FINAL

OU-I FEASIBILITY STUDY REPORT

FORMER RED DEVIL FACILITY
MOUNT VERNON, NEW YORK

June 1995

Prepared For:

Insilco Corporation
Dublin, Ohio

Prepared By:

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ERM

ERM-Northeast

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28 June 1995

Robert Smith
New York State Department of Environmental Conservation
21 South Putt Corners Road
New Paltz, New York 12561-1696

Re: Final OU-I Feasibility Study Report
Former Red Devil Facility, Mount Vernon, New York

ERM

Dear Rob:

Enclosed please find four copies of the Final OU-I Feasibility Study Report (FS report) for the former Red Devil Facility located in Mount Vernon, New York. By copy of this letter, I am also transmitting copies of this document to Michael J. O'Toole, G. Anders Carlson, and Rosalie Rusinko.

This final version of the FS report incorporates responses to NYSDEC's comments as documented in letters from ERM to NYSDEC, dated 18 May 1995 and 30 May 1995. In addition to document revisions resulting from responses to NYSDEC's comments, page 2-12 of the text has been revised to include discussion regarding recent air sampling efforts (i.e., the "Ambient Air Sampling Report", ERM, 31 March 1995). These results were received after preparation of the draft FS report and therefore were not included in the draft version of this report.

If you have any questions or need additional copies of the report, please do not hesitate to contact Troy Meyer at (614) 792-0468.

Sincerely,

ERM-Northeast

Carla Weinpahl
Senior Project Engineer

cc: Michael J. O'Toole, NYSDEC
G. Anders Carlson, NYSDOH
Rosalie Rusinko, NYSDEC
Troy Meyer, Insilco Corporation
Jeff Zimmerman, Coffield, Ungaretti & Harris
Laura Truettner, ERM-Northeast
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Mike Teetsel, ERM-Northeast
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enclosure

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Prepared For:

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John Iannone, Project Director
New York State P.E. #62260

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

APPENDICES

TABLE OF CONTENTS

LIST OF FIGURES

TABLE OF CONTENTS

LIST OF TABLES

TABLE OF CONTENTS

1.0 INTRODUCTION

The former Red Devil Paint and Chemicals Facility (hereinafter referred to as the "Site"), located at 30 North West Street, has been listed on the New York State Registry of Inactive Hazardous Waste Sites, number 3-60-031. On 29 June 1993, the New York State Department of Environmental Conservation (NYSDEC) and Insilco Corporation (Insilco) entered into an Order on Consent (Index # W3-0588-92-03) to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Site. The parcel of land identifying the Site is reflected on the map shown in Figures 1-1 and 1-2. This Feasibility Study (FS) has been prepared in accordance with the terms of the afore-mentioned RI/FS Order on Consent and the NYSDEC approved RI/FS Workplan and on behalf of Insilco, by ERM-Northeast (ERM).

At the request of NYSDEC, the FS for this Site will be divided into three operable units (OUs). The first operable unit (OU-I), which is addressed by this FS Report, will evaluate remedial actions for media which have been adequately characterized (i.e., on-Site non-aqueous phase liquid (NAPL)). NAPL is defined as the immiscible portion of a hydrocarbon liquid present in ground water. The NAPL found at this Site is lighter than water and therefore "floats" on the ground water table.

The second operable unit (OU-II) will be completed after a Supplemental Remedial Investigation (SRI) has been completed and sufficient information has been gathered to evaluate remedial action objectives for off-Site NAPL. A workplan for the SRI, which includes activities for characterization of off-Site NAPL, is currently being developed and will be submitted to NYSDEC for review and approval in February 1995.

Finally, after the on-Site NAPL has been addressed and soil and ground water quality at the Site have been re-evaluated, the third operable unit (OU-III) will be addressed. This final FS will evaluate additional remedial requirements, if any, remaining after the NAPL has been addressed, to address ground water quality (NYSDEC, 1994a) and soil quality (ERM, 1994a; NYSDEC, 1994b) at the Site.

This document represents the OU-I FS for the Site. This FS and subsequent FSs will utilize information contained in the Remedial Investigation (RI) report to identify the media of interest for the Site. The RI report, which also contained the Risk Assessment for the Site, was prepared by ERM, on behalf of the Insilco. This report was submitted to NYSDEC on 26 May 1994 and was subsequently approved by the department on 19 July 1994.

The RI contained an assessment of the nature and extent of organic and inorganic constituents in soil, ground water, surface water, sediment and air at and around the Site. In addition, the geologic and hydrogeologic settings at the Site were likewise analyzed in the RI to assess potential migration pathways. In the RI Risk Assessment, organic and inorganic chemicals of potential concern were identified and potential risks to human health resulting from exposure to soil, ground water, surface water, sediment and air containing chemicals of potential concern were evaluated.

In addition to the RI report, the following form the basis for this FS:

- "RI/FS Work Plan, Former Red Devil Facility, Mount Vernon, New York", ERM, 18 December 1992 (ERM, 1992b);
- "Addendum 1 to the RI/FS Work Plan, Former Red Devil Facility, Mount Vernon", New York, ERM, 20 May 1993 (ERM, 1993a);
- "Interim Remedial Measures Workplan, Former Red Devil Facility, Mount Vernon, New York", ERM, 24 September 1993 (ERM, 1993b);
- "IRM (Interim Remedial Measure) Product Recovery and Storage System Contract Drawing and Specifications", ERM, 22 December 1993 (ERM, 1993c); and

- reports that predated the Administrative Order on Consent, correspondence and verbal discussions between parties.

1.1 PURPOSE AND ORGANIZATION OF REPORT

The purpose of an FS is to identify a remedial alternative that will achieve the remedial action objectives for a site. The remedial action objectives for the affected media (or medium) are based upon established NYSDEC Standards, Criteria and Guidelines (SCGs) that are applicable or relevant and appropriate requirements for the Site and on constituent concentrations which are protective of human health and the environment.

This FS has been prepared in accordance with the approved RI/FS Work Plan for this Site, the NYSDEC Technical and Administrative Guidance Manual (TAGM) "Selection of Remedial Actions at Inactive Hazardous Waste Sites" (HWR-90-4030; Revised 15 May 1990), the National Contingency Plan (NCP at 40 CFR Part 300), sound engineering practices and the following documents:

- "New York State Standards, Criteria and Guidelines", NYSDEC, Revised December 1993;
- "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (Comprehensive Environmental Response Compensation and Liability Act)", US Environmental Protection Agency (USEPA), October 1988 (Interim Final).
- "CERCLA Compliance with other Laws Manual, Draft Guidance", USEPA, August 1988 (OSWER Directive 9234.1-01); and
- "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions", USEPA, April 22, 1991 (OSWER Directive 9355.0-30).

The FS considered general response actions capable of achieving these remedial action objectives and identified potential remedial action technologies to implement these actions. Remedial technologies that were found to be applicable to Site conditions were then used to develop comprehensive remedial action alternatives. Remedial action alternatives were then evaluated in accordance with the NYSDEC guidelines to identify a preferred remedial action alternative for the Site.

The FS is divided into five sections. The first section is an introduction to the report and contains a summary of the Site history, Site background and IRM activities. The remedial action objectives are developed in the second section of the report, based upon an evaluation of the RI and Risk Assessment (RA) data. As appropriate, these remedial action objectives are based on SCGs or chemical specific remediation goals based on unacceptable potential human or environmental risks, if any. This section also identifies general response actions which may achieve the remedial action objectives for the affected Site media (or medium).

In the third section of the report, various remedial action technologies, which might be used to accomplish the general response actions, are identified. This section also includes a screening of these technologies to determine which technologies are appropriate for conditions at the Site. A number of remedial action technologies are eliminated from further consideration in the FS as a result of this screening. Potential technologies are screened based on their ability to meet the remedial action objectives, on their implementability and on their short-term and long-term effectiveness.

The fourth section of the report combines the remedial action technologies into comprehensive remedial action alternatives. These remedial action alternatives are evaluated for consistency with criteria in the aforementioned guidance documents.

The fifth and final section of the report compares the remedial action alternatives, previously presented in Section 4.0, and identifies a preferred remedial alternative for implementation at the Site.

1.2 SITE BACKGROUND

This section presents a general Site description, Site history, a summary of the physical characteristics of the Site and a summary of previous investigative activities.

1.2.1 Site Description

The Site is located at 30 North West Street in the City of Mount Vernon, Westchester County, New York. Figure 1-1, generated from the United States Geological Survey (USGS) Mount Vernon, New York quadrangle, identifies the plant location at 40^0 54'54" north latitude and 73^0 51' 35" west longitude.

The property is approximately 50,000 square feet (ft^2) in area, 73 percent (37,035 ft^2) of which is occupied by the multi-floored plant building. A Site plan of the facility, showing the property boundaries and the locations of the former tanks, is shown in Figure 1-2. To facilitate discussion, the Site has been divided into four areas, designated A, B, C and D. These four areas were delineated based upon the physical layout of the property and the primary operations that were undertaken in each part of the Site.

A number of underground and vaulted aboveground storage tanks were previously located in Areas A, B, C and D of the Site. In May 1991, tank closure and removal activities were conducted in these areas. These activities are discussed in further detail in Section 1.3.

Area A is on the ground floor and consists of an office area and a courtyard. Previously, eleven underground storage tanks (USTs) were located in this area. Area B, which is located in the basement of the facility, was used for raw material storage and contained the boiler room. Ten vaulted aboveground storage tanks and four USTs were previously located in this area. Area C, which is also located in the basement of the facility, was the former production area and contained two USTs and four vaulted aboveground storage tanks. Area D, which contained the packing operations and a garage/storage area, is located on the same level as Areas B and C. Seven USTs were previously located in this area. At this time, only two USTs (Tanks A and B) are in operation in this Area of the Site. These tanks are used for stormwater storage.

Local land use within one mile of the Site is urban with some mixed residential and industrial/commercial development. The properties immediately surrounding the Site are industrial or commercial in nature. An active railroad track area currently used by the Metro-North Railroad Company and by other railroad companies, the Harlem Line, runs directly adjacent to the northwest side of the facility; Oak Street (shown as a continuation of Sherwood Avenue on Figure 1-1) is located on the northeast side of the facility; North West Street is located on the southeast side of the Site; and several unoccupied storefronts are located on the southeast side of the street. The Bronx River is located to the northwest of the Site (i.e., immediately adjacent to the active railroad track area). The distance from the Site to the Bronx River, as measured from aerial maps of the Site and the tax map, ranges from 125 feet on the northern end of the Site to 185 feet on the southern end of the Site.

The Site is located in an area that is expressly zoned for industrial use. A map showing the land usage within the vicinity of the Site is shown in Figure 1-3. Facilities presently and formerly located in the vicinity of the Site include: machine shops, laundry cleaners, metal stamping factory, tinsmith, printing factory, brewery, jewelry manufacturing facility, pharmaceutical company, chemical manufacturing company, brass instruments manufacturing facility, dental laboratory, car wash, service stations, and auto body repair shops.

1.2.2 Site History

The Site is located in an industrial area. Industrial activities have occurred in this area for at least 75 years. The earliest Buildings Department records indicate that Egler and Sons Baking Company constructed a baking factory at the Site in 1908. Between 1908 and 1940, the Site was owned/operated by several bakeries including Shults Bread Company, Bakery Services Corporation and Continental Baking Corporation. During this time, additional structures such as sheds, a mill and a garage were added to the property.

At some point between the late forties and early fifties, Red Devil Paints and Chemicals, Inc., which was related to the Technical Color and Chemical Works, Inc., began operations at the Site. Insilco Corporation acquired Red Devil Paint in 1971 and purchased the property in 1985. In 1989, Insilco sold the assets of the Red Devil Paint division to Thompson and Formby. Insilco continued to operate the facility under a supply agreement until mid-1990. After operations ceased in 1990, Thompson and Formby removed most of the operating equipment and all of the remaining stock and transported these materials to other facilities. In 1991, Metro Self Storage Bronx, Inc. began leasing the property and the building from Insilco. The building has subsequently converted into self-storage units. Metro Self Storage Bronx, Inc. continues to lease the Site from Insilco.

The chronology of Site operators is as follows:

Metro Self Storage	1991-Present
Insilco	1989-1991
Red Devil Paint Division of Insilco	1971-1989
Red Devil Paints & Chemicals, Inc.	1959-1971
Technical Color and Chemical Works, Inc.	1955-1963
Continental Bakery Corporation	1926-1940
Bakery Services Corporation	1927-1930
Shults Bread Company	1911-1915
Egler and Sons Baking Company	1908

1.2.3 *Summary of Site Physical Characteristics*

The Site geology, hydrogeology, surface water drainage, nearby surface water bodies and the Site floor drain system are discussed in this subsection.

1.2.3.1 *Geology*

The geology at the Site was characterized during the various phases of drilling. A fence diagram (i.e., cross-section) showing a three dimensional view of the geology at the Site, is shown in Figure 1-4. This figure was constructed using boring data from wells MW-8C, MW-6C and MW-2A.

The elevation of the top of the bedrock surface is highest at wells MW-7A and MW-8C and slopes downward toward the river. Refer to Figure 1-5 for location of ground water monitoring wells. The elevation of the bedrock surface at MW-8C is 62 feet above mean sea level (MSL). The bedrock surface slopes downward to a topographic low of 31 feet above MSL at MW-6C. Bedrock chips were found in the auger during the installation of background soil borings in Area A. The chips were white in color and the bedrock was tentatively identified as the Inwood Marble. Since the Hartland Formation has interlayered layers of impure marble, it was not possible to definitively determine whether the bedrock was the Inwood Marble or the Hartland Formation.

The thickness of the overburden soil varies at the Site from approximately 45 feet in Area A to 25 feet in the vicinity of MW-8C. The unconsolidated materials (soils) are thickest in Area A since there was no basement in this area. The unconsolidated materials consist of a mixture of fill, recent stream deposits and glacial till. In general, the fill material varies in thickness from 2 to 4 feet in Areas B, C and D to 12 feet in Area A. There were some locations in Area D that contained thicker layers of fill. For example, fill was present at D-3 to a depth of 10 feet and overlay a one foot thick concrete pad. At D-4, fill was found to a depth of 8 feet. At D-2, a void with a concrete bottom was encountered and the concrete bottom was at 9 feet. The fill material was generally composed of coal dust, bricks, concrete rubble and boulders. The location of these borings is presented in figures referenced in Section 1.2.4.2..

The natural sediments beneath the fill are primarily recent stream deposits; a thin layer of till was found above the bedrock at MW-8C. The stream deposits tend to be better graded than the glacial deposits and may range from coarse sand to silt in grain size. Some poorly developed stratification was identified in some of the stream deposits. These deposits probably represent the old Bronx River floodplain. The glacial material is on the side of the bedrock slope and topographically above the floodplain. The glacial material is composed of reworked bedrock and is generally sandy with lesser amounts of silt and coarse sand.

1.2.3.2 Hydrogeology

The NYSDEC Registry Site Classification Decision states that the Site is located on or adjacent to a principal aquifer. This decision was based upon a map prepared by Bugliosi and Trudell (Bugliosi and Trudell, 1988). ERM also reviewed the map and found that as a result of the scale, it is difficult to determine the exact location of the Site. However, based upon the location of the junction of the railroad lines, ERM's analysis indicted that the Site was not within the aquifer boundaries. Furthermore, the aquifer adjacent to the Site was described as yielding between 10 and 100 gpm and consisting of "[s]and and gravel with saturated zones generally less than 10 feet thick, or thicker, but with less permeable silty sand and gravel". The aquifer outlined on the map is probably the former Bronx River streambed. As discussed below, field tests indicate the aquifer underlying the Site yields a maximum rate of five gallons per minute (gpm).

The depth to ground water varies across the Site from 30 feet below ground surface in Area A to 15 feet below ground surface in Area D. The water level measurements obtained from the seven ground water monitoring wells were plotted on a map of the Site to evaluate ground water flow directions. The data collected in June of 1993 is shown in Figure 1-5 and the data collected in October of 1993 is shown in Figure 1-6. Although the water table has dropped somewhat between June and October, the flow maps are virtually identical. Both maps show that the direction of ground water flow is to the west at an oblique angle to the Bronx River. The hydraulic gradient at the Site is approximately 0.024 feet/foot. The maps also show the elevation of the Bronx River near the Oak Street and Mount Vernon Avenue overpasses. The elevation of the river is usually several feet lower than the water table elevation at the Site, confirming that ground water from the Site is discharging to the river.

The results of the slug testing data indicated that the hydraulic conductivity of the unconsolidated materials ranged from 3.0×10^{-4} ft/min at MW-7A to 1.53×10^{-2} ft/min at MW-2A. The fairly wide range in conductivities observed at the Site is a function of the nature of the subsurface materials which range from fill to glacial till. The slug test data, the hydraulic gradient derived from the ground water flow maps and a range of estimated porosities were used to calculate ground water flow velocities at the Site. Based on actual field data, the ground water velocities at the Site range from 0.49 to 0.99 ft/day.

Also of note is the sustainable pump rate that was estimated during well development at the Site. The maximum sustainable pump rate was five gpm at MW-1A and MW-2A and the minimum rate was 0.5 gpm at MW-8C. These pump rates are much lower than those noted on the map prepared by Bugliosi and Trudell (Bugliosi and Trudell, 1988) and this information further verifies that the Site is not within the principal aquifer boundaries as noted on this map.

1.2.3.3 *Nearby Surface Water Bodies*

The Bronx River, which is located northwest of the Site, flows southward (southwestward in the immediate vicinity of the Site) and discharges into Long Island Sound, near the head of the East River. In the vicinity of the Site, the river channel has been stabilized by a vertical concrete wall on the north bank and riprap material along the south bank. The width of the river adjacent to the Site is approximately thirty feet, and its depth is approximately three to five feet. As a result of the retaining wall on the north bank of the river and dense vegetation along the south bank, access to the river is physically restricted.

During preparation of the RI, flow data from the U.S. Geological Survey gaging station in Bronxville, New York (gage 01302000), located approximately two miles upstream of the Site, were reviewed to obtain river flow rates. These data cover the period from October 1, 1988 through September 30, 1989, and were the latest available data at the time the RI was prepared. Over the time period that the data was collected, the flow in the river ranged from 6.6 cubic feet per second (ft^3/sec) to 1,180 ft^3/sec. The average flow was 57.4 ft^3/sec, which is equivalent to 25,763 gallons per minute.

1.2.3.4 *Surface Water Drainage*

As shown in Figure 1-7, surface water around the Site generally drains to storm water grates located at various points in the facility. Because the Site is covered almost entirely by buildings or concrete, surface water that runs off of Site soils is limited to the embankment area on the northwest side of Area A outside the building. In this area, storm water from the embankment either infiltrates into the soils or leaks into the building. In the paved courtyard located on the southeast side of Area A, storm water discharges to a storm water grate located within the courtyard. There is no surface runoff in Areas B or C since these areas are located in the basement of the facility. Any storm water run-off from the front of the building is discharged to the municipal storm sewer located on North West Street which subsequently feed into the Oak Street storm sewer. In the alley on the northwest side of Area D, some storm water may accumulate on the southern side of the alley near the clogged storm grate. This water is generally manually pumped to the street by the Site operator where it flows into a storm water sewer basin. In addition, some storm water from the paved alley also drains naturally to the municipal storm grates on Oak Street. As shown in Figure 1-7, the municipal storm water sewer runs along the Oak Street overpass and discharges into the Bronx River.

1.2.3.5 Floor Drain Sewer System

The basement areas of the facility contains a floor drain and sump system. This system is comprised of a series of floor drains connected to concrete sumps located in the basement of the facility building. According to the RI, overflows and spills that occurred during operations in the basement of the facility were apparently collected by this floor drain and sump system. An overflow or spill would be collected in the floor drains and flow in underground piping to the sumps, where it would accumulate. The material which had accumulated in the sumps was removed by either hand bailing or pumping the material and transferring it to an on-site storage tank. ERM had planned to evaluate the connections between the drains and the sumps by dye testing. However, the dye testing could not be performed due to the presence of material, including silt, that had accumulated in the floor drains and sumps. During the RI, ERM was able to locate 6 sumps and 4 floor drains, but the location of underground piping connecting the floor drains to sumps could only be identified in two areas. The location of the sumps, floor drains and underground piping identified by ERM during the RI is shown in Figure 1-7.

As a result, some information regarding this system, such as the connections between the floor drains and sumps, the location of the components of this system, and the connections, if any, to other sewer systems (e.g., sanitary or storm water) are not known. In addition, Section 4.2.4 of the RI report suggested that the floor drains and sumps in Area C may have been a possible source of NAPL in this area. The RI report noted that there is a sump connected to two floor drains located adjacent to a NAPL delineation well (DW-6C), where the largest apparent NAPL thickness in Area C has been noted (i.e., 1.93 feet to 2.01 feet in well DW-6C).

In response, the NYSDEC requested that sampling of floor drains and sumps be performed and that a figure be prepared showing the locations of the floor drains and sumps and connections from this system, if any, to the municipal sewer line under the adjacent streets. The NYSDEC also stated that direct contact with the accumulated material present in the floor drains and sumps could be a potential exposure pathway to future maintenance workers, depending on the results of the sampling of this accumulated material.

In order to address this issue, a scope of work for the cleaning and survey of the floor drain and sump system is currently being developed as part of a supplemental RI work effort to be performed at the Site. As part of this work, the location of the floor drain, sump and connecting piping will be identified through a survey of the system. Accumulated material found in the system will be removed when it is encountered during the survey, to the extent practicable. The removal of accumulated material found in the floor drain and sump system will eliminate any potential future impacts to ground water or future maintenance workers. As a result, a detailed characterization of this material and an evaluation of its potential future impacts will not be needed. In addition, a more thorough examination of the system can be performed if the floor drains, sumps and connecting piping are cleaned as part of the survey. The components of this program include: an initial survey and system access; cleaning and survey; sampling and off-site disposal of accumulated material; and the preparation of a revised floor drain and sump system drawing.

1.2.4 *Summary of Previous Investigative Activities*

After manufacturing operations ceased in 1990, Insilco initiated a preliminary assessment at the Site to mitigate any potential property damage. Initially, this program focused on the permanent closure of USTs and vaulted abovegrade storage tanks remaining on the property. However, this scope of work was expanded after an inspection of the tanks revealed that additional tank closure activities were needed.

During subsequent field work, it was determined that several tanks might have leaked and impacted the adjacent soils and the water table in Areas A, C and D. Discussion regarding these closure activities is presented in Section 1.3. NYSDEC was notified of these findings and the assessment activities were expanded to include the performance of a Preliminary Site Investigation (PSI). PSI activities included limited soil and ground water sampling and NAPL delineation. A complete description of the PSI was contained in a report submitted to the NYSDEC in May 1992 and approved on June 29, 1993.

To obtain additional Site information, a RI was then implemented in accordance with the RI/FS Order on Consent. RI field activities, which were overseen by the NYSDEC and the New York State Department of Health (NYSDOH), were conducted between November 1992 and September 1993. Field activities completed during the RI included: air sampling, soil sampling, ground water monitoring well installation, installation of additional NAPL delineation wells, measurement of apparent NAPL thickness, evaluation of measures for removal of NAPL, ground water sampling, surface water and sediment sampling in the Bronx River and an evaluation of the hydraulic characteristics of the soils underlying the Site.

In addition to the three monitoring wells, which had been previously installed and sampled during the PSI, four additional monitoring wells were installed at the Site during the RI. Ground water samples and water level measurements were collected in the spring and fall of 1993 from all seven ground water monitoring wells to evaluate seasonal changes in ground water elevations and composition. All samples were analyzed for volatile organic compounds (VOCs) and for semi-volatile organic compounds (SVOCs). In addition, 26 product delineation wells were installed at the Site. These wells were located in Areas A, C, and D, and one well was located off-site. Additional discussion regarding the results of the ground water sampling program are presented in Section 1.2.4.1.

The soil sampling program, conducted at the Site during the RI, included the drilling of 20 soil borings and the collection of approximately 40 subsurface soil samples in Areas A, C and D. Two soil samples were collected at different depths from each boring and were analyzed for VOCs. In addition, four samples from Area C were also analyzed for SVOCs and inorganic constituents. Previous soil sampling results for Area B and visual inspection of the tanks found in this area indicated that the soils in Area B had not been impacted by releases from the tanks. Therefore, no additional soil borings were required in Area B. Additional discussion regarding the results of the soil sampling program are presented in Section 1.2.4.2.

During the RI, seeps of materials similar to those used at the Site were found on the southeast face of the embankment of the Bronx River. In response, a surface water and sediment sampling program was conducted to evaluate the potential impacts of these seeps on the Bronx River. This sampling program included the collection of five surface water and nine sediment samples from locations adjacent to the Site and downstream of the Site. All samples were analyzed for VOCs, and four surface water and four sediment samples were also analyzed for SVOCs and inorganics. Additional discussion regarding the results of the surface water and sediment sampling program are presented in Section 1.2.4.3.

An indoor air monitoring program was conducted during the RI to assess the potential for impacts from volatile chemicals in Site soil and ground water on ambient air quality within the facility. This program included collection of nine ambient air samples over a seven hour period. Eight samples were collected within the facility, and one sample was collected outside the facility to represent background air quality at the Site. All samples were analyzed for forty-two separate compounds which generally correspond to those found on the USEPA Target Compound List (TCL). The results of this survey indicated no risks to workers in the building. Additional discussion regarding the results of the air sampling program are presented in Section 1.2.4.2.

1.2.4.1 Groundwater Quality

Delineation of NAPL

During the RI, 25 NAPL delineation wells were installed in Areas A, C and D of the Site and two rounds of apparent NAPL thickness measurements were collected (Table 1-1). The results of these measurements, presented in Figures 1-8 and 1-9, demonstrate that although the shape of the NAPL plume has changed slightly, the overall distribution of NAPL at the Site in both rounds of measurements was similar. These slight changes in the apparent NAPL thickness were probably related to NAPL removal efforts, fluctuations in the elevation of the water table, seasonal changes and some preferential movement of NAPL which may be occurring along subsurface pathways.

The data from both rounds of measurements indicates that the thickest accumulations of NAPL are found in Area D at wells DW-10D and DW-13D. The apparent thickness of the NAPL layer ranged between three and four feet at these two wells. The apparent NAPL thickness then decreases in the central portion of Area D and increases again in the alley in Area D. The NAPL extends to the northwest from Area D in the direction of the Bronx River.

Seeps along the embankment of the Bronx River suggest that NAPL is present under the railroad embankment.

In Area C, the apparent NAPL thickness is highest on the southwestern side where as much as two feet of NAPL was found in DW-6C. Based upon the distribution of NAPL in the existing wells, it appears that NAPL in well DW-5C may have originated in Area D and that there is a partially separated plume of NAPL in Area C that originated on the southwestern side of the production area. This plume appears to extend into the northern edge of Area B. The fact that the plumes seem to have a westerly component may indicate that ground water, which is flowing in a westerly direction, has an impact on the distribution of the NAPL. As was noted in the previous paragraph, the NAPL plume in Area C also appears to extend in a northwestern direction, underneath the railroad embankment, toward the Bronx River.

In Area A, the only delineation well which contained any NAPL was DW-1A which exhibited an apparent NAPL thickness of 0.02 feet. Since the NAPL in this well occurs in such a thin layer, it is unlikely that it is very extensive. In addition, since no NAPL was found in the two adjacent delineation wells (DW-2A and DW-3A), the volume of NAPL in this area is quite small. The extent of NAPL in Area A is presented Figures 1-8 and 1-9.

The sources of the NAPL in Areas A and D were leaking USTs which have since been removed or permanently closed in place. In Area C, the source of NAPL is less well known, but is suspected to be infiltration from the sump, floor drains and possibly tank piping.

A total analysis of the composition of on-Site NAPL is presented in Table 1-2 and a toxicity characteristic leaching procedure (TCLP) analysis of the on-Site NAPL samples is presented in Table 1-3. The results of these analyses indicate that the on-Site NAPL is not hazardous with respect to corrosivity and reactivity. However, all of the on-Site NAPL samples were hazardous with respect to ignitability and four of the seven samples (i.e., DW-1C, DW-6C, DW-2D AND DW-10D) exceeded the TCLP level for benzene. In addition, the TCLP level for tetrachloroethene (PCE) was also exceeded in two of the seven samples (i.e., DW-2D and DW-10D). However, the validity of the PCE results is suspect because: (1) PCE was not detected in the total compound analysis (Table 1-2); the highest concentration of PCE in soil was 1.1 mg/kg; and (3) PCE was only detected in trace amounts in two ground water wells.

The analysis of the physical characteristics of the on-Site NAPL samples indicates that the pH of all the samples was nearly neutral but there was a significant variation in specific gravity. The specific gravity of the samples from Area C is notably lower than that from Area D. These results correspond with the observed viscosity differences - the less dense NAPL in Area C is also less viscous, while the denser NAPL in Area D is more viscous.

In a January 19, 1993 letter to NYSDEC, ERM provided a brief description of the seep areas based upon the information available at the time. In that letter, ERM identified three seeps: two that were between 15 and 25 feet in length and one that was five feet in length. Since that time, ERM has had an opportunity to investigate the seeps further and has found that it is difficult to distinguish completely separate seeps along the banks. The change in the configuration of the seeps may be related to the drop in river level; as the river level drops and the head differential decreases, more seeps may actively discharge to the river. As of November 1994, there appears to be a 250 foot stretch of bank along which small seeps occur fairly frequently. The actively seeping area is shown in Figures 1-8 and 1-9.

The seeps are located within the riprap, both above and below the river surface, on the southwestern side of the river bank. Material is discharged along the seeps into the river, solidifies on contact with the air, and forms discontinuous, irregularly shaped patches of hardened material on the surface of the water. Because of the relatively small volume of material that is being discharged, and the length of bank over which the discharge occurs, it has not been possible to estimate a seepage rate into the river.

A flame ionization detector/gas chromatograph (FID/GC) analysis of the three seep samples collected from the active seeps is presented in Table 1-4. This analysis indicated that the seep samples were similar in composition to mineral spirits. Since both the historical quarterly data and the soil data from the Site indicate that mineral spirits were present on Site, these results indicate that some of the seep material in the Bronx River is originating from the Site. In light of the concentrations of toluene in upgradient well MW-7A, it is possible that some of the seep material may also originate from a source upgradient of the Site. In addition, Table 1-4 also presents TCLP results for the seep material sampling conducted in June 1994 and September 1994. These sampling results indicate that while the June 1994 seep sample was not a hazardous waste as per the Resource Conservation and Recovery Act (RCRA) (i.e., RCRA hazardous), four out of the five samples collected in September 1994 were RCRA hazardous with respect to ignitability.

The discharged material is currently being contained by approximately 300 feet of heavy weight skirted boom installed by Enviroclean-Northeast (Enviroclean). Maintenance of the booms is performed at least once a week by Enviroclean. The maintenance includes collection of floating material contained within the boom, and replacement of any saturated boom. The material removed from the river, as well as the spent boom, is containerized for proper disposal.

Dissolved Constituents in Ground Water

The presence of NAPL on top of the water table constitutes an impact to the ground water at the Site pursuant to NYSDEC criteria. In addition, the NAPL, either as a discrete layer or in residual saturation in the soils, may act as a minor source of dissolved constituents to the ground water. A summary of ground water sampling data for Rounds 1 and 2 is presented in Table 1-5 and

Figure 1-10. Based upon the data collected during these rounds of sampling, some level of dissolved constituents have been found in the ground water. However, the concentrations of the dissolved constituents are relatively low and suggest that the NAPL is not highly soluble. Furthermore, evaluation of the dissolved constituents in the ground water is complicated by the suspected presence of an off-site upgradient source that may have a more significant impact on the ground water at the Site than the Site itself.

The impact of NAPL in Area A on the ground water can be seen by evaluating the concentration of compounds in wells MW-7A, MW-1A and MW-2A detected during the first round of sampling (Table 1-5 and Figure 1-10). During this round, MW-7A and MW-1A were essentially clean and MW-2A contained trichloroethene (TCE), 1,1,1-trichloroethane (TCA) and toluene in concentrations ranging from 74 to 260 ug/l. Based on the presence of these compounds in Area A and the tanks contents in this area, the tank release in this area appears to have had some impact on the ground water.

The potential impact of the NAPL in Area A measured during the first round of sampling appears small in comparison to the data from the second round of sampling. In the second round of sampling, 16,000 ug/l of toluene and 13 ug/l of benzene were found in an upgradient well, MW-7A. This data strongly suggests the existence of an off-Site upgradient source of dissolved constituents in the ground water. Furthermore, the concentration of toluene in MW-1A and MW-2A, which are downgradient of MW-7A, increased during the second round of sampling to 96,000 ug/l and 10,000 ug/l respectively. Again, the fact that 96,000 ug/l of toluene was found in the ground water strongly suggests that the ground water quality in the vicinity of the Site has been degraded by another source that has contributed almost 500 times as much toluene to the ground water as the NAPL at Site. The suspected upgradient source of toluene is not known at this time; however, there are several industrial facilities upgradient of the Site including an automotive repair shop and a metal stamping operation.

The impact of NAPL in Area C on the ground water and the solubility of NAPL found in this area can be evaluated by comparing the sampling data from the upgradient well, MW-8C, to MW-6C. With the exception of trace levels of bis(2-ethylhexyl)phthalate (BEHP) in the second round of sampling, no compounds were found at concentrations above the detection limits in MW-8C in either round of sampling. However, MW-6C, located on the downgradient side of Area C, exhibited toluene and xylene in concentrations ranging between 77 and 150 ug/l in the first round of sampling. In the second round of sampling, the concentration of most compounds were lower than those detected in the first round of sampling. The relatively low concentrations of the dissolved constituents in Area C ground water in both rounds of sampling suggest that the NAPL in Area C is not highly soluble and therefore has not substantially impacted Area C groundwater.

It is interesting to note that the toluene concentrations in Area C were not impacted by the suspected upgradient off-Site source of contamination. The ground water flow direction at the Site has a strong westerly flow component; hence, only wells located in Area A (i.e., MW-1A and MW-2A) appear to have been impacted by the suspected upgradient source.

The impact of NAPL in Area D on ground water was evaluated by comparing the ground water concentrations in MW-8C, MW-4D and MW-5D. As previously discussed, with the exception of BEHP, no VOCs were found at concentrations above the detection limits in either round of sampling at MW-8C. In MW-4D, which is located on the upgradient side of Area D, low concentrations of xylenes were detected. Concentrations of compounds in MW-4D decreased in the second round of sampling, and none of the compounds were found in concentrations exceeding 2 to 3 ug/l. The decrease in chemical concentrations in the second round of sampling is consistent with the trend noted above in MW-6C in Area C.

In MW-5D, located on the downgradient side of Area D, 180 ug/l of ethylbenzene, 1,200 ug/l of xylenes and 200 ug/l of 1,1-dichloroethane were detected in the first round of sampling and in the second round of sampling, the concentrations of most of the compounds decreased. This data suggests that the NAPL in Area D may be slightly more soluble than the NAPL in Area A and has contributed higher concentrations of dissolved constituents to the ground water in this area.

Although all three downgradient wells at the Site (i.e., MW-2A, MW-5D and MW-6C) show evidence of dissolved constituents from the NAPL, the data collected from the off-site upgradient well (i.e., MW-7A) strongly suggests that the ground water in the vicinity of the Site is being impacted by another source. Although the source has not been identified, it has a significant impact on ground water quality and may be contributing as much as 500 times more toluene to the ground water than the NAPL at the site. Additional rounds of samples will be collected during the SRI to verify the presence of the suspected upgradient source.

1.2.4.2 *Soil Quality*

Soil samples were collected from Areas A, B, C and D of the Site. In addition, background soil samples were also collected off-Site from borings installed for installation of MW-7A and MW-8C. A summary of these results is presented in Table 1-6.

Area A

A total of twelve soil borings, as shown in Figure 1-11, were drilled in Area A. A summary of the analytical results for soil samples collected from these borings is presented in Tables 1-7 and the distribution of VOCs in this area is presented in Figure 1-11.

The compounds found most frequently in this area included: acetone, methylene chloride, toluene, ethylbenzene and xylenes. Eleven USTs, which contained mineral spirits, methanol, ethanol and methylene chloride, were previously located in Area A.

The highest concentrations of VOCs were found in boring locations HP-6, A1, A2 and A7. These samples were located close to one another in the vicinity of former Tanks 1A, 2A and 3A. In addition, a thin layer of NAPL (i.e., 0.02 feet) was also measured in the NAPL delineation well (DW-1A) located adjacent to former Tank 1A. It therefore appears that leaks from Tanks 1A, 2A and 3A impacted soils in the immediate vicinity of these tanks and a small amount of NAPL from the tanks had accumulated on the water table. However, the area impacted by leakage from the tanks is relatively small and has been completely delineated since the VOC concentrations in the soils decrease significantly within twenty feet of Tanks 1A, 2A and 3A.

In addition to organics, soil samples from Area A were also analyzed for inorganic compounds during the PSI (Table 1-7). A comparison of this data and background data verified that none of the inorganic concentrations exceeded the Site background concentrations and that the soils in Area A have not been impacted by inorganics.

Area B

During tank closure activities, the nine tanks located aboveground in vaults were found to be in good condition. However, samples were collected from this area during the PSI to confirm that soil quality in this area had not been impacted. A summary of these analytical results are presented in Table 1-8. Based upon the PSI sampling data and visual inspection of the tanks, it was determined that soils and ground water in this area had not been impacted by the previously used tanks. Consequently, no further work was conducted in this area during the RI field activities. Soils in this area are considered to be free of contamination; hence Area B is not considered a source area.

Area C

A total of seven borings, as shown in Figure 1-12, were drilled in Area C. A summary of the analytical results for these soil samples is presented in Table 1-9 and the distribution of VOCs and SVOCs in this area are presented in Figures 1-12 and 1-13, respectively.

Based on the data collected in Area C, the aromatic hydrocarbons, toluene, xylenes and ethylbenzene, which were the most prevalent compounds detected in the soils in this area, ranged in concentration from 1.0 mg/kg to 120 mg/kg. Varnish, mineral spirits, polyurethane varnish, propyl glycol and methyl carbitol were previously stored in Area C. The presence of the afore-mentioned aromatic compounds in soils is therefore consistent with the composition of materials, such as mineral spirits, used in this area.

Review of the distribution of VOCs found in soils presented in Figure 1-12, indicates that the VOCs found in this area are not distributed uniformly. The highest concentrations of VOCs were found in soil samples collected at the surface of the water table either within or adjacent to the area where NAPL was found. Because the tanks located in this area were found to be in good condition, it has been hypothesized that a possible source of the NAPL and soil contamination in Area C is the floor drain system on the southwestern side of this area or various piping systems in this area. The location of this system appears to correspond with the area where the thickest accumulation of NAPL was found.

Although portions of Area C are covered by wooden flooring, the data from the borings located in these areas did not indicate that these areas had been significantly impacted by spills or releases to the floor. The only shallow soil sample to show detectable concentrations of compounds was located on the southern side of Area C adjacent to the vaulted tanks. However, the soils at this location are too far from the floor drain system to have been impacted by leaks from the sump and the impact is probably a result of leaks in the piping system.

In addition to VOC analysis, four soil samples were also collected and analyzed for SVOCs and inorganics. For the most part, the concentrations of SVOCs were low and the dominant SVOCs detected were phthalates and polynuclear aromatic hydrocarbons (PAHs). While PAHs may be found in paint, it is interesting to note that both soil boring locations C-4 and C-5 were located within the area of the facility covered by the wooden floor and that both of the shallow samples from these borings showed PAHs. Visual inspection of these borings indicated that coal slag and coal dust were in the fill material, and it appears that the source of the PAHs is the fill material. Given the date of this expansion, it would not be unusual for Site material to have been previously contaminated prior to introduction to the Site.

A review of the inorganic data from Area C indicates that there were few inorganics present at levels above background and that these levels generally only occurred in one sample. The following inorganics showed some elevation above background: chromium, cobalt, nickel and vanadium. However, since these levels were minimal and only occurred in one or two samples, they are not considered indicative of an impact by facility operations.

Area D

A total of 21 soil borings, as shown in Figure 1-14, were drilled in Area D. A summary of the analytical results for soil samples collected from these borings is presented in Table 1-10 and the distribution of VOCs in this area are presented in Figure 1-14.

Former Tanks 35 and 36, which had been used to store mineral spirits, and their associated piping were found to be in poor condition. Soils surrounding these tanks were found to be impacted and were subsequently removed to a depth of six feet. In addition, although Tank 34, which contained polyurethane varnish, was found to be in good condition, soil around this tank was also found to be impacted and was removed as part of the RI.

Review of the soil sampling data indicates that the distribution of compounds in this area is directly related to the location of the leaking USTs. Soils around the periphery of the Site tended to contain the lowest concentrations of compounds, while soils in the center of Area D contained higher concentrations of compounds. The shape of this central area of elevated concentrations roughly corresponds to the shape of the NAPL body in Area D, delineated by the one foot NAPL isopleth in this area (see Figure 1-14). Specifically, the boring that contained the highest concentrations of VOCs, B-9D, was located directly adjacent to former Tank 36 which contained mineral spirits and was found to be in poor condition.

According to the sampling data, the predominant compounds in Area D soils are xylenes, ethylbenzene and toluene. In addition, several chlorinated compounds were found on the northeastern side of Area D. The source of the chlorinated compounds may have been the waste oil tank (Tank C) previously located in Area D or the NAPL in this area. The total compound analysis conducted on the NAPL samples collected from Area D (Table 1-2) indicated that chlorinated compounds are present in NAPL found in this area.

During the PSI, seven samples were collected and analyzed for SVOCs and inorganics. Naphthalene was the predominant SVOC found in six of the soil samples and the source of this compound is probably the mineral spirits. When the concentrations of inorganics in Area D soil samples were compared to background, several of the inorganics (chromium, cobalt, lead, manganese, nickel and vanadium) were present in two samples in concentrations that were greater than three times background. Because these borings were drilled between two tanks that were found in a deteriorated condition, it is possible that the source of the metals is the tanks. Because metals were not a significant part of the operations at the former paint operations, it is unlikely that the presence of inorganics in these samples is a function of the facility operations.

1.2.4.3 *Surface Water and Sediment Quality*

According to NYSDEC Region 3 personnel, the portion of the Bronx River located adjacent to the Site is classified as a Class C stream. This classification indicates that the river is a fresh surface water which is suitable for fishing, fish propagation and survival, and primary and secondary contact recreation. Various regulatory and research organizations were contacted in an attempt to obtain water quality data for the river; however, each source stated that no information was available.

Surface water samples were collected from five locations in the Bronx River to assess the potential impacts of the seeps on the Bronx River. The location of these samples is presented in Figure 1-15 and the sampling results are presented in Table 1-11.

With the exception of a trace level of 2,6-dinitrotoluene in upstream sample SW-2, no VOCs or SVOCs were found in any of the surface water samples in the river; and the water sample collected within the boomed area only contained trace concentrations of VOCs. Therefore, even within the boomed area where the maximum impact of seep materials on the river would be anticipated, there was virtually no impact to the surface water body from organic compounds in the seep material.

A total of 13 inorganics were detected in both the upstream and the downstream surface water samples. In general, the concentrations of the inorganics in both the upstream and downstream samples were similar. This indicates that the inorganics are present naturally or as a result of upstream conditions. However, the concentrations of three inorganics, iron, lead and manganese, deviated sightly from this pattern. The concentrations of these three inorganics were similar in samples collected at the upstream sample locations SW-1 and SW-2 and at the sample location SW-3 adjacent to the seep. However, all three inorganics showed an increase in concentration in the sample collected at downstream sample location SW-4. Although this trend might suggest an impact by the Site, the concentrations of inorganics were generally within background levels and elevated levels of inorganics were detected at only one localized area at the Site. Therefore, it is unlikely that the Site is a source of inorganics.

There were several other potential source areas found between the downstream edge of the boom and sampling location SW-4. These locations included: an actively flowing discharge pipe and several inactive discharge pipes located on the northwestern bank of the Bronx River, and storm water runoff from the Mount Vernon Avenue bridge. The fact that a source other than the Site may have impacted the river can also be demonstrated by a review of the sediment sampling data, discussed below.

Sediment samples were collected from nine locations in the Bronx River. All the samples were analyzed for VOCs and four of the samples were analyzed for SVOCs and inorganics. The location of these samples is presented in Figure 1-15 and the sampling results are presented in Table 1-12. A number of sediment samples were also analyzed for total organic carbon (TOC). A summary of these results are presented in Table 1-13. Based on these TOC results, the mean TOC concentration in sediment is approximately 5,861 mg/kg.

The results of the VOCs analysis of the sediment samples indicated that trace concentrations of VOCs were present in the two sediment samples collected adjacent to the large seep and that no VOCs were detected at the other sampling locations. This data confirms the surface water data which indicated that VOCs in the seep materials were not impacting the Bronx River.

A number of SVOCs were detected in the three downstream sediment samples, primarily polynuclear aromatic hydrocarbons (PAHs) and bis(2-ethylhexyl)phthalate. The concentrations of the SVOCs show a small increase in concentrations at SED-6 which is downstream of the seep area and a larger increase in SED-8 which is downstream of the Mount Vernon Avenue bridge. The concentrations of the SVOCs decrease further downstream of the bridge at SED-9. Only two of the SVOCs detected in the sediments were found on the Site and therefore the Site is not the source of all of the organics detected in the sediment. These data indicate that the seeps are having a minor impact on the sediment in the vicinity of SED-6 and that a second source, such as runoff from the Mount Vernon Avenue bridge, is having a more significant impact on the sediment quality in the vicinity of SED-8. Based upon the decrease in concentrations at SED-9, most of the impact on the sediments from the bridge dissipates over a short distance.

Slightly different trends were noted in the concentrations of the inorganics in the sediment samples. Three general patterns were noted. For one group of metals, the highest concentrations were found in the upstream location; for another group of metals the highest concentrations were found in the downstream location; and in the third group of metals, there was no significant change in concentration with location in the river. The fact that the highest concentrations of some inorganics occurs in the upstream sampling location verifies that there are sources upstream of the facility that have impacted the Bronx River. The other notable trend in the inorganics concentrations is the threefold increase in the concentrations of a number of inorganics between SED-8 on the downstream side of the Mount Vernon Avenue bridge and the furthest downstream sample, SED-9.

There are several conclusions to be drawn from the sediment data. First, the Bronx River sediments have been impacted by sources upstream of the former Red Devil Facility. Second, based on the inorganic data from SED-6 and SED-8 and the organic data from SED-6, the Site is having only a minor impact on the Bronx River. Third, there are other sources impacting the Bronx River downstream of the Site. One potential source of inorganics downstream of the Site between SED-8 and SED-9 is probably storm water runoff from a pipe that discharges to the Bronx River. In addition, a potential source of PAHs in the vicinity of SED-8 is runoff from the Mount Vernon Avenue overpass.

1.2.4.4 Air Quality

Air monitoring was conducted at the Site under worst case conditions (i.e., during the winter when the facility windows and doors were closed and while test borings were being drilled) to determine whether Site soil or ground water was impacting ambient air quality within the facility. This effort confirmed that concentrations of organics in the air in the basement were all several orders of magnitude below the Occupational Safety and Health Agency (OSHA) Time Weighted Average (TWA) Permissible Exposure Levels (PELs) (Table 1-14). OSHA TWA PELs are used to evaluate health hazards to adult workers present at a Site 8 hours/day, 5 days/week. Therefore, the ambient air concentrations detected within the facility should not represent a health hazard to an adult worker present in the basement of the facility for a standard forty hour work week. Furthermore, the concentrations of these compounds would also be significantly lower on the first and second floors of the facility where people are routinely present.

To evaluate the source of the detected compounds, the concentrations of the compounds that were detected most frequently were plotted on facility maps (Figures 1-16 through 1-20). An evaluation of these maps indicates that the compounds detected were distributed in several different patterns within the facility and therefore may originate from several possible sources.

Since all of the compounds detected in the air have also been found in the subsurface soil and ground water, the source of some of these compounds may be volatilization through the vadose zone and the concrete foundation into the facility. However, because of the presence of interferants generated by the RI activities and the automobiles, the concentrations measured are indicative of worst case conditions and are not indicative of true ambient conditions.

The conclusion of the study was that even under worst case conditions, the concentrations of organics in the air were several orders of magnitude below the OSHA time weighted average PELs. Therefore, these concentrations should not present a health hazard to an adult worker present in the basement of the facility eight hours a day for a standard 40 hour work week.

A second round of air sampling was conducted in December 1994. These results will be used to confirm that the concentrations of constituents in the air related to the former operations at the facility after implementation of the IRM do not present a health hazard to an adult worker.

1.2.5 Baseline Risk Assessment

A comprehensive baseline public health and ecological risk assessment (RA) was conducted for the former Red Devil facility using the data collected during the RI. The purpose of the baseline RA was to establish the overall degree of hazard posed by existing conditions at the Site. The risk assessment was performed in accordance with the USEPA's risk assessment guidance documents (USEPA, 1989 etal.), the Human Health Evaluation Manual and the Environmental Evaluation Manual (USEPA, 1991a), as well as NYSDEC's Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (NYSDEC, 1991a). This RA was presented in the RI report (ERM, 1994b).

In summary, the RA concluded the following:

- no significant exposures to Site soil or ground water are expected to occur under either current or projected future conditions;
- no significant impacts to ecological resources at the Site itself are expected to occur as a result of chemicals in Site soil and ground water;
- no adverse impacts to NYSDEC significant habitats, endangered or threatened species, species of special concern, regulated wetlands, or wild and scenic rivers are expected to result from chemicals from the Site;
- no adverse impacts are expected to result from direct contact with the Bronx River or ingestion of fish from the Bronx River;
- the concentration of chemicals in air should not represent a health hazard to an adult worker present in the basement of the facility 8 hours/day, 40 hours/week;
- due to its viscous nature, the seep material discharging into the Bronx River could represent a physical threat to aquatic life associated with the Bronx River;
- the Site has had only a minor impact on surface water and sediment quality of the Bronx River; and
- other potential sources, including an actively flowing discharge pipe and runoff from the Mount Vernon Avenue bridge, are impacting the surface water and sediment quality in the Bronx River.

Additional discussion regarding these conclusions is presented below.

The risk assessment consisted of six steps: (1) identification of potential exposure pathways; (2) identification of chemicals of concern; (3) estimation of exposure point concentrations and calculation of intakes; (4) toxicity assessment; (5) risk characterization; and (6) ecological risk assessment (fish and wildlife impact analysis).

Three potential human exposure pathways were identified for chemicals present in Site soil and ground water:

- inhalation of volatilized organics from Site soil and ground water by Site workers;
- direct contact with Bronx River surface water through recreational activities by nearby residents; and
- ingestion of fish from the Bronx River by nearby residents.

No significant exposures to Site soil or ground water are expected to occur under either current or projected future conditions. The Site, as well as the surrounding area, is fully developed and is covered almost entirely by building or pavement. There are no known public or private water supply wells in the City of Mount Vernon. The city purchases all of its water from the City of New York and the City of New York receives its water from upstate surface water reservoirs (City of Mount Vernon, 1993; NYSDOH, 1993). In addition, the City of Mount Vernon Water District does not allow the installation of private domestic wells within the Water District's boundaries in order to ensure the safety of the water supply (Westchester County Health Department, 1993). The only two identified industrial wells are no longer believed to be in use and are upgradient of the Site (City of Mount Vernon, 1993). In addition, both physical and institutional access restrictions and the presence of elevated concentrations of toluene from a suspected off-site upgradient source would prevent the installation of a domestic well downgradient of the Site.

Compounds of potential concern in ambient air at the Site and in the Bronx River surface water (the two media to which human exposure can occur) were identified using site-specific background concentrations. Seven chemicals of concern were identified in air, including acetone, benzene, ethylbenzene, methylene chloride, toluene, 1,1,1-trichloroethane, and xylenes. Compounds of concern in the Bronx River include manganese, toluene, and xylenes.

For each potential exposure pathway, average daily intakes of each of the compounds of concern were calculated. In the risk characterization step, a comparison was made between these projected intakes and reference levels (acceptable intakes) for noncarcinogens and between calculated risks and acceptable risks for potential carcinogens.

The two potential exposure pathways for the Bronx River are direct contact and ingestion of fish. Using conservative exposure assumptions, no adverse impacts are projected for these two pathways as a result of compounds from the Site. No carcinogenic compounds were identified to be of concern for these pathways and the calculated noncarcinogenic hazard quotients and hazard indices are all less than 1.0.

The carcinogenic pathway risk for inhalation of volatilized organics by Site workers is 3×10^{-5}, which exceeds the 10^{-6} point of departure level for evaluating risk but is within USEPA's target risk range of 10^{-4} to 10^{-6}. The only compound which individually exceeds the 10^{-6} risk level is benzene, with a risk level of 3×10^{-5}. The noncarcinogenic hazard quotients and hazard index were all less than 1.0. In OSWER Directive 9355.0-30, USEPA states that remedial action is generally not warranted at a Site if the cumulative carcinogenic risk is less than 10^{-4} and the hazard quotient is less than 1.0.

Three additional factors should be considered in evaluating exposures to Site workers via inhalation of benzene. First, a number of conservative assumptions were used in evaluating this pathway, which would tend to result in an overestimation of risk. These included the following:

- air samples upon which this evaluation was based were collected on a "worst-case" basis (i.e., samples were collected from the basement during the winter when the facility windows and doors were closed and while test borings were being drilled);

- it was assumed that a worker was present in the basement 8 hours/day, 5 days/week when in fact usage of the basement is extremely limited; and
- concentrations of the compounds in ambient air on the first and second floor where people are routinely present are expected to be significantly lower.

Second, although the exposure point concentration of benzene results in a carcinogenic risk of 3×10^{-5}, it should be noted that this concentration is well below the relevant OSHA Permissible Exposure Limit (PEL). Third, Site soil and ground water are not the only potential sources of benzene in the building and there are a number of "interferants" at the Site, such as gasoline in parked cars, which could also contribute to concentrations of benzene to ambient air. A second round of air sampling is scheduled to take place following implementation of the IRM. These results will be used to confirm that benzene concentrations in the air do not pose an unacceptable risk.

The results of the fish and wildlife impact analysis indicate that no significant impacts to ecological resources at the Site itself are expected to occur as a result of compounds present at the Site. In addition, no adverse impacts to NYSDEC significant habitats, endangered or threatened species, species of special concern, regulated wetlands, or wild and scenic rivers are expected to result from compounds from the Site.

Ground water from the Site discharges to the Bronx River which is located from 125 to 185 feet northwest of the Site. Materials of the type previously used at the facility have been found seeping from the east bank of the Bronx River. Evaluation of surface water data from the Bronx River in the Site vicinity indicates that concentrations are generally below NYSDEC Surface Water Quality Standards and Guidance Values. However, due to its viscous nature, the seep material could represent a physical threat to aquatic life associated with the Bronx River.

Evaluation of sediment data from the Bronx River in the Site vicinity indicates that concentrations are generally below NYSDEC Sediment Criteria, where available. Sediment criteria have not been established for many of the SVOCs and inorganics detected in Bronx River sediment. However, the distribution of compounds in the sediments suggests that other potential sources observed during the investigation, including an actively flowing discharge pipe and runoff from the Mount Vernon Avenue bridge, are impacting the sediment. Furthermore, an evaluation of the composition of the NAPL and the ground water shows that only two of the SVOCs detected in the Bronx River sediment were detected in the NAPL or the ground water at the Site. This data indicates that the Site is not the source of all of the organic compounds and supports the conclusion that other sources are impacting the Bronx River.

1.3 SUMMARY OF PREVIOUS REMOVAL ACTIONS

After cessation of manufacturing operations was completed, a site assessment was conducted. This program included the permanent closure of USTs and vaulted aboveground storage tanks remaining at the Site. In May 1991, tank removal and closure activities were conducted. A summary of these activities was presented in the "Preliminary Site Investigation Report", ERM, May 1992 (ERM, 1992a).

Prior to conducting tank removal and closure activities, the location of vaulted aboveground storage tanks and USTs were confirmed using an existing facility map. The location of the tanks found during this effort are presented in Figure 1-2. This figure presents the tanks found at the Site immediately prior to the May 1991 closure activities. In addition, five tanks which were reported as previously removed from Area A have also been included in this figure. During tank closure activities it was confirmed that these five tanks had been previously removed.

With the exception of the vaulted aboveground fuel oil storage tank (Tank No. 9) located in Area B and the two stormwater USTs (Tank Nos. A and B) located in Area D, all aboveground and underground storage tanks were addressed during the May 1991 tank closure activities. Although Tank No. 9 was not removed during the May 1991 closure activities, this tank has subsequently been removed by the Site operator, Metro-Self Storage, Inc..

During the May 1991 tank closure activities, aboveground and underground storage tanks were emptied and cleaned; aboveground tanks were removed; USTs not located below load bearing walls were removed; and USTs located below load bearing walls were abandoned in-place by filling with an USEPA approved, inert, amino-based foam. A summary of the previous tanks, as well as the tank removal and closure activities is presented in Table 1-15. The contents of these former tanks and the condition in which they were found is also presented in this table.

1.4 SUMMARY OF IRM ACTIVITIES

Insilco has been conducting two NYSDEC approved Interim Remedial Measures (IRMs) at the Site since early 1993. The first IRM, which addresses off-Site NAPL, entails passive product recovery via containment and collection of seep materials in the Bronx River.

Seep materials discharging from the railroad embankment to the Bronx River are collected within a boom system. This system includes a 300 foot length of heavy weight skirted outer boom and an inner disposable adsorbent boom. The inner boom and collected material is removed on a weekly or semi-weekly basis for off-site disposal. The seep material and the spent boom are collected in heavy duty plastic bags and moved to the Site where they are stored in drums for disposal. It is estimated that approximately 0.25 cubic yards of solidified seep material is recovered from the boom each week. This IRM has been in operation since January 1993 when the seep materials were first observed in the Bronx River. As previously discussed, sampling results for disposal of the seep material are presented in Table 1-4. Materials exhibiting a flash point less than 140°F were classified and disposed as an ignitable (i.e., D001) hazardous waste and materials exhibiting a flash point greater than 140°F were classified as non-hazardous waste.

The second IRM, which addresses on-Site NAPL in Areas C and D, entails active product collection via a product recovery system. Following delineation of the extent of on-Site NAPL, information was gathered to evaluate and identify an IRM for on-Site NAPL. Product baildown tests and product pumping pilot tests were subsequently conducted in Areas C and D of the Site. During the pilot test in Area C, approximately 415 gallons of NAPL were collected from DW-6C from 19 January to 1 February 1993 and approximately 1,285 gallons of NAPL were collected from DW-1C from 4 February to 30 April 1993. Pilot testing conducted in Area D from February through April 1993 yielded 155 gallons of product.

The design documents for the on-Site active product recovery IRM were approved by NYSDEC in March 1994 and construction of the system was completed in July 1994. This system was installed pursuant to the "Interim Remedial Measures Work Plan, Former Red Devil Facility, Mount Vernon, New York", 24 September 1993 (ERM, 1993b) which was approved by the NYSDEC.

In July 1994, operation of an on-Site product recovery system for Areas C and D of the Site commenced. This system is comprised of eleven product recovery wells (three in Area C and eight in Area D), four product-only Spillbuster^{R} pumps, one 300 gallon aboveground product storage tank for Area D product, one 500 gallon aboveground product storage tank for Area C product, piping, tubing and controls. Pumps are rotated between the recovery wells located in each area to promote recharging of materials in wells not being pumped. The NAPL, collected into the two on-site storage tanks, is pumped out on a regularly scheduled basis for off-site disposal.

Between July 1994 and 31 December 1994, 1,565 gallons of NAPL have been collected from Area C and 110 gallons of NAPL have been collected from Area D. In total, 2,265 gallons of NAPL have been collected from Area C and 265 gallons of NAPL have been collected from Area D. A summary of the volume of on-Site NAPL recovered is presented in Table 1-16.

Numerous operational difficulties have been encountered in Area D due to the viscous and variable nature of NAPL found in this area. As a result, the majority of the NAPL collected in this area was manually removed from the recovery wells by hand bailing. Automated on-Site product recovery in Area D was discontinued in November 1994. Automated product recovery continues in Area C.

The sampling results for disposal of the recovered on-Site NAPL are presented in Table 1-17. Because the flash point of this liquid, nonaqueous material was less than 140°F, the recovered NAPL was classified and disposed as an ignitable (i.e., D001) hazardous waste. In addition, the sampling results for the disposal of the seep material are presented in Table 1-4.

Following discontinuation of automated recovery, bench scale testing was conducted with Area D NAPL and two types of manual product recovery devices were tested in Area D. Bench scale testing entailed a preliminary evaluation of: (1) solvent addition to decrease product viscosity; and (2) belt skimming devices. Manual product recovery devices tested in Area D included: (1) canisters; and (2) sorbent socks. Additional discussion regarding the bench scale tests, manual recovery devices and other components of the IRM is presented in Section 2.4.1.

2.0 *REMEDIAL ACTION OBJECTIVES*

This section presents an evaluation of the remedial action objectives for the Site. NYSDEC RI/FS guidance (Technical and Administrative Guidance Memorandum (TAGM) #HWR-90-4030) provides for the development of remedial action objectives in order to determine the extent of remediation which may be necessary at a site. Remedial action objectives consist of medium-specific or operable-unit specific goals to protect human health and the environment.

According to NYSDEC RI/FS guidance, the media to be treated are identified based on the nature and extent of contamination, and on applicable or relevant and appropriate New York State Standards, Criteria and Guidance (SCGs). As identified in Section 375-1.10(c)(1)(ii) of the NYSDEC Inactive Hazardous Waste Disposal Site Remedial Program regulations, SCGs are provided in a listing prepared by the NYSDEC and presented in Appendix A of this document.

The remedial action objectives specify the chemical(s) of potential concern, potential exposure route(s) and receptors(s), and an acceptable concentration or range of concentrations for each potential exposure route. A remedial action objective which reflects a promulgated or legally enforceable chemical concentration may be defined as a chemical-specific SCG. Additional SCGs may be based on the site location or pertain to a technology considered for remediation. These SCGs are referred to as location specific and action specific, respectively. The purpose of SCGs is to provide protection to human health and the environment and comply with related federal and state laws or guidelines.

In the case of protection of human health, remedial action objectives usually reflect the concentration and potential exposure route since protectiveness may be achieved by reducing potential exposure (e.g., well restrictions, limiting access) as well as by reducing concentrations. Remedial action objectives which are established for protection of environmental receptors are usually intended to preserve or restore a resource. As such, environmental remedial action objectives are set for a medium of interest and a target concentration level.

As to the federal requirements, the National Contingency Plan (NCP) sets forth applicable or relevant and appropriate requirements (ARARs), (the federal equivalent of SCGs) and defines To Be Considered (TBC) information as other advisories, criteria or guidance, as well as proposed standards issued by federal or state agencies, that while not meeting the definition of an ARAR should also be considered in remedial decisions (NCP at 40 CFR 300.400(g)(3)). The preamble to the NCP states that TBCs are to be used on an "as appropriate" basis. Because federal TBCs are not promulgated or enforceable, they do not have the same weight as ARARs (or SCGs in the case of New York State (NYS)), and thus, consideration of TBCs is not required. In accordance with NYSDEC procedures, TBCs have been identified as regulations and guidance documents not identified in the NYSDEC listing of SCGs (Appendix A).

Following development of the remedial action objectives, the NYSDEC RI/FS guidance suggests that general response actions be developed. General response actions describe those actions that: (1) satisfy the remedial action objectives; and (2) are to be considered in the development of remedial action alternatives. General response actions are descriptive terms which are intended to satisfy the remedial action objectives and potential SCGs. Typically, general response actions are medium-specific and may include containment, excavation, treatment, disposal, institutional actions, etc. or a combination thereof, to achieve the remedial action objective.

The NYSDEC RI/FS guidance also suggests that volumes of media to which general response action might be applied be identified. These volumes should take into account requirements for protectiveness as identified in the remedial action objectives and the chemical and geological characterization of the site.

The NYSDEC has stated that their major concern with regard to this Site is the presence of NAPL on the groundwater table (NYSDEC, 1994a). To that end, NYSDEC has stated that their remediation goals for the Site are to remove NAPL from the groundwater and to prevent the migration of NAPL to the Bronx River (NYSDEC, 1994a). Furthermore, the NYSDEC has also stated that once the NAPL has been addressed, dissolved constituents in ground water at the Site (NYSDEC, 1994a) and soil quality in Areas C and D (ERM, 1994a; NYSDEC, 1994b) would then be evaluated.

As discussed in Section 1.2.4.2, in addition to NAPL identified at the Site ("on-Site NAPL"), it appears that the NAPL plume from Areas C and D extends underneath the railroad embankment to the Bronx River. However, as part of the RI, NAPL located between the Site and the Bronx River (hereafter referred to as "off-Site embankment NAPL") was not characterized and the presence of NAPL or impacted ground water, if any, was not delineated during the RI. Instead, delineation and characterization of off-Site NAPL during the RI was limited to evaluation of NAPL seeps into the Bronx River (hereafter referred to as "off-Site surface water NAPL"). While the NYSDEC has indicated that a remedial goal for the Site is to prevent NAPL migration to the Bronx River (NYSDEC, 1994a), due to problems with recovery of Area D NAPL, it is evident that additional information regarding off-Site embankment NAPL must be obtained before potential remedial actions for off-Site embankment NAPL can be evaluated. To obtain this information, a Supplemental RI (SRI), which will include characterization of off-Site embankment NAPL, will be conducted for the Site.

As previously discussed in Section 1.0, because remedial actions for the off-Site NAPL cannot be evaluated until the SRI has been completed and Site soil and ground water cannot be evaluated until on-Site NAPL has been addressed, it has been determined that for expedited response to known issues at the Site, the FS for this Site will be divided into three operable units (OUs). The OU-I FS will address on-Site NAPL, off-Site surface water NAPL and Area A soil; the OU-II FS will address off-Site embankment NAPL; and the OU-III FS will address Site soil and groundwater after the on-Site NAPL has been addressed. Additional discussion regarding the scope of these operable units is presented in the Section 2.3.

Although the NYSDEC has defined the term ground water to include both NAPL and dissolved constituents in ground water, NAPL and the dissolved constituents will be discussed separately in this document since the primary objective of this operable unit is to address the on-Site NAPL and off-Site surface water NAPL. Because NAPL will be discussed separately, the term "ground water" will hereafter refer to all the components of ground water, including dissolved constituents, but not the NAPL layer present above ground water at the Site.

On-Site NAPL, off-Site surface water NAPL and Area A soil have been evaluated in this section as potential media of interest. In addition to these three media, a discussion is also provided in this section regarding surface water, sediment and air as potential media of interest for this operable unit. Although the RI, which has been approved by the NYSDEC, has determined that surface water, sediment and air do not present unacceptable risks, these media have been included in this section since additional air quality data has been collected and minor modifications have been made to the NYS Surface Water Quality Standards and the NYS sediment criteria contained in the *Technical Guidance for Screening Contaminated Sediments*, NYSDEC, November 1993. As discussed later in Sections 2.2.6 and 2.2.7, this additional information has provided additional support to the conclusion that surface water, sediment and air are not media of interest for the Site. In addition, discussion is also provided in this section regarding off-Site embankment

NAPL, soil in Areas C and D of the Site, and Site ground water as potential media of interest for future operable units.

2.1 IDENTIFICATION OF SCGS

Table 2-1 presents potential SCGs which may govern remediation at the Site. This table lists the regulatory citation; a description of the SCG; whether the SCG is chemical, action or location specific; and the reason the SCG maybe relevant, applicable or appropriate. The relevance of the regulation to the Site and to remedial actions included in the development of alternatives is discussed with the evaluation of each alternative in Section 4.0 (i.e., in the evaluation of the alternatives ability to comply with the SCGs).

2.2 MEDIA OF INTEREST

As a first step in development of the remedial action objectives, the investigative information collected will be evaluated to determine the media of interest for the Site. As previously discussed, the following potential media of interest will be evaluated: on-Site NAPL, off-Site surface water NAPL and Area A soil. In addition, surface water and sediment in the Bronx River, which may have been affected by constituents from the Site, are evaluated as potential media of interest for this operable unit. Furthermore, potential media of interest for future operable units (e.g., off-Site embankment NAPL, Site ground water and soil in Areas C and D) are also briefly discussed in this section.

NAPL has been separated according to location because: (1) the physical characteristics of the NAPL (e.g., viscosity) are highly dependant upon the location of the NAPL; and (2) the applicable remedial technologies for the NAPL are highly dependant upon the physical characteristics of the location of the NAPL (e.g., geology, etc.). Characterization of the off-Site embankment NAPL, to the extent practicable, will be conducted during implementation of the SRI.

2.2.1 *On-Site NAPL*

The extent of on-Site NAPL has been presented in Figures 1-8 and 1-9 of this document. Because the RA, which has been approved by the NYSDEC, has indicated that seeps of NAPL may pose a physical threat to fish in the Bronx River (ERM, 1992a), and the NYSDEC has indicated that the Department considers the presence of NAPL to constitute a threat to ground water (NYSDEC, 1994a), on-Site NAPL will be retained as a media of interest. In addition, Section 595.2(e) of the NYSDEC Chemical Bulk Storage Regulations requires corrective actions to be implemented after investigation of a suspected tank release. However, because none of the above considerations are provided in the NYSDEC List of SCGs (Appendix A), they are considered to be TBC information; hence, consideration of these issues in this FS is not mandatory.

2.2.2 *Off-Site Surface Water NAPL*

As previously discussed, off-Site product delineation work conducted during the RI was limited to a search of the banks of the Bronx River for product seeps (i.e., off-Site surface water NAPL). During the seep search, conducted on 5 January 1993, product seeps were identified on the southeast face of the embankment of the Bronx River. Because the seep material is similar to the on-Site NAPL, it is suspected that the NAPL layer extends from the Site, underneath the railroad embankment, to the Bronx River. As previously discussed, the seep material which enters the surface water of the Bronx River in this area is referred to as off-Site surface water NAPL.

Because the RA, which has been approved by the NYSDEC, has indicated that seeps of NAPL may pose a physical threat to fish in the Bronx River (ERM, 1992a), off-Site surface water NAPL will be retained as a media of interest. In addition, Section 703.2 of the NYSDEC Water Quality Regulations for Surface Waters, prohibits the discharge of floatable materials to surface water bodies.

2.2.3 *Off-Site Embankment NAPL*

While the NYSDEC has indicated that a remedial goal for the Site is to prevent NAPL migration to the Bronx River (NYSDEC, 1994a), additional information regarding off-Site embankment NAPL must be obtained before potential remedial actions for this media can be evaluated. Therefore, off-Site embankment NAPL will be retained as a media of interest for the OU-II FS.

2.2.4 *Ground Water*

Based upon the data collected during the two rounds of ground water sampling, the compounds found in ground water are similar to those found in soil at the Site, and include primarily toluene, ethylbenzene and xylenes with some occurrences of 1,1,1-trichloroethane (TCA), trichloroethene (TCE) and 1,1-dichloroethane. Ground water data for the Site indicates that NAPL and a potential upgradient source have contributed to constituents to the ground water.

Although the presence of TCA and TCE in MW-2 suggests that the tank release in Area A has had some impact on the ground water, the degree of impact that the NAPL in Area A has had on ground water is difficult to determine due to the suspected presence of an upgradient source. Furthermore, the concentration of dissolved constituents in ground water in Areas C and D (i.e., areas not located downgradient of the suspected upgradient source) are relatively low; suggesting that the NAPL is not highly soluble. Therefore, it is reasonable to assume that the contribution from NAPL to dissolved constituents in ground water is not a significant concern.

According to the RA, which has been approved by the NYSDEC, no significant exposures to Site ground water are expected to occur under either current or projected future conditions (ERM, 1992a). Although no exposure route and hence no risk was identified for this media, the NYSDEC has indicated that ground water cannot be evaluated until on-Site NAPL has been addressed (NYSDEC, 1994a). In addition, the NYSDEC has indicated that they would like additional data in order to evaluate the suspected presence of an upgradient source of dissolved constituents (NYSDEC, 1994a). Based on NYSDEC's position, ground water cannot, at this time, be eliminated as a media of interest; ground water has therefore been retained as a potential media of interest for the OU-III FS.

2.2.5 *Soil*

Based upon the data collected during the RI, it appears that NAPL has impacted soils in Area A, C and D. In Area A, a localized area of elevated volatile organic compounds (VOCs) was identified in the vicinity of a former underground tank, near soil boring HP-6. In Area C, aromatic compounds were identified near the water table both within and near the area where NAPL was identified. In Area D, aromatic compounds were detected in soils in the vicinity of the former underground storage tanks that had previously leaked and the highest concentration of constituents was found in soil in the center of this area. Because Area B soil did not exhibit elevated chemical concentrations, soil in this area of the Site is not considered to be a media of interest.

The RA, which has been approved by the NYSDEC, has indicated that no significant direct contact exposures to Site soil are expected to occur under either current or projected future conditions since the Site, as well as the surrounding area, is fully developed and is covered almost entirely by buildings or pavement (ERM, 1992a). Although no direct contact exposure routes were identified for this media, based on the chemical concentrations detected in Site soil, the NYSDEC considers soil in Areas A, C and D soil to be potential media of interest (NYSDEC, 1994a). However, as discussed in Section 2.0, the NYSDEC has agreed that ground water quality (NYSDEC, 1994a) and soil quality in Areas C and D (ERM, 1994a; NYSDEC, 1994b) can not be evaluated until the NAPL in these areas has been addressed. Soil in Areas C and D of the Site will therefore be retained as potential media of interest for the OU-III FS. However, as per NYSDEC's request, because product recovery is not being conducted in Area A, soil in this area will be addressed in this operable unit (NYSDEC, 1994b). Consequently, soil in Area A has been identified as a potential media of interest for this FS as a TBC action.

2.2.6 *Surface Water and Sediment*

During the RI, surface water and sediment samples were collected upstream of the Site, adjacent to the Site and downstream of the Site. According to the RA, which has been approved by the NYSDEC, surface water quality data for the Bronx River indicates that the Site has had virtually no impact on surface water quality (ERM, 1992a).

Furthermore, a sheen emanating from an upstream location has been observed on the Bronx River on several occasions. On 13 December 1994, Enviroclean personnel noted a cloudy film on the Bronx River during routine boom maintenance activities. A survey of the area by Enviroclean personnel revealed that the sheen was originating from a location upstream of the Oak Street bridge. The film itself was substantial and in areas where the water was calm, the cloudy film extended from one bank of the river to the other. Where there were rocks in the river or where the flow was more turbulent, the film dissipated into a rainbow colored sheen that was similar in appearance to a petroleum sheen. The film was also observed on the river during subsequent activities at the Site on 19 December 1994 and 22 December 1994.

In addition, on 29 December 1994, representatives of NYSDEC, ERM and Enviroclean conducted a joint inspection of the river. The sheen was again observed on the river from the Oak Street bridge, although it has reportedly dissipated over time. The source of the sheen appeared to be a culvert that discharged to the Bronx River approximately three-fourths of a mile upstream of the site. At the point where the water from the culvert discharged to the

Bronx River, a cloudy suspension could be observed in the river and a sheen was seen on the river. Both the cloudy suspension and the sheen were also observed within the boomed area adjacent to the Site. NYSDEC reportedly relayed this information to the Spill Unit for further investigation.

According to NYSDEC Region 3 personnel, the portion of the Bronx River adjacent to the Site is classified as a Class C stream. According to the New York Water Classifications and Quality Standards regulation, this classification indicates that the river is a fresh surface water which is suitable for fishing, fish propagation and survival, and primary and secondary contact recreation. To evaluate potential surface water impacts, surface water sampling results were compared to: (1) the NYS Surface Water Quality Standards (SWQS) (NYSDEC, 1994c; NYSDEC, 1993d) for the protection of aquatic life in Class C waters; (2) upstream sampling results; and (3) downstream sampling results. This comparison is presented in Table 2-2.

Review of this table indicates that aluminum and iron concentrations in both upstream and downstream samples exceeded the NYS SWQSs. The remaining constituents were all detected at concentrations below their applicable standards. Aluminum concentrations in both the upstream and downstream samples are fairly consistent, thus suggesting that the downstream concentrations are due solely to upstream sources.

Iron results for samples collected upstream and adjacent to the Site are consistent and these samples contain concentrations slightly above or slightly below the SWQS. However, a noticeable increase in the iron concentration occurs at the sampling location downstream of the Mount Vernon Avenue bridge. These data suggest that exceedances of the iron SWQS adjacent to the Site are due primarily due to upstream sources; while the exceedance at the downstream sampling location SW-4 is also due to several potential sources located downstream of the Site (e.g., an actively flowing discharge pipe, several inactive discharge pipes located on the northwestern bank of the Bronx River, and runoff from the Mount Vernon Avenue bridge). In addition to iron, these sources are also suspected to contribute to the relatively higher concentration of other inorganic constituents (e.g., lead, manganese) at this sampling location (i.e., SW-4).

To evaluate potential impacts to sediment from the Site, sediment sampling results were compared to: (1) the NYSDEC sediment criteria (NYSDEC, 1993e); (2) upstream sampling results; and (3) downstream sampling results. This comparison is presented in Table 2-3. The NYSDEC sediment criteria listed in this table are used as guidance by the NYSDEC and are not enforceable standards.

Review of this table indicates that the sediment criteria for one VOC and several metals were exceeded at locations upstream of the Site, adjacent to the Site and downstream of the Site. The sediment criteria for tetrachloroethene (PCE) was slightly exceeded in one sample collected adjacent to the Site; however, this concentration was below the contract required quantification limit (CRQL) for this compound and was therefore an estimated value. With the exception of antimony, upstream concentrations of all inorganics were up to one level of magnitude higher than the concentrations in the sediment samples collected adjacent to or downstream of the Site. This distribution indicates that any exceedances of the criteria for these inorganics adjacent to or downstream of the Site are due to the upstream sources. Furthermore antimony was non-detect in all sediment samples except those collected downstream of the Mount Vernon Avenue bridge. As previously stated, this bridge is a suspected downstream source of inorganic constituents to sediment in the Bronx River.

In conclusion, comparison of the surface water and sediment data for the Bronx River to NYSDEC SWQSs and sediment criteria, indicates minor exceedances of the standards and criteria. Review of the data and the Site conditions indicates that these exceedances are primarily due to sources located upgradient and downgradient of the Site and that the Site has had virtually no impact on the quality of surface water and sediment in the Bronx River.

2.2.7 *Air*

Air samples were collected in Area A and in the basement of the facility in Areas B, C and D under worst case conditions (i.e., during the winter when the facility windows and doors were closed and while test borings were being drilled). Comparison of the air sampling results to the OSHA Time-Weighted Average Permissible Exposure Limits (TWA PELs) (OSHA, 1989) demonstrated that the concentration of organics in air were several orders of magnitude below the PELs. PELs are acceptable worker exposure levels that are based on an 8 hour/day, 40 hour/week exposure scenario. Therefore the concentration of constituents in air should not represent a health hazard to an adult worker present in the basement of the facility 8 hours/day, 40 hours/week. Furthermore, it is also expected that the concentration of these compounds would be significantly lower on the first and second floors of the Areas B, C and D (Area A is at grade).

In accordance with the RI, air sampling was also conducted on 2 December 1994 to identify any potential impacts caused by operation of the on-Site product recovery interim remedial measure (IRM). Results from this sampling effort were documented in the "Ambient Air Sampling Report", 31 March 1995, prepared for Insilco by ERM. This report was subsequently approved by the NYSDEC on 4 May 1995.

Once again, the air sampling results were compared to the OSHA TWA PELs. This comparison demonstrated that: (1) operation of the IRM system has had a negligible impact on indoor air quality at the Site; and (2) the concentration of chemicals detected in indoor air do not pose any unacceptable risks to adult workers present at the Site eight hours per workday.

Because both rounds of air monitoring have demonstrated that indoor air at the Site does not pose unacceptable risks, air has not been identified as a media of interest for the Site.

2.2.8 *Summary*

On-Site NAPL, off-Site surface water NAPL and Area A soil have been identified as media of interest for the Site. Although the RI indicated that NAPL has only contributed low levels of constituents of regulatory concern to ground water, and the RA indicated that significant exposure to Site ground water is not expected due to the absence of ground water receptors, on-Site NAPL has been identified as a media of interest for the Site to address NYSDEC's concern that the presence of NAPL constitutes a threat to ground water (NYSDEC, 1994a). In addition, off-Site surface water NAPL has also been selected as a media of interest since the RA concluded that a risk may be posed to fish in the Bronx River by the physical threat of solidified material resulting from NAPL seeps (ERM, 1992a).

Although the RA has indicated that significant exposure to Site soil is not expected (ERM, 1992a): (1) Area A soil has been identified as a potential media of interest for this operable unit FS; and (2) soil in Areas C and D will be retained as a potential future media of interest to address NYSDEC's concerns (NYSDEC, 1994a). Remedial objectives for soil in Areas C and D of the Site will be developed in the OU-III FS after on-Site product recovery has been completed.

Furthermore, although: (1) the RI has indicated that NAPL has only contributed low levels of chemicals to ground water and that an upgradient source is suspected to be contributing a significantly higher level of chemicals to Site ground water than the NAPL; and (2) the RA has indicated that significant exposure to Site ground water is not expected (ERM, 1992a), ground water will be retained as a potential future media of interest to address NYSDEC's concerns (NYSDEC, 1994a). Remedial objectives for ground water will be developed in the OU-III FS after on-Site product recovery has been completed.

Based on sampling results, surface water, sediment and air are not considered to be media of interest at this Site. Surface water and sediment samples collected from the Bronx River demonstrated considerable impacts to the river from both upgradient and downgradient sources; only minor impacts to sediment quality and virtually no impacts to surface water quality (i.e., dissolved constituents in surface water) were found to be attributable to the Site. Air sampling results indicated that Site conditions were not posing unacceptable risks to workers at the Site.

2.3 SCOPE OF THE FS OPERABLE UNITS

As previously discussed, the FS process for this project will be separated into three operable units. This approach is necessary because the need to address certain media of interest cannot be determined until additional information has been collected (for off-Site embankment NAPL) or until on-Site NAPL recovery has been completed (for Area C and D soil and Site ground water).

This FS defines the remedial actions for the first operable unit and will address media to the extent that currently available information allows. Mitigation of the potential impacts of on-Site NAPL, off-Site surface water NAPL and Area A soil will be addressed in this OU-I FS.

Characterization of the off-Site embankment NAPL will be addressed during the SRI. Following completion of the SRI, the OU-II FS will be prepared. This FS will address off-Site embankment NAPL and identify remedial actions for this media, if needed.

Finally, after the on-Site NAPL has been addressed and studies have been conducted to re-evaluate the soil quality in Areas C and D and ground water quality at the Site, the OU-III FS will be prepared. This FS will evaluate the need for remedial actions, if any, for Area C and D soil and groundwater at the Site.

2.4 DEFINE REMEDIAL ACTION OBJECTIVES FOR THE OU-I FS

Remedial action objectives for the Site are designed to protect human health and the environment. These objectives specify the following parameters:

- the constituents of potential concern;
- the potential exposure pathways and receptors; and
- acceptable chemical of potential concern concentrations for each medium of interest.

The following subsection defines the OU-I specific remedial action objectives for the following media of interest: on-Site NAPL (2.3.1), off-Site surface water NAPL (2.3.2) and Area A soil (2.3.3) and identifies general response actions for each of these media. In addition, overall Site remedial action objectives, which are consistent with the overall remedial action goals for the Site, are also identified in this subsection. A summary of the identified OU-I specific remedial action objectives for on-Site NAPL, off-Site surface water NAPL and Area A soil, as well as the overall Site remedial action objectives are presented in Section 2.3.4.

2.4.1 On-Site NAPL

Through installation and monitoring of twenty-four on-site product delineation wells, the extent of on-Site NAPL was delineated. On-Site product recovery wells were installed in the following areas: two wells were installed in Area A; one well was installed in Area B; seven wells were installed in Area C; and 14 wells were installed in Area D. In addition, one side-gradient well, located on the north side of Oak Street, was installed off-Site. No NAPL was detected in this side-gradient well.

A summary of the apparent on-Site NAPL thickness measurements collected during the RI is presented in Table 1-1. Figures 1-8 and 1-9 present the on-Site NAPL distribution for March 1993 and October 1993 measurement rounds. The results of these measurements demonstrate that the shape of the on-Site NAPL plume changed only slightly from March to October 1993 and the overall distribution of NAPL at the Site in both rounds of measurements was similar. Slight changes in NAPL during these two rounds of thickness measurements were probably related to on-Site NAPL removal efforts, fluctuations in the elevation of the water table, seasonal changes and some preferential movement of NAPL which may be occurring along subsurface pathways.

Following delineation of the extent of on-Site NAPL, information was gathered to evaluate and identify an IRM for the on-Site NAPL at the Site. Product baildown tests, conducted during the RI, indicated that the NAPL delineation wells in Area C had excellent recharge capacity; while the recharge capacity of Area D wells was more variable. Based on this information, it was concluded that an IRM consisting of product-only pumping for on-Site NAPL would be feasible. A product pumping pilot test was subsequently conducted at the Site. During this pilot test, product-only pumps were installed in Area C and Area D. Product recovery was not necessary in Area A where the extent of NAPL was minimal.

During the pilot test in Area C, approximately 415 gallons of product was collected from DW-6C from 19 January to 1 February 1993 and approximately 1,285 gallons of product was collected from DW-1C from 4 February to 30 April 1993. Product recovery rates from DW-6C and DW-1C ranged from 20 to 50 gallons per day (gpd) and 5 to 65 gpd, respectively.

Due to the high viscosity of the material found in Area D, product recovery proved to be more difficult in this area. Pilot testing conducted in this area from February through April 1993 yielded 155 gallons of product. During the pilot test, all the product recovery wells tested in Area D (i.e., DW-1D, DW-2D, DW-4D, DW-6D, DW-8D, DW-10D and DW-13D) yielded between two and 10 gpd of product, per well.

In July 1994, operation of an on-Site product recovery system for Areas C and D of the Site commenced. This system was installed pursuant to the NYSDEC approved "Interim Remedial Measures Work Plan", dated 24 September 1993 (ERM, 1993b). The on-Site product recovery system was comprised of eleven product recovery wells (three in Area C and eight in Area D), four product-only Spillbuster[R] pumps, one 300 gallon above ground product storage tank for Area D product, one 500 gallon above ground product storage tank for Area C product, piping, tubing and controls.

Pumps were to be rotated between the recovery wells to promote recharging of materials in wells not being pumped. Due to the high viscosity of material in Area D and the lower recharge and recovery rates exhibited in this area, a smaller storage tank (300 gallons) was installed in this area than in Area C (500 gallons). Between July and 31 December 1994, 1,565 gallons of product were collected from Area C and 110 gallons of product were collected from Area D.

Operational difficulties were encountered in Area D due to the viscous and variable nature of product found in this area. As a result of these problems, the NYSDEC approved discontinuation of automated product recovery in Area D. Following discontinuation of automated recovery, bench scale testing was conducted with Area D NAPL and two types of manual product recovery devices were tested in Area D.

As of 31 December 1994, two technologies have been bench scale tested. One bench scale test involved mixing small samples of NAPL with canola oil and linseed oil to determine whether the NAPL was soluble in those oils. The NAPL was found to be significantly more soluble in canola oil than in linseed oil. Theoretically, canola oil might be added to the wells in Area D to decrease the viscosity of the NAPL and increase its pumpability. This concept will be explored further during the SRI.

A second bench scale test was undertaken to evaluate the feasibility of using a belt skimming device in Area D. A nylon and a polyurethane belt were tested to determine which material was more durable and better able to remove NAPL from the water. While this bench scale test has not been completed, the polyurethane belt appears to collect the NAPL on its surface without retaining ground water whereas the nylon belt appears to collect ground water as well.

On 6 December 1994, two manual product recovery devices (a canister device and a sorbent sock) were installed in two of the eight recovery wells in Area D. Approximately 2.2 gallons of NAPL has been recovered using these manual recovery methods. Table 2-4 presents the volumes of NAPL recovered via these devices. As part of the continuing IRM, these manual devices will be used in other product recovery wells to evaluate their performance and other options for automatic recovery systems for the Area D wells will also be explored.

In total (i.e., during the pilot study, operation of the full scale IRM and testing of the manual product collection devices), as of 31 December 1994, approximately 3,265 gallons of NAPL have been recovered from Area C and approximately 265 gallons of NAPL have been recovered from Area D. A summary of the product that has been collected is presented in Table 1-17.

NAPL thickness measurements collected following commencement of on-Site IRM product recovery are presented in Table 2-5. This table indicates that the product thickness in the recovery wells has remained relatively constant with minor fluctuations. Although some readings indicate the absence of a product layer (i.e., NAPL thickness of zero feet), this reading may be attributable to the interface probe's inability to distinguish the interface between the NAPL and the ground water.

A summary of the physical characteristics of the on-Site NAPL encountered during the June 1994 (pre-IRM) and September 1994 (post-IRM) measurement rounds is presented in Table 2-6. Review of this table indicates that the NAPL in Area C is fairly consistent. In general, this material has been a low viscosity, light brown liquid. However, in September, a medium viscosity milky white liquid was also encountered in one of the Area C recovery wells. In contrast, the material encountered in the Area D recovery wells has varied considerably and generally has higher viscosity than the material found in Area C.

The NYSDEC has stated that the presence of NAPL constitutes a threat to ground water (NYSDEC, 1994a). Although the RA, which has been approved by the NYSDEC, concluded that no significant direct contact exposure to Site ground water is expected (ERM, 1992a), at the request of NYSDEC (NYSDEC, 1994a), this FS will consider general response actions to address on-Site NAPL.

2.4.1.1 Potential Exposure Pathways and Receptors

Although exposure pathways to ground water and soil exist for NAPL, there are no human receptors for these media. The Site, as well as the surrounding area, is fully developed and is covered almost entirely by building or pavement. In addition, there are no known public or private water supply wells in the City of Mount Vernon; the only identified industrial wells are no longer believed to be in use and are upgradient of the Site; the City of Mount Vernon Water District does not allow the installation of private domestic wells within the water district boundaries (Westchester County Health Department, 1993); and both access restrictions and the presence of elevated concentrations of toluene from a suspected off-site upgradient source would prevent the installation of a domestic well downgradient of the Site.

2.4.1.2 *Remedial Action Objectives*

Although there are no direct contact receptors for ground water, NYSDEC considers the presence of NAPL on top of the water table to constitute a potential impact to the ground water (NYSDEC, 1994a). While NAPL at the Site may be a source of dissolved constituents to the ground water, the concentrations of the dissolved constituents found during the RI were relatively low and suggest that the NAPL is not highly soluble. Furthermore, it is suspected that an off-site upgradient source may be having a more significant impact on the ground water at the Site than the Site itself. The OU-I specific remedial objective for the on-Site NAPL will be to mitigate the potential impact to ground water posed by NAPL, to the extent practicable.

2.4.1.3 *Extent of On-Site NAPL*

Figures 1-8 and 1-9 present the distribution of NAPL at the Site during the two delineation rounds and Table 2-6 presents a physical description of the material found in these recovery wells. Based on the information collected during the RI, it has been estimated that there is approximately 12,000 gallons of NAPL under the facility (see Appendix B for calculations). In total, approximately 3,265 gallons of NAPL have been recovered from Area C of the Site and 265 gallons of NAPL have been recovered from Area D of the Site as of 31 December 1994. A summary of the product recovered at the Site has been presented in Table 1-17.

2.4.1.4 *General Response Actions*

The general response actions for on-Site NAPL will include: removal, containment and treatment. Product removal technologies to be evaluated include: excavation and product recovery. Product containment technologies to be evaluated include: access restrictions, use restrictions, vertical barriers and in-situ stabilization. Treatment technologies to be evaluated include: vacuum extraction and vacuum extraction with air sparging.

2.4.2 ***Off-Site Surface Water NAPL***

As discussed in Section 1.2.4, seeps of materials similar to those used at the Site were found on the southeast face of the embankment of the Bronx River during the RI. Following discovery of the product seeps, a surface water product recovery IRM was implemented in the Bronx River. This IRM entailed installation of a five inch disposable absorbent boom along the southeast face of the Bronx River to contain the discharging product. This containment system was subsequently upgraded and a heavy duty, six-inch boom with a 12-inch weighted skirt was installed outside of the adsorbent boom on 16 April 1993 to address high flow conditions in the river during precipitation events. As of December 1994, there continues to be a 250 foot stretch of bank along which small seeps occur fairly frequently. This area is shown in Figures 1-8 and 1-9. Sampling results for disposal of the surface water NAPL are presented in Table 1-16.

The RA for the Site has indicated that seeps of NAPL (i.e., surface water NAPL) pose a physical threat to fish in the Bronx River (ERM, 1992a). An alternative which mitigates the physical threat to fish would therefore be consistent with the long term goals of remediation.

2.4.2.1 *Potential Exposure Pathways and Receptors*

As demonstrated by the seeps found in the Bronx River, a pathway to surface water also exists for NAPL. The RA, which has been approved by the NYSDEC, has identified fish in the Bronx River as receptors for the NAPL seeps and has identified physical harm to this receptor as being an unacceptable risk (ERM, 1992a).

2.4.2.2 *Remedial Action Objectives*

To mitigate potential impacts to fish in the Bronx River, the OU-I specific remedial objective for this media will be to prevent off-Site surface water NAPL exposure to fish in the Bronx River.

2.4.2.3 *Extent of Surface Water Off-Site NAPL*

As of December 1994, some NAPL continues to seep into the Bronx River from a 250 feet stretch of the southeast face of the Bronx River embankment. Once this material enters the Bronx River, it solidifies. This material has been identified as surface water off-Site NAPL. As of December 1994, approximately 22 yd^3 of surface water off-Site NAPL has been collected from the Bronx River. Approximately 0.25 yd^3 of surface water off-Site NAPL (i.e., solidified seep material) is recovered from the boom each week.

2.4.2.4 *General Response Actions*

The general response action for off-Site NAPL will be removal. The product removal technology for this media will include passive off-Site product recovery.

2.4.3 *Area A Soil*

The NYSDEC has agreed that the need for soil remediation in Areas C and D will be determined after NAPL has been addressed (ERM, 1994a; NYSDEC, 1994b). However, at the request of NYSDEC, a localized area of elevated toluene concentrations located in Area A will be addressed in this FS since NAPL recovery is not being conducted in this area.

2.4.3.1 *Constituents of Potential Concern*

In total, 41 soil borings were installed in Areas A, C and D of the Site. Twelve borings were installed in Area A. Soil sampling results for these borings are presented in Table 1-7 and Figure 1-11. In Area A, aromatics, predominantly toluene, were detected in a localized area around one of the soil borings (HP-6) and trace levels of chlorinated organics and acetone were detected at the other boring locations in this area. Soil boring HP-6 was located in the vicinity of a former underground tank.

2.4.3.2 *Potential Exposure Pathways and Receptors*

According to the RA, no significant direct contact exposures to Site soil are expected to occur under either current or projected future conditions (ERM, 1992a). Although the data collected during the RI does indicate the presence of compounds in the soil at the Site in Area A, there is no direct contact route by which humans may be exposed to the soils at the Site. The configuration of the former Red Devil Facility building and its location directly adjacent to the Metro-North railroad embankment is such that there is no accessible exposed soil at the Site.

A potential pathway for constituents in soil to migrate to ground water does exist at the Site. However, as discussed in Section 2.4.1.1, there are no direct contact receptors for ground water at the Site. In addition, the Site is almost entirely occupied by the building or paved areas and the only receptor for ground water (i.e., the Bronx River) has not been impacted by Site ground water. The impact of NAPL on receptors in the surface water body (i.e., fish) was discussed in Section 2.4.2.1.

2.4.3.3 *Remedial Action Objectives*

It is recognized that the NYSDEC considers the presence of constituents in soil to pose a risk to ground water. Although the RA indicates that no unacceptable risks are posed by Site soil (ERM, 1992a), Insilco has agreed, at the request of NYSDEC, to address affected soils in areas where NAPL recovery is not being conducted (i.e., Area A) (ERM, 1994a; NYSDEC, 1994b). The OU-I specific remedial action objectives for soil will be to address soils in Area A during on-Site NAPL recovery activities.

2.4.3.4 *Extent of Affected Soil in Area A*

As previously discussed, soils in Area A will be addressed although no risks are posed by this media. Review of the sampling data for Area A (Table 1-7) indicates elevated toluene concentrations were detected in soil boring HP-6 at a depth of 16-18 feet. This sample, which is located below the subsurface concrete slab previously used as a base for the former underground storage tanks, exhibited 2,200 mg/kg toluene. Soils below the subsurface concrete slab in Area A will be treated via passive venting. Review of the analytical results for soil samples located adjacent to HP-6 (i.e., A-1 and A-2) indicates that the area of elevated toluene concentrations is limited to an area about 12 feet in diameter around boring HP-6. The approximate extent of affected soil in Area A is 90 yd^3 (refer to Appendix C for calculations).

2.4.3.5 *General Response Actions*

General response actions for Area A soil will include treatment. Treatment technologies will include passive venting. As per correspondence with the NYSDEC (ERM, 1994a; NYSDEC, 1994b), soils beneath the subsurface concrete slab in Area A will be treated via passive soil venting. Soil studies in Area A after NAPL removal will entail the collection and analysis of two soil samples from beneath the concrete slab (ERM, 1994b).

2.4.4 ***Summary***

As previously discussed in this section, remedial action objectives for the OU-I FS have been identified for on-Site NAPL, off-Site surface water NAPL and Area A soil. These OU-I specific remedial action objectives include:

- <u>on-Site NAPL:</u> mitigating potential impacts to ground water posed by NAPL, to the extent practicable;
- <u>off-Site surface water NAPL:</u> preventing exposure to fish in the Bronx River; and
- <u>soil:</u> addressing soils in Area A during NAPL recovery activities.

Although neither Site ground water nor soil in Areas C and D of the Site are media of interest for this operable unit, maintaining the existing exposure barriers to direct contact exposure with these media is considered to be consistent with the overall remedial action goals for the Site. Consequently, maintaining the existing exposure barrier to direct contact with ground water and soil in all areas of the Site is identified as an overall Site remedial action objective.

3.0 IDENTIFICATION AND SCREENING OF REMEDIAL ACTION TECHNOLOGIES

This section identifies applicable remedial technologies and associated process options which can be employed at the Site to achieve the OU-I specific remedial action objectives and the overall Site remedial action objectives described in Section 2.0. The OU-I specific remedial action objectives should be met and be consistent with the overall objectives for the Site. The remedial technologies discussed in this section are considered general technologies which correspond to the previously identified and reasonably anticipated future response actions for affected media. The process options, associated with each remedial technology, are specific procedures in each technology. For example, a remedial technology such as stabilization may be composed of a number of process options which involve adding different agents in various ratios to the affected media in order to immobilize the regulated constituents which are present.

The remedial technologies and associated process options in this section were identified through a review of USEPA guidelines, relevant literature and experience in developing feasibility studies and remedial action plans for similar types of environmental problems. The objective of screening the remedial technologies and process options is to narrow the field of available technologies, eliminating those which can not technically be implemented and to combine the technologies into a variety of remedial alternatives which will undergo more detailed evaluation in Section 4.0. The screening procedures are based on limitations posed by on-site conditions and the characterization of constituents of regulatory concern in affected media.

Remedial technologies and process options considered to be implementable will undergo further evaluation to select one process for each technology. In accordance with the NYSDEC guidance (NYSDEC, 1990), the technologies will be screened in accordance with: (1) their ability to meet medium-specific remedial action objectives, implementability, and short-term and long-term effectiveness; (2) NYSDEC's hierarchy of remedial technologies; and (3) NYSDEC's preference for technologies which have:

- been successfully demonstrated on a full scale or a pilot scale under the federal Superfund Innovative Technology Evaluation (SITE) Program;
- been successfully demonstrated on a full scale or a pilot scale at a federal Superfund site, federal facility, state Superfund site, a potentially responsible party (PRP) overseen by a state environmental agency or the USEPA;
- a RCRA Part B permit;
- a RCRA Research and Development permit; and
- a documented history of successful treatment, such as granular activated carbon.

The criteria for short-term and long-term effectiveness consider whether the technology and process option can handle the volume of the affected media. Also considered are: (1) potential impacts to human health and the environment which result from the use of the process options; and (2) whether the process options have proven reliable for the media and constituents requiring remediation at the Site.

The criteria for implementability focuses on institutional aspects associated with use of the remedial technology and associated process options. Institutional aspects involve potential permits or access approvals for off-site work as well as off-site treatment, storage and disposal services.

The following section describes eleven remedial action technologies and associated process options for affected media at the Site. The remedial technology descriptions include evaluations of the practical aspects of the remedial technologies and process options which are judged to be implementable. Section 3.2 summarizes the evaluation of remedial action technologies and process options presented in Section 3.1.

3.1 *IDENTIFICATION OF REMEDIAL ACTION TECHNOLOGIES*

The Remedial Action Technologies identified for the Site include:

1. Access Restrictions
2. Use Restrictions
3. Active On-Site Product Recovery
4. Passive Off-Site Surface Water Product Recovery
5. Vertical Barriers
6. In-Situ Chemical Fixation\Stabilization
7. Excavation and Off-Site Disposal
8. Vacuum Extraction
9 Vacuum Extraction with Air Sparging
10. Passive Soil Venting
11. Off-Site Product Disposal

Active product recovery has been defined as aggressive subsurface recovery via either automated product recovery equipment (e.g., product recovery pumps, belt skimmers) or manual product recovery equipment (e.g., bailers, in-well sorbents). In contrast, passive product recovery has been defined as above ground recovery of seeps (i.e., surface water product) via manual recovery equipment (e.g., adsorbent booms).

Sections 3.1.1 through 3.1.11 present descriptions of each remedial action technology and an assessment of each technology's: (1) ability to meet the medium-specific remedial action objectives; (2) implementability; and (3) short-term and long-term effectiveness. In addition, NYSDEC's hierarchy of remedial technologies and NYSDEC's technology preference is also evaluated with respect to each technology.

3.1.1 Access Restrictions

This technology involves restricting access to soil located below the Site. This would be accomplished through maintenance of existing pavement and building foundations at the Site. Access restrictions have been proven to be effective in eliminating potential direct contact risks at numerous other sites.

With the exception of a small parcel of land in an alleyway behind Areas A and B, the entire Site is covered with facility buildings, concrete or pavement. Areas B, C and D of the Site are constructed with a basement. The basement foundation is generally constructed of concrete in these areas. In some sections of Areas C and D, the floor is comprised of steel plates and in some sections of Area C, the floor is comprised of wood.

3.1.1.1 Ability to Meet Medium-Specific Remedial Action Objectives

The overall Site remedial action objective is to maintain the existing exposure barrier to direct contact with Site soil and ground water. By mitigating potential risks associated with direct contact exposure with soil, this technology would be effective in addressing this remedial action objective for Site soil.

3.1.1.2 Short-Term and Long-Term Effectiveness

Pavement and concrete building foundations, if properly maintained, would continue to provide short-term and long-term protection against contact with surface soil.

3.1.1.3 Implementability

Maintenance of the existing Site pavement and building foundation would be readily implementable. Such maintenance is routinely conducted at the Site. In addition, access restrictions have been demonstrated at numerous sites.

3.1.1.4 *Evaluation Summary*

While access restrictions are not considered to be a permanent remedy, access restrictions would be effective in addressing the overall Site remedial action objective for Site soil. Maintaining the existing pavement and building foundations would be easily implementable as part of OU-I activities and access restrictions have a proven history. This technology will therefore be carried forward to the Development of Alternatives Section.

3.1.2 ***Use Restrictions***

This technology involves restricting specific uses of the Site, such as residential uses, and thereby limiting human contact with constituents in the media of interest. Use restrictions for this Site would include restricting subsurface work via existing Site zoning, and restricting installation of domestic wells between the Site and the Bronx River (i.e., downgradient of the Site) via existing City of Mount Vernon private domestic well restrictions currently in effect for this area (Westchester County Health Department, 1993).

3.1.2.1 *Ability to Meet Medium-Specific Remedial Action Objectives*

By mitigating potential risks associated with direct contact exposure with Site soil and ground water, this technology would be effective in addressing the overall Site remedial action objective for Site soil and ground water.

3.1.2.2 *Short-Term and Long-Term Effectiveness*

By eliminating potential exposures to soil (for construction workers, the only segment of the population who may reasonably be expected to be exposed to Site soil) and ground water, use restrictions would provide short-term and long-term effectiveness in attaining the overall Site remedial action objective for Site soil and ground water.

3.1.2.3 *Implementability*

Use restrictions for the Site are readily implementable and have been demonstrated at numerous other sites. Specifically, with regard to the implementability of ground water use restrictions, the following factors apply: (1) there are no known public or private water supply wells in the City of Mount Vernon; (2) the only identified industrial wells are no longer believed to be in use and are upgradient of the Site; and (3) the City of Mount Vernon Water District does not allow the installation of private domestic wells within the water district boundaries which includes on-Site and off-Site areas impacted by constituents from the Site. In addition, both limited downgradient property access and the presence of elevated concentrations of toluene from a suspected off-site upgradient source would prevent the installation of a domestic well downgradient of the Site.

With regard to the implementability of subsurface work restrictions, the Site is currently zoned for industrial use. As such, residential usage would not be allowed and subsurface work would therefore not be probable. To ensure that subsurface work would not be conducted, use restrictions for the Site would include a notice to future owners containing subsurface conditions and work restrictions. Should subsurface work be required, workers would be required to follow a Health and Safety Plan (HASP) prepared with consideration to the subsurface conditions. As part of the HASP, air monitoring would be conducted to ensure that adequate personnel protective equipment is being used.

3.1.2.4 *Evaluation Summary*

Use restrictions would be effective in addressing the overall Site remedial action objective for Site soil and ground water. While use restrictions are not considered to be a permanent remedy, they can be easily and readily implemented as part of the OU-I and have a proven history. This technology will therefore be carried forward to the Development of Alternatives Section.

3.1.3 *Active On-Site Product Recovery*

Active on-Site product recovery would entail continued use of the existing Area C on-Site automated product recovery systems and the use of manual product recovery equipment or automated product recovery systems for Area D. The existing on-Site product recovery system is comprised of eleven product recovery wells (three in Area C and eight in Area D), four product-only Spillbuster[R] pumps, one 300 gallon above ground product storage tank for Area D product, one 500 gallon above ground product storage tank for Area C product, piping, tubing and controls.

Manual active product recovery equipment includes in-well sorbents and passive bailers. In-well sorbent units, such as the 2" SoakEase, manufactured by Enviro Products, Inc., are comprised of stainless steel refillable canisters containing absorbent tubes. The spent adsorbent tubes are manually replaced when fully saturated. Passive bailers, such as the PRC-91 Keck Canister, manufactured by Keck Instruments, Inc., use a floating canister constructed using a hydrophobic filter buoy to recover only product. This canister floats on the product/water interface within the well, thus enabling it to recover only product. The recovered product collects in a sump at the bottom of the unit and is drained out through a valve located in the bottom. The sump is capable of storing approximately 0.5 liters of product.

In addition, further modifications to the existing product recovery system for Area D are also being investigated at this time. Modifications currently being investigated include: (1) solvent addition to the product recovery wells to reduce the product viscosity; and (2) alternate pumping methods.

3.1.3.1 *Ability to Meet Medium-Specific Remedial Action Objectives*

The OU-I specific remedial action objective for on-Site NAPL will be to mitigate the potential impact to ground water posed by NAPL, to the extent practicable. Active on-Site product recovery has the ability to address this OU-I specific remedial action objective.

3.1.3.2 *Short-Term and Long-Term Effectiveness*

On-Site NAPL can be effectively addressed by this technology and potential impacts to ground water from the on-Site NAPL, as defined by the NYSDEC (NYSDEC, 1994a), can be mitigated by implementation of this technology. Previous and current IRM activities demonstrate that active automated product recovery is effective in removing Area C product. Although difficulties have been encountered recovering Area D product via automated active product recovery systems, modification to the automated systems (e.g., solvent addition, alternate pumping methods) and manual active product recovery technologies are currently being explored for this area.

Manual active product recovery technologies are being considered for interim, short-term product recovery. Modifications to the current automated product recovery system are being considered for more long-term product recovery. Provided these automated product recovery system modifications improve product recovery in this area, active on-Site product recovery would be effective for Area D NAPL.

3.1.3.3 *Implementability*

As part of the IRM, a number of on-Site product recovery wells have been installed at the Site and automated product recovery systems have been installed in Areas C and D of the Site. Active on-Site product recovery would therefore be implementable at the Site.

3.1.3.4 *Evaluation Summary*

Active on-Site product recovery is currently being implemented as an IRM at the Site. Automated recovery of the product located in Area C has been very effective; however, due to the variable nature of the product in Area D and its high viscosity, automated product recovery of this product has been more difficult. Currently, automated product recovery has been discontinued with NYSDEC approval in Area D. Modifications to the automated recovery system, as well as manual product recovery methods are currently being investigated for this area. The effectiveness of automated system modifications and manual product recovery methods will continue to be investigated in the context of the IRM. If these technology modifications improve product recovery in this area, active on-Site product recovery would be effective for Area D NAPL. This technology will be carried forward to the Development of Alternatives Section.

3.1.4 *Passive Off-Site Surface Water Product Recovery*

Passive off-Site surface water product recovery would entail continued use of the existing passive off-Site surface water product recovery system. As part of the IRM for the Site, a passive surface water product recovery system has been installed in the Bronx River near the Site to recover seep materials. This system is comprised of a permanent 300 foot long heavy-weight skirted marine outer boom and a disposable inner adsorbent boom. The purpose of the outer skirted marine boom is to provide secondary containment of the boomed area by creating a physical barrier to the product floating on the surface of the river and to protect the integrity of the adsorbent boom from changes in the river water level and high flow conditions. These booms have been placed along a seep area located on the southeast face of the Bronx River embankment as shown in Figures 1-8 and 1-9. Surface water NAPL is periodically manually removed from the boomed area and containerized for off-Site disposal.

3.1.4.1 *Ability to Meet Medium-Specific Remedial Action Objectives*

The OU-I specific remedial action objective for off-Site surface water NAPL will be to prevent contact with fish in the Bronx River. Passive off-Site surface water product recovery has in the past and will continue to address this OU-I specific remedial action objective in the future.

3.1.4.2 *Short-Term and Long-Term Effectiveness*

Passive product recovery can effectively address potential impacts posed by off-Site surface water NAPL. By containing and removing off-Site NAPL from the Bronx River, potential impacts to fish from this material would be mitigated. This technology, as part of the IRM implemented for the Site, has effectively been used to address off-Site surface water NAPL.

3.1.4.3 *Implementability*

As demonstrated by the IRM, passive off-Site surface water product recovery would be implementable.

3.1.4.4 *Evaluation Summary*

Passive off-Site surface water product recovery is currently being implemented as an IRM and has been effective in containing and recovering off-Site surface water NAPL from the Bronx River. This technology will be carried forward to the Development of Alternatives Section.

3.1.5 ***Vertical Barriers***

Vertical barriers are considered to be a NAPL containment technology (USEPA, 1992). Low permeability, fine-grained barrier walls can be constructed to impede the lateral movement of NAPL. Examples of vertical barriers include: slurry walls, concrete walls and sheet piling with grouted joints.

3.1.5.1 *Ability to Meet Medium-Specific Remedial Action Objectives*

The OU-I specific remedial action objective for on-Site NAPL will be to mitigate the potential impact to ground water posed by NAPL, to the extent practicable. Even if vertical barriers could be used to contain on-Site NAPL and prevent migration of on-Site NAPL to the Bronx River, this technology would not have the ability to meet the OU-I specific remedial action objective for on-Site NAPL. Specifically, containing NAPL would not mitigate the potential impacts to ground water posed by NAPL.

3.1.5.2 *Short-Term and Long-Term Effectiveness*

Barrier walls can provide effective control for NAPL migration in favorable settings; however, barrier walls have not been tested to determine their long-term effectiveness for impedance of NAPL migration (USEPA, 1992). The effectiveness of vertical barriers to prevent NAPL migration would also be dependant upon the integrity of the barrier wall. Small fractures or openings in the wall could result in NAPL breakthrough and subsequent NAPL migration. Furthermore, the barrier wall material of construction would also have to be compatible with subsurface constituents.

3.1.5.3 *Implementability*

Installation of vertical barriers at the Site is not practically implementable. To contain on-Site NAPL, a vertical barrier would have to either encircle the entire Site or encircle only the areas containing NAPL (i.e., Areas C and D). If the vertical barrier does not encircle an entire area, NAPL can flow along the vertical barrier and migrate to other areas. For example, if the vertical barrier was only constructed along the rear of Areas C and D, NAPL could travel along the vertical barrier in a southern direction towards Areas C and D and in a northern direction off-Site. Consequently, such construction would not affect NAPL containment and may result in additional NAPL migration.

Because the Site is almost entirely covered by buildings, installation of a vertical barrier encircling only Areas C and D would not be feasible. Because the vertical barrier would have to be at least as deep as the ground water table in these areas (15 to 16 feet in Areas C and D), the depth of the wall would be considerable and construction of the vertical barrier would require sizeable heavy equipment. As a result, access to these basement areas of the Site would require considerable demolition of Site buildings.

In addition, construction of vertical barrier encircling the entire site is not feasible. To contain on-Site NAPL, a vertical barrier ranging in depth from 30 feet (Area A) to 15 feet (Area D) below ground surface would have to be constructed. Again, the depth of the wall would be considerable and its construction would require sizable heavy equipment. Due to the severe access restrictions between the Site and the adjacent railroad embankment, access to this area with heavy equipment is not feasible. Furthermore, the materials of construction found on the eastern side of the embankment (i.e., rip rap, etc.) would make installation of a vertical barrier extremely difficult, if not impossible in this area of the Site.

3.1.5.4 *Evaluation Summary*

While vertical barriers would contain on-Site NAPL and prevent migration of on-Site NAPL to the Bronx River, this technology would not address the OU-I specific remedial action objective for on-Site NAPL. Furthermore, the effectiveness of vertical barriers would be highly dependant upon site-specific conditions. Due to the severe access restrictions, on-Site NAPL containment via vertical barriers would not be implementable. This technology will not be carried forward to the Development of Alternatives Section.

3.1.6 *In-Situ Chemical Fixation\Stabilization*

In-situ chemical fixation\stabilization is a potential NAPL containment technology (USEPA, 1992). This technology entails injecting and mixing cementing agents into the subsurface to enhance the physical properties of the waste and immobilize the chemical(s) of potential concern. More specifically, "chemical fixation" describes the chemical technology used to detoxify a matrix and immobilize constituents of concern. It often denotes a reaction between one or more constituents of concern and a solid matrix - one either introduced deliberately, or already existing in the matrix.

Stabilization or encapsulation can occur without chemical fixation. Stabilization without chemical fixation does not, by itself, affect the hazard potential of the material, although it may reduce the hazard by setting up a barrier between particles and the environment, limiting permeability of the material by water, or reducing the effective surface area available for diffusion.

3.1.6.1 *Ability to Meet Medium-Specific Remedial Action Objectives*

The OU-I specific remedial action objective for on-Site NAPL will be to mitigate the potential impact to ground water posed by NAPL, to the extent practicable. Because on-Site NAPL contains VOCs, this technology would not be effective in immobilizing NAPL and hence, could not be used to address the OU-I specific remedial action objective for on-Site NAPL. According to an USEPA OSWER directive (Publication 9380.3-07FS; February 1991), chemical fixation\stabilization cannot be considered to be an effective treatment technology for media containing VOCs since VOCs prevent the immobilization of constituents.

3.1.6.2 *Short-Term and Long-Term Effectiveness*

Although stabilization has been shown to be effective in reducing the mobility of SVOCs, materials containing VOCs cannot be stabilized. Because the NAPL layer contains both VOCs and SVOCs, in-situ chemical fixation\stabilization would not be an effective containment technology for the NAPL.

3.1.6.3 *Implementability*

In order to inject and mix cementous agents with subsurface materials, heavy equipment fitted with augers capable of providing large amounts of torque are required. The Site is almost entirely covered by buildings. Due to the size of this equipment and the severe access restrictions associated with this Site, considerable building demolition would be required to implement this technology for on-Site NAPL. Consequently, in-situ chemical fixation\solidification would not be implementable.

3.1.6.4 *Evaluation Summary*

Implementation of this containment technology would not be effective in achieving the OU-I specific remedial action objective for on-Site NAPL and is not implementable. Consequently, this technology will not be carried forward to the Development of Alternatives Section.

3.1.7 Excavation and Off-Site Disposal

This technology would require the NAPL and associated overlying unsaturated soil to be excavated, tested, transferred into trucks and transported to an off-Site facility for disposal. If the excavated material was determined to be a characteristic RCRA hazardous waste, the material would have to be managed at a RCRA permitted hazardous waste management facility. If the excavated material was determined to be a non-hazardous waste, the material could be disposed at an industrial landfill.

3.1.7.1 *Ability to Meet Medium-Specific Remedial Action Objectives*

The OU-I specific remedial action objective for on-Site NAPL will be to mitigate the potential impact to ground water posed by NAPL, to the extent practicable. Excavation and off-Site disposal would address this remedial action objective for on-Site NAPL.

3.1.7.2 *Short-Term and Long-Term Effectiveness*

Excavation and off-Site disposal is an effective and commonly used remedial technology. However, this technology is generally practical for sites where the depth of excavation is shallow.

3.1.7.3 *Implementability*

Although off-Site disposal of excavated material would be implementable, excavation of on-Site NAPL would not be implementable. Based on the average depth to ground water in Areas C and D, approximately 17 feet of overlying soil would have to be removed to enable excavation of the on-Site NAPL layer. To enable excavation of these soils, on-Site buildings would have to be demolished. These buildings are currently occupied and operated by Metro-Self Storage Bronx, Inc. This self storage company provides rental storage space to the area.

In addition, to enable excavation of these soils, significant shoring would have to be constructed to prevent subsidence of the northeastern railroad embankment. The Harlem River line of the Metro-North Railroad commuter service, a major mass transit line serving Westchester County, operates along this railroad embankment. Consequently, any shoring problems would disrupt commuter rail service on this heavily trafficked line. Furthermore, the risks of excavating directly adjacent to this track are increased by the fact that this railroad embankment is over 100 years old and its structure is unknown.

Excavation of soil would cause an increase in particulate levels in the ambient air in the area of work. Therefore, monitoring would be required to ensure that the increase in particulate levels do not adversely impact the surrounding population and compliance with OSHA regulations would be required for protection of Site Workers. An increased chance of truck accidents during transport to the off-Site disposal facility would also be realized as a result of this technology.

Based on the considerable constraints associated with excavation, this technology is not considered to be reasonably implementable for this Site.

3.1.7.4 Evaluation Summary

Although this removal technology would be effective in achieving the OU-I specific remedial action objective for on-Site NAPL, excavation and off-Site disposal would not be reasonably implementable at this Site. Consequently, this technology will not be carried forward to the Development of Alternatives Section.

3.1.8 Vacuum Extraction

Vacuum extraction has been identified as a NAPL treatment technology (USEPA, 1992). To enable vacuum extraction, vacuum extraction wells are installed in the subsurface and screened through the unsaturated zone into the top of the water table. Air is then pulled through the unsaturated zone via blowers to remove volatile compounds from the soil media within the unsaturated zone. The air flow generates advective vapor fluxes that change the vapor-liquid equilibrium, inducing volatilization of constituents. The resulting vapors are then collected and treated, if necessary.

3.1.8.1 *Ability to Meet Medium-Specific Remedial Action Objectives*

The OU-I specific remedial action objective for on-Site NAPL will be to mitigate the potential impact to ground water posed by on-Site NAPL, to the extent practicable. This treatment technology could be used to solidify and immobilize the on-Site NAPL through the removal of VOCs contained in the NAPL. The VOCs contained in the NAPL serve as a solvent for the balance of the NAPL (i.e., non-VOCs and SVOCs) and thus enable the entire material to flow. Consequently, removal of VOCs contained in the NAPL would prevent movement of the balance of this material (i.e., non-VOCs and SVOCs). In the absence of a solvent, this immobile material would then be considered to be a solid.

However, due to the properties and location of the NAPL, this technology would not be effective in treating the on-Site NAPL and hence would not mitigate potential impact to ground water posed by this media. Additional discussion regarding this issue is presented in the following section. In conclusion, this technology would not address the OU-I specific remedial action objectives for on-Site NAPL.

3.1.8.2 *Short-Term and Long-Term Effectiveness*

Vacuum extraction has been shown to be very effective for removal of low molecular weight, VOCs from homogenous permeable media. However, vacuum extraction is ineffective in removing chemicals from the saturated zone (USEPA, 1992). As a result, this technology would be limited to addressing the soils above the NAPL layer. Any treatment of the NAPL would therefore result from convective air transfer above the NAPL layer.

The product layer, which lies above the water table, readily solidifies when subjected to air. Although solidification of this material could be considered to be a treatment technology, it is probable that only the top layer of product, which would be subjected to the air movement resulting from operation of a vacuum extraction system, would solidify. As a result, the majority of the NAPL layer (i.e., the bottom and middle layer) would not be addressed and would remain mobile.

3.1.8.3 *Implementability*

Installation of a vacuum extraction system for on-Site NAPL would require installation of vapor extraction and injection wells in Areas C and D of the Site. Since these areas are located within the Site building and numerous storage lockers are located within these areas, installation of a vacuum extraction system would not be readily implementable without significant disruption of the current Site operations.

3.1.8.4 *Evaluation Summary*

It is suspected that vacuum extraction would be effective in removing VOCs from the top layer of the NAPL and solidifying this portion of the NAPL. By solidifying the NAPL, the potential impacts to ground water caused by the on-Site NAPL could be reduced. However, because this technology would only solidify the top layer of NAPL and would not solidify the entire NAPL mass, it can not be considered to be effective in attaining the OU-I specific remedial action goals for NAPL. As a result, this technology will not be carried forward to the Development of Alternatives Section.

3.1.9 *Vacuum Extraction with Air Sparging*

Vacuum extraction with air sparging, also known as in-situ aeration, has been identified as a NAPL treatment technology (USEPA, 1992); however, the application of this technology is very limited. To enable vacuum extraction with air sparging, air injection wells are installed through the unsaturated zone well into the water table. However, unlike vacuum extraction wells, air injection wells are only screened in the water table. Air is forced into the water table through these wells. In conventional air sparging applications, the injected air volatilizes the dissolved VOCs in the ground water and these compounds are then transferred to the unsaturated zone where they are collected by the vacuum extraction wells.

3.1.9.1 *Ability to Meet Medium-Specific Remedial Action Objectives*

The OU-I specific remedial action objective for on-Site NAPL is to mitigate the potential impact to ground water posed by on-Site NAPL, to the extent practicable. This treatment technology could be used to solidify and immobilize the on-Site NAPL through the removal of VOCs contained in the NAPL. The VOCs contained in the NAPL serve as a solvent for the balance of the NAPL (i.e., non-VOCs and SVOCs) and thus enable the entire material to flow. Consequently, removal of VOCs contained in the NAPL would prevent movement of the balance of this material (i.e., non-VOCs and SVOCs). In the absence of a solvent, this immobile material would then be considered to be a solid.

However, due to the properties and location of the NAPL, this technology would not be effective in treating the on-Site NAPL and hence would not mitigate potential impact to ground water posed by this media. Additional discussion regarding this issue is presented in the following section. In conclusion, this technology would not address the OU-I specific remedial action objectives for on-Site NAPL.

3.1.9.2 *Short-Term and Long-Term Effectiveness*

Unlike conventional air sparging applications whose purpose is to remove VOCs in the ground water, the purpose of air sparging for this application would be to remove VOCs from the product layer. Because the product layer readily solidifies when subjected to air, it is suspected that the injected air would follow preferential pathways along the bottom of the product layer with some bubbling (channeling) up through the layer at various points. This would cause the bottom layer of product to become solidified and the solidified product would, in turn, impede the movement of injected air to other portions of the product. In addition, because vacuum extraