranging from below detectable levels (<0.1 ppmv) to 3,800 ppmv (at ESM-3) for photo-ionizable compounds in soil. Headspace results are recorded on the drilling logs in Appendix B.

One soil sample from each boring, selected at the interval recording the highest PID reading or closest to the water table depth where no measurement was recorded, was submitted for laboratory analysis to Mitkem for VOC by EPA Method 8260B, SVOC by EPA Method 8270C, total metals by EPA 6010B, mercury by EPA 7470A, cyanide by EPA 9012A, PCB by EPA 8082, and pesticides by EPA 8081. Soil analytical results are summarized on Table 2, and laboratory analytical reports are included in Appendix E.

Soil analytical results were compared to Massachusetts Contingency Plan (MCP) reporting category RCS-1 Reportable Concentrations (310 CMR 40.1600) for oil and hazardous material (OHM) in soil, for the purpose of determining whether a notification obligation would exist under 310 CMR 40.0315. Reporting category RCS-1 was selected over RCS-2 since it appears that the site is within 500 feet of a residential dwelling, residentially zoned property, school, playground, recreational area, or park. For reference, analytical results on Table 2 are also compared to MCP Method 1, S-3 soil standards, as the most likely soil category given the current status of the site. Analytical results on Table 2 are also compared to MCP Method 1, S-1 and S-2 soil standards due to the uncertain future use of the site.

Summary of Soil Analytical Results

- The highest VOC concentrations were detected in the soil sample collected from the boring for ESM-3 (at 10-12 feet). In this sample, vinyl chloride, 1,1-dichloroethene, 1,1-dichloroethane, cis 1,2-dichloroethene, 1,1,1-trichloroethane, trichloroethylene, toluene, and tetrachloroethylene were detected at concentrations above the RCS-1 reportable concentrations. Tetrachloroethylene was also detected above the RCS-1 reportable concentrations in the samples submitted from ESM-1, ESM-5, ESM-6, ESM-8, ESM-10, and the Tank Farm (TF) Drain.
- The highest semi-volatile concentrations were also detected at ESM-3. Benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene were detected in the sample collected from ESM-3 (at 10-12 feet) at concentrations exceeding applicable RCS-1 reportable concentrations.
- No metal, cyanide, or pesticide concentrations were detected above applicable RCS-1 concentrations. PCBs (aroclor-1248) were detected in the soil samples collected from ESM-5, ESM-6, and the TF Drain at concentrations exceeding the RCS-1 reportable concentration.

6.2 Groundwater Analytical Results

Groundwater samples were collected from monitoring wells B1/OW1, and ESM-1 through ESM-10 on June 25, 2002. Groundwater samples were submitted to Mitkem

for laboratory analysis for VOC by EPA 8260B, SVOC by EPA 8270C, total metals by EPA 6010B, mercury by EPA 7470A, and cyanide by EPA 9012A. Groundwater analytical results are summarized on Table 3, and laboratory analytical reports are included in Appendix E.

Groundwater analytical results were compared to reporting category RCGW-2 reportable concentrations (310 CMR 40.1600). Reporting category RCGW-2 was selected over RCGW-1 since the property is not known to be located within a Current or Potential Drinking Water Source Area as defined by 310 CMR 40.0006. For reference, Table 3 also includes MCP Method 1, GW-2 and GW-3 groundwater standards.

Summary of Groundwater Analytical Results

- The highest VOC concentrations were detected in groundwater collected from monitoring wells ESM-5 and ESM-6. Two compounds - 1,1,1-trichloroethane and trichloroethylene were detected in groundwater samples from ESM-5 and ESM-6 at concentrations above MCP Method 3 upper concentration limits (UCL) (310 CMR 40.0996(7)). UCLs are concentrations of OHM in soil and groundwater which if exceeded indicate the potential for significant risk of harm to public welfare and the environment. RCGW-2 reportable concentrations were exceeded for numerous compounds in samples collected from wells B1/OW1, ESM-1, ESM-2, ESM-3, ESM-4, ESM-5, ESM-6, ESM-7, ESM-8, and ESM-9. Figure 3 is a Site Information Map that shows the highest VOC concentrations in groundwater for select compounds detected at the site.
- Only two SVOCs were detected in the groundwater samples collected on June 25, 2002 at concentrations exceeding applicable RCGW-2. Bis(2-ethylhexyl) phthalate was detected above RCGW-2 in the samples from wells ESM-1 and ESM-3 and bis(2-chloroethyl) ether was detected above applicable RCGW-2 concentrations in samples from wells B1/OW1 and ESM-5.
- No metal concentrations or cyanide was detected in groundwater samples above applicable RCGW-2 concentrations.

6.3 Trench Drain Analytical Results

Soil samples (D-1 and D-2) were collected at two breached areas within the trench drain located in the basement of the on-site building on July 2, 2002. The samples were submitted to Mitkem for laboratory analysis for VOC by EPA Method 8260B, SVOC by EPA Method 8270C, total metals by EPA 6010B, mercury by EPA 7470A, cyanide by EPA 9012A, PCB by EPA 8082, and pesticides by EPA 8081A. Trench drain sampling results are summarized on Table 4, and laboratory analytical reports are included in Appendix E.

Summary of Trench Drain Analytical Results

- VOC concentrations exceeded RCS-1 reportable concentrations in the sample collected from D-1 for cis 1,2-dichloroethene, 1,1,1-trichloroethane, trichloroethylene, and tetrachloroethylene. 1,1-dichloroethene, methylene chloride, cis 1,2-dichloroethene, and tetrachloroethylene concentrations were also detected above applicable RCS-1 reportable concentrations in D-2.
- SVOC concentrations were detected above RCS-1 in both D-1 and D-2 for benzo(a)anthracene, benzo(b)fluoranthene, and benzo(a)pyrene.
- Lead was detected above the RCS-1 in D-2. Only one pesticide compound, dieldrin, and one PCB compound, aroclor-1248, were detected above applicable RCS-1 concentrations in both samples collected from D-1 and D-2.

6.4 Surface Water and Sediment Analytical Results

Surface water (SW) and sediment (SED) samples were collected from select downstream (DS), upstream (US), mid-channel (MC), and shoreline (SH) locations in the Neponset River on July 8, 2002. Surface water samples were submitted to Mitkem for analysis for VOC by EPA 8260B, total metals by EPA 6010B, and Mercury by EPA 7470A. Sediment samples were submitted to Mitkem for VOC by EPA 8260B, SVOC by EPA 8270C, total metals by EPA 6010B, and Mercury by EPA 7470A. Surface water analytical results are summarized on Table 5, and sediment sample analytical results are summarized on Table 6. Laboratory analytical reports for surface water and sediment are included in Appendix E.

Summary of Surface Water and Sediment Analytical Results

- Low concentrations were detected in the surface water sample collected at SW-SH for vinyl chloride, chloroethane, 1,1-dichloroethane, cis 1,2-dichloroethene, 1,1,1-trichloroethane, and toluene. Cis 1,2-dichloroethene was also detected at an estimated concentration below the reporting limit in the sample collected from SW-DS. No other VOC concentrations were detected in surface water samples above the reporting limits.
- Barium and lead were detected in all the surface water samples at trace concentrations below or equal to the reporting limit. No other metals were detected above reporting limits.
- The highest VOC concentrations in sediment were detected in the sample collected from SED-SH. At this location, vinyl chloride, chloroethane, acetone, 1,1,1-trichloroethane, cis 1,2-dichloroethene, 1,1-dichloroethane, toluene,

ethylbenzene, xylenes, and 1,2-dichlorobenzene were detected above reporting limits.

- The highest SVOC concentrations were detected at SED-DS. At this location, phenanthrene, fluorene, and pyrene were detected at 10 mg/kg, 11 mg/kg, and 13 mg/kg, respectively.
- The highest metal concentrations were detected in the sample collected from SED-SH. At this location, lead was detected at a concentration of 296 mg/kg and chromium at 100 mg/kg. The sediment analytical results were compared to Freshwater Sediment Screening Benchmarks used for Stage I Environmental Risk Characterizations under the MCP. DEP has adopted the consensus-based threshold effect concentrations (TECs) for use in screening freshwater sediment for risk to benthic organisms.
- Sediment analytical results for metals showed concentrations of arsenic, cadmium, chromium, lead, and mercury above TECs at SED-SH and at the upstream sample location (SED-US). Concentrations of lead exceeded TECs in the samples collected at SED-DS and SED-MC, and concentrations of mercury exceeded TECs at SED-MC (Table 6).

6.5 Surficial Soil Sampling Results

The surficial soil samples collected at the site by DEP personnel were screened for metals with an XRF analyzer. XRF screening results revealed several compounds in surface soils above RC S-1 and Method 1, S-3 standards. Lead was detected in numerous samples above the RC S-1 standard and Method 1, S-3 standards. Zinc was detected in one sample at a level above the RC S-1 standard, but below the Method 1, S-3 standard. Cobalt and zirconium were found in numerous samples above the RC S-1 standards, however no Method 1, S-3 standards have been established for these compounds. Arsenic was detected in one sample above the RC S-1 and Method 1, S-3 standard. Figure 4 shows surficial soil sampling locations. A summary of these results is included in the Niton XRF Analysis report presented in Appendix C.

Six of these surficial soil samples were selected for laboratory analysis at Mitkem for total metals by EPA 6010B and Mercury by EPA 7470A. Confirmatory laboratory analysis revealed screening level correlation with the XRF samples for lead. Insufficient data was collected to establish correlation for arsenic. The one arsenic sample above the RC S-1 and Method 1, S-3 standards by XRF screening was below the standards when analyzed in the laboratory. These results are presented on Table 7, and the complete laboratory analytical reports are provided in Appendix E.

Summary of Surficial Soil Sampling Results

- Arsenic, barium, cadmium, chromium, lead, mercury, and silver concentrations were detected in all six of the samples submitted for laboratory analysis.
- The sample collected at location C-15 (80-100) exhibited the highest concentration lead (2640 mg/kg).

7.0 EXPOSURE POTENTIAL

Exposure assessment is the process of identifying human and environmental receptors at the site based on site activities and uses, and characterizing the nature of their contact with compounds detected on site.

7.1 Potential Receptors

The human receptors that are likely to be present on the site and in the surrounding environment are evaluated based on the site activity and land use. Based on the current site status as a fenced-in, vacant industrial property, potential human receptors currently at the site include City of Boston - Department of Neighborhood Development personnel who inspect the site on a weekly basis, and trespassers.

Since the Neponset River borders the property to the south and east, other potential human receptors to the site may include recreational canoe or kayakers that may come in contact with impacted sediment or surface water.

Although the site use is currently industrial, future use may be considered uncertain due to the potential for recreational use along the Neponset River. Therefore, potential human receptors in the future may include recreational users in addition to construction workers for site improvement or utility work, who might engage in temporary activities involving soil excavation, or other site workers/employees. Exposure routes for construction workers may include dermal contact, ingestion, and inhalation of dust and vapors from both soil and shallow groundwater.

The potential exposure points for current and future use scenarios include soil and groundwater, particularly located along the southern portion of the site (between the building and Neponset River), within the vicinity of monitoring wells ESM-5 and ESM-6.

Potential environmental receptors that may likely be impacted by site conditions include the Neponset River that borders the site to the south and east. Because of its proximity to the site, terrestrial or avian receptors could be exposed to volatile organic compounds in the soil or groundwater. The Neponset River flows from the west to the

east along the site and is classified under the Massachusetts Surface Water Quality Standards (314 CMR 4.00) as Class B Inland Surface Water. According to 314 CMR 4.05 (3) (b), Class B "waters are designated as a habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated they shall be suitable as a source of public water supply with appropriate treatment. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value."

7.2 Potential Migration Pathways

NSTAR and Boston Water and Sewer were contacted on June 3, 2002 to locate underground utilities and other subsurface structures in the vicinity of the site. The locations of identified underground structures are illustrated on Figure 1. In addition, the GPR survey conducted by Hager-Richter (Appendix A) included identification of utilities in the vicinity of the underground storage tanks (USTs).

Underground utilities in the immediate vicinity of the site include water, sewer, and natural gas supply lines. The depth to water beneath the site ranged from 7 to 12.5 feet below grade on June 25, 2002. Engineering drawings obtained from NSTAR indicate that the depth to their 3-inch diameter steel and 1 ¼-inch diameter plastic gas lines are above the water table. An 8-inch diameter steel water line that enters the property from Fairmount Court is also likely located above the water table, although Boston Water and Sewer could not confirm the actual depth. There is also a 24-inch diameter concrete sewer main line that enters the property from Fairmount Court, which runs southwest to a manhole northwest of the building. From this manhole, the sewer main veers west towards the Penn Central Railroad property and Walnut Street. The depth of this sewer line was estimated to be 20 feet below surface grade, which places the line below the groundwater table. Sewer lateral lines likely enter the sewer main from the northwest and northeast sides of the building; however the depths to these laterals were not confirmed. It should be noted that based on the subsurface investigation, the areas of significant VOC impact (located south of the building) are downgradient of these utility lines.

Floor drains were identified during site reconnaissance activities as potential migration pathways for hazardous wastes formerly stored at the site. These included floor drains within the outside tank farm containment area, and in the shipping and receiving area on the southwest side of the building. The tank farm drain was an approximately 18-inch x 18-inch cutout in the floor of the outside concrete containment area. Investigative activities included driving a split-spoon sampling device through the middle of the drain, which confirmed the drain was filled with leaves, debris, sludge and dense sand and gravel material to a refusal depth of approximately four feet. The presence of an outlet pipe or conduit could not be verified. The floor drain in the shipping and receiving area was a shallow drain with an outlet pipe directed towards the southeast.

Other migration pathways include the two breached areas within the trench drain located in the basement on the western side of the building, and the trench drain exit pipe (near ESM-9).

Based on the GPR Survey (Appendix A) performed in November 2001, two possible USTs are located just outside the northwest wall of the building. This would be consistent with historical evidence that indicated the presence of a 2,500-gallon and a 7,200-gallon fuel oil USTs at the northwest side of the building. GPR data indicated that one of the suspected USTs is 22 feet long and is buried approximately 2 feet below grade, and the other UST is 8 feet long, and is also buried 2 feet below grade. GPR data also indicated the presence of a flat object and a short section of a possible utility located in the southwest portion of the property, and the presence of a filled area with many unidentified objects, some of which could possibly be drums, a flat object and other unidentified objects in the northeast portion of the property.

Finally, a manhole was identified during site reconnaissance north of the existing building. The manhole is covering a dry vault or well. The vault was inspected by ES&M and observed to be constructed of brick, with no observed pipes entering or exiting it. The floor of the vault is approximately eight feet below grade, and appeared to be connected to an underlying chamber below.

7.3 Indoor Air Exposure Potential

The 12-24 Fairmount Court property is unpaved for the most part, with the exception of the driveway that enters the property from Fairmount Court to the northeast. A basement exists beneath the one- to three-story brick and wood building that comprises approximately one-third of the property.

The potential for volatile organic compounds to volatilize into the indoor air of the existing building on the property was evaluated through comparison of groundwater analytical results to MCP Method 1, GW-2 groundwater standards (MCP; 310 CMR 40.0974(2)), as shown on Table 3. Groundwater located within 30 feet of an occupied building or structure, where the average depth to groundwater in that area is less than 15 feet, is considered to be a potential source of vapors of OHM to indoor air. As the building on site is currently unoccupied, there is no current indoor air exposure potential. However, if the building were to become occupied in the future, volatile organic compounds detected in groundwater in the vicinity of monitoring wells B1/OW1, ESM-3, ESM-4, ESM-5, ESM-6, and ESM-9 could potentially volatilize into the indoor air of the building. Volatile compounds in groundwater at wells B1/OW1, ESM-3, ESM-4, ESM-5, ESM-6, and ESM-9 were detected at concentrations above MCP Method 1 GW-2 standards.

7.4 Qualitative Imminent Hazard Evaluation

The Lewis Chemical site was evaluated for conditions that may pose an Imminent Hazard in accordance with the MCP, 310 CMR 40.0950. A qualitative imminent hazard evaluation was selected over a quantitative evaluation because of the limited dataset, and as a cost-efficient means to determine if overt Imminent Hazard conditions are present that should be addressed in a timely manner.

An imminent hazard evaluation focuses on actual or likely exposures to human and environmental receptors under current site conditions, considering the current uses of the site. The first step in evaluating the potential for an imminent hazard is to identify the receptor group or groups that may experience the greatest exposure potential or susceptibility to environmental contamination. Since this site is currently an abandoned industrial property surrounded by fencing, residential exposures need not be evaluated at this time. The only probable human receptors under current site conditions are trespassers and City of Boston - Department of Neighborhood Development employees. Other probable receptors may include recreational canoe and kayak users who may contact surface water and/or sediment in the Neponset River.

The primary environmental receptor at the site is the Neponset River. The Neponset River, described in Section 7.1, is a Class B inland surface water body designated as a habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Impact to the Neponset River was evaluated to identify a potential Imminent Hazard to ecological receptors.

Releases and threats of release that could pose an imminent hazard are identified in the MCP - 310 CMR 40.0320. For the purposes of reporting, releases that pose or likely pose an imminent hazard to health, safety, public welfare, and the environment are:

- A release to the environment which results in the presence of vapors within buildings, structures, or underground utility conduits at concentrations equal or greater than 10% the lower explosive limit (LEL);
- A release to the environment of a reactive or explosive hazardous material;
- A release to a roadway that endangers public safety;
- A release to the environment of OHM that poses a significant risk to human health when present even for short period of time as specified in 310 CMR 40.0950;
- A release to the environment of OHM that produces immediate or acute adverse impacts to freshwater and saltwater fish populations; or

- A release to the environment that produces readily apparent effects to human health, including respiratory distress or dermal irritation.

Additionally, releases that pose or would likely pose an imminent hazard to human health in the MCP are identified as:

- A release to the environment measured by a concentration of OHM in a private drinking water supply well equal to or greater than 10 times the RCGW-1 reportable concentration; or
- A release to the environment measured by a concentration of arsenic, cadmium, chromium, cyanide, mercury, methyl mercury, and PCB in surficial soil (within 12 inches) at any location within 500 feet of a residential dwelling, school, playground, recreation area, or park unless controlled or prevented by means of bituminous pavement, concrete, fence, or other physical barrier [equal to or greater than those concentrations listed in 310 CMR 40.0321(2)(b)]; or
- A release to the environment for which estimated long-term risk levels associated with current exposures are greater than 10 times the Cumulative Receptor Risk Limits in 310 CMR 40.0993(6).

Each of these criteria was qualitatively evaluated relative to the Lewis Chemical site to determine if an imminent hazard may exist, as summarized below:

- The presence of vapors in the building at concentrations equal to or greater than 10% LEL was not identified during site visits to the Lewis Chemical site (based on PID measurements within the building).
- The release of a reactive or explosive hazardous material or a release to a public roadway that would endanger public safety was not identified.
- No immediate or acute adverse impacts to freshwater fish populations in the Neponset River were observed or identified during the river sampling event in July 2002.
- No readily apparent effects to human health were identified. The Lewis Chemical site is located near residential areas; however the property is secured by locked chain-link fencing, and residential areas are separated from the site by the railroad right-of-way and the Neponset River.
- No private drinking water supply wells were identified within 500 feet of the site.

No elevated concentrations of hazardous materials listed in 310 CMR 40.0321(2)(b) were identified in surficial soil at the site with the exception of cadmium that was detected in the surficial sample collected at F-6, (100-120) at a concentration of 64 mg/kg. However, this location is within the fenced area surrounding the site, thereby controlling or preventing potential access.

To determine if OHM at the site pose a significant risk to human health when present for even a short time, exposure duration must be identified. Exposure duration is the length of time over which the receptor(s) comes in contact with contaminants at a site. The MCP requires that the imminent hazard evaluation focus on an appropriately short period of time, usually less than five years. Since the human receptors identified at Lewis Chemical are infrequent (if at all) trespassers and occasional City of Boston employees, the potential duration of time for them to come in contact with OHM at the site is very low.

Once exposure duration is identified, the potential adverse human health effects that may be associated with exposure to a particular contaminant, or the toxicity of a contaminant of concern, is identified. At Lewis Chemical, the contaminants of greatest concern detected in soil and groundwater were chlorinated solvents, particularly 1,1,1-trichloroethane and trichloroethylene. These contaminants were identified in groundwater samples collected from wells ESM-5 and ESM-6, at concentrations above MCP Method 3 upper concentration limits (UCLs). UCLs are concentrations of OHM in soil and groundwater, which if exceeded, indicate the potential for significant risk of harm to public welfare and the environment under future conditions. However, the depth to groundwater in these wells was determined to be greater than six feet below grade, and therefore groundwater in this portion of the site is not readily accessible under existing site conditions.

Wells ESM-5 and ESM-6 are located approximately 20 feet from the banks of the Neponset River on the southern portion of the property. Surface water samples were collected along the shoreline (SH) east of these wells (Figure 1). Analytical results from this surface water sample (SW-SH) showed 1,1,1-trichloroethane detected at a concentration of 5 ug/L. Trichloroethylene was not detected in SW-SH above the reporting limit (Table 5).

MCP Method 1 GW-3 standards are intended to provide protection against the migration and eventual discharge of contaminants in groundwater to surface water at concentrations above USEPA Ambient Water Quality Criteria (AWQC) and Massachusetts Surface Water Standards (314 CMR 4.00). A dilution/attenuation factor of 10 was applied to the lowest allowable ecologically based AWQC to determine allowable groundwater concentrations (GW-3 standards). Since the surface water concentration for 1,1,1-trichloroethane detected at SW-SH does not exceed a calculated concentration 1/10 of the GW-3 standard for 1,1,1-trichloroethane, then it is unlikely that an imminent hazard exists to surface water at this time.

The elevated concentrations of 1,1,1-trichloroethane and trichloroethylene in groundwater at ESM-5 and ESM-6 do, however, suggest the possibility of an imminent hazard to the Neponset River under future conditions. Since seasonal chemical data is not available, and since the vertical extent of impact has not been investigated, additional investigation relative to hydrogeologic conditions beneath the site and the river would be required to determine this level of risk.

Elevated concentrations of arsenic, cadmium, chromium, lead, and mercury were detected in the sediment samples collected from the shoreline (SED-SH) and at the upstream location (SED-US). At both of these locations, concentrations of metals exceeded threshold effect concentrations (TECs) recommended by DEP for use in screening potential risk to freshwater benthic organisms. Although the presence of these concentrations in the shoreline sample may indicate impact from the Lewis Chemical site, the concentrations observed in the upstream sample could indicate elevated background concentrations in this area of the river. More sediment data and possibly the completion of a Stage II Environmental Risk Characterization to fully evaluate potential impact and level of risk are required.

Additionally, lead was detected in surficial soil (within a depth of 12 inches) at three locations (C 80-100, F 100-120, and F 140-160) at concentrations exceeding MCP Direct Contact Exposure-Based Soil Concentrations (applicable to soil category S-3) (Table 5, 310 CMR 40.0985(6)). The Direct Contact soil standards were developed using non-cancer and cancer risk management criteria ($HI=0.2$, $ELCR=1E-06$) that are roughly 10 times lower than risk management criteria used to evaluate whether risks experienced over a short period of time may pose an imminent hazard. The Direct Contact soil standards consider risks from direct contact (dermal contact and ingestion) with soil. Given this, multiples of the Direct Contact soil standards can be used as a general indicator of a situation that may warrant further investigation as a possible imminent hazard. Category S-3 was selected since: (1) children are not present at the site; (2) the site is controlled/secured with chain-link fencing, and (3) frequency and intensity of use for the adult receptors (trespasser and/or City worker) are considered low. Given this information, the concentrations of lead detected in surficial soil were compared to 10 times the applicable Direct Contact Category S-3 standard. No concentration exceeded this multiple.

8.0 IDENTIFICATION OF SOIL AND GROUNDWATER CATEGORIES

This section identifies and documents the groundwater and soil categories applicable to the site, as described in 310 CMR 40.0930. The groundwater and soil categories are considered as general indicators of the potential for exposure to oil and hazardous material. In addition, the groundwater categories are used to identify applicable or suitably analogous standards.

8.1 Soil Classification

Under the MCP, soil can be classified into one of three categories (S-1, S-2, or S-3) based on the human potential for exposure to soil. The MCP contains standards for soil in each of these categories. Category S-1 soil represents the highest potential exposure because it assumes unrestricted use of the soil (i.e., residential), whereas category S-3 soil represents the lowest potential for exposure.

The MCP requires that soil be categorized based on current site uses. In addition, soil to a depth of 15 feet must be evaluated as S-1 soil for foreseeable uses unless an Activity and Use Limitation (AUL) is placed on the property. An AUL is a deed restriction designed to limit activities on the site that may result in a potential risk to human health, public welfare, or the environment.

Considering the current site use (vacant) and the existence of a locked chain-link fence around the entire property, category S-3 appears to be appropriate for this site.

8.2 Groundwater Classification

Under the MCP (310 CMR 40.0932), there are three categories for groundwater (GW-1, GW-2, and GW-3) that can apply to a specified volume of groundwater or to an aquifer taken as a whole. These groundwater categories were established to identify groundwater associated with the following three distinct types of exposures:

GW-1 applies to groundwater assumed to be a current or future source of drinking water.

GW-2 applies to groundwater considered to be a potential source of vapors that could migrate through the soil and concentrate in indoor air of buildings.

GW-3 applies to groundwater that is assumed to discharge to surface water. All groundwater in the state is assumed classified as GW-3.

Because these exposures are not necessarily related to each other, they are not mutually exclusive. Therefore, more than one category may be applicable to a site and/or different categories may be applicable to distinct areas of the site.

8.2.1 Groundwater Category GW-1

The MCP (310 CMR 40.0932(4)) describes seven criteria that are used to identify current or future drinking water aquifers. If any one of the seven criteria is met then

the groundwater is classified as a GW-1. The seven criteria are as follows:

1. Within the Zone II for a public water supply;
2. Within the Interim Wellhead Protection Area for a public water supply;
3. Within the Zone A of a Class A surface water body used as a public water supply;
4. Within 500 feet of a private water supply well;
5. 500 feet or more from a public water supply distribution pipeline;
6. Within an area designated by a municipality specifically for the protection of groundwater quality to ensure its availability for use as a source of potable water supply. Such designation shall be in the form of: (1) a local ordinance or bylaw adopted by the municipality (*e.g.*, an Aquifer Protection District or Zone); (2) an inter-municipal agreement approved by the municipal legislative body; or (3) an executed inter-governmental contract for the purchase or sale of drinking water (*e.g.*, a contract between a public authority supplying water and a municipality); or
7. Within a Potentially Productive Aquifer that has not been defined as a Non-Potential Drinking Water Source Area, as defined by the DEP GIS overlay maps and confirmed by a site visit.

Information from site reconnaissance visits and the DEP file review were used to evaluate if the site groundwater met any of the criteria above. The following information was determined regarding the site groundwater:

- The site groundwater is not within a Zone II,
- The site groundwater is not within an Interim Wellhead Protection Area,
- The site groundwater is not within the Zone A of a Class A surface water body used as a public water source,
- The site is not within 500 feet of a private water supply well,
- The site is connected to a municipal water supply,

- The site groundwater is not within an Aquifer Protection District or Zone and,
- The site groundwater is not within a potentially productive aquifer.

Based on the information collected for this evaluation, the site groundwater does not meet the GW-1 classification for either a current or future drinking water source area based on information presented in this report.

8.2.2 Groundwater Category GW-2

Groundwater can also serve as a source of volatile compounds migrating into indoor air, and DEP established a groundwater category to identify circumstances under which such an impact may be likely. Groundwater is classified as GW-2 when it is located within 30 feet of an existing occupied building or structure and the average annual depth to groundwater in the area is 15 feet or less (310 CMR 40.0932(6)). Therefore, the GW-2 classification would apply if the building was occupied.

Groundwater at monitoring wells B1/OW1, ESM-3, ESM-4, ESM-5, ESM-6, ESM-8, ESM-9, and ESM-10 may be classified as GW-2 if the average depth to groundwater is determined to be 15 feet below the ground surface and there is an occupied building on-site within 30 feet. However, since the building on-site is currently unoccupied and there is not enough information to determine average depth to water at the site (only one well monitoring event conducted), site groundwater does not currently meet the GW-2 classification.

8.2.3 Groundwater Category GW-3

All groundwater in the Commonwealth is classified as GW-3. GW-3 standards are based on potential discharge to surface water, and all groundwater is deemed to ultimately discharge to surface water. Therefore, groundwater at this site is currently classified as GW-3.

9.0 SUMMARY AND CONCLUSIONS

A Phase I Brownfields site assessment was conducted at the former Lewis Chemical Company site located at 12-24 Fairmount Court in Hyde Park, Massachusetts. The Phase I site assessment included:

- A site inspection to identify potential sources, pathways and receptors at the site;
- A GPR survey to determine the presence of underground features, including two suspected underground tanks, subsurface utilities, drainage lines, fill areas, and buried debris;

- The development of site-specific supporting plans including a Quality Assurance Project Plan, Sampling and Analysis Plan, Health and Safety Plan, and Waste Management Plan; and
- A subsurface investigation including the installation of soil borings and monitoring wells, and the collection and analysis of soil, groundwater, surface water, and sediment samples to characterize surficial and subsurface conditions and to define the nature and extent of contamination, to the extent possible.

Summary of Site Assessment Results

- The results of this site assessment revealed VOC concentrations detected above RCS-1 in soil samples collected from soil boring locations ESM-1, ESM-3, ESM-4, ESM-5, ESM-6, ESM-8, ESM-9, and ESM-10. Concentrations of SVOC were detected above RCS-1 in soil from ESM-2, ESM-3, and ESM-10. Metals were not detected in soil samples above RCS-1 concentrations. No pesticides were detected in soil samples above RCS-1 concentrations. One PCB compound (Arochlor-1248) was detected above RCS-1 concentrations, in soil samples from soil borings ESM-5, ESM-6, and in the TF Drain sample. Metals were detected in all the surficial soil samples submitted for XRF screening. The highest overall metal concentrations were detected at F-6 (100-120). In addition, lead was detected at sample location C-15 (80-100), at a concentration of 2,640 mg/kg. The surface soil screening and confirmatory sampling revealed some metals above reportable concentrations.
- VOCs were detected in groundwater samples collected from wells B1/OW1, ESM-1, ESM-2, ESM-3, ESM-4, ESM-5, ESM-6, ESM-7 and ESM-9 above applicable RCGW-2 concentrations. The highest VOC concentrations were detected in samples from ESM-5 and ESM-6 for the compounds 1,1,1-trichloroethane and trichloroethylene. Trichloroethylene was detected in samples from ESM-6 and ESM-5 at concentrations 600 and 800 times higher than the RCGW-2 reportable concentration, respectively.
- SVOCs in groundwater were detected above RCGW-2 concentrations in B1/OW1, ESM-1, ESM-3 and ESM-5. Metal concentrations were not detected in groundwater samples above RCGW-2 concentrations.
- VOC and SVOCs were detected above RCS-1 concentrations in both soil samples collected from the breached areas of the trench drain (D-1 and D-2). Lead was also detected above RCS-1 in the soil sample collected from trench drain location D-1. No other metals were detected in the trench drain samples at concentrations above RCS-1. No pesticides were detected above RCS-1 concentrations in the trench drain samples. Arochlor-1248 was the

only PCB compound detected in both trench drain samples (D-1 and D-2) at concentrations above the RCS-1.

- VOC concentrations in surface water were detected at levels above the laboratory reporting limits only in the sample collected at the shoreline of the Neponset River (SW-SH). Barium and lead were detected in surface water samples at trace levels, below the reporting limit and equal to or above the detection limit.
- VOCs were detected in sediment samples at low concentrations but above the laboratory reporting limits. The highest VOC concentrations were detected in the sediment sample collected at the shoreline location (SED-SH). SVOCs were detected above reporting limits in all the sediment samples, with the highest concentrations detected in the sample collected from the downstream location (SED-DS). Metals were detected in all the sediment samples, with the highest concentrations detected at SED-SH and SED-US. At these locations, lead was detected at concentrations of 296 mg/kg and 212 mg/kg, respectively, and chromium was detected at 100 mg/kg and 79.8 mg/kg, respectively. The sediment analytical results for arsenic, cadmium, chromium, lead, and mercury at both SED-SH and SED-US exceeded threshold effect concentrations (TECs) used in screening freshwater sediment for risk to benthic organisms.

Conclusions

- The source or sources of the contaminants at this site are likely related to historical waste, handling, storage, and treatment operations conducted at the former Lewis Chemical Company between the years of 1963 and 1983. The two breached areas of the trench drain were likely contaminant migration pathways to the subsurface, as well as floor drains located in the shipping and receiving area and within the former tank farm pad. Additionally, documented and undocumented spills and general poor waste handling activities likely contributed to the current state of the subsurface.
- Two suspected USTs - a 7,200-gallon tank and/or a 2500-gallon steel heating oil tank located in the northwest portion of the site – are likely sources of petroleum-related compounds detected in soil and groundwater at ESM-8. These USTs should be closed in accordance with 527 CMR 9.00 to eliminate the potential for future releases. In addition, the GPR survey identified numerous buried objects across the site that may be other potential sources of OHM to the environment. A site inspection also revealed the presence of possible tar-paper-like still bottom waste that may be considered hazardous waste and warrant further evaluation.

- There are no existing identifiable conditions that may pose an imminent hazard to human health and/or the environment. This conclusion is based on the results of a qualitative imminent hazard evaluation performed to determine if existing conditions and uses (the site is a fenced-in, vacant industrial property) at the Lewis Chemical site pose an imminent hazard. The information used in the imminent hazard evaluation was based on one groundwater-monitoring event.
- The imminent hazard evaluation did, however, identify conditions that may pose an imminent hazard or other longer-term risks to human health and the environment under future conditions. Of greatest concern are surficial impacts by metals, and highly elevated concentrations of chlorinated solvents in groundwater adjacent to the building and the Neponset River.

Because of this finding, additional investigations regarding geologic and hydrogeologic conditions beneath the site and the river are required to make a more plausible determination of imminent hazard or other longer-term risks to human health and the environment under future conditions.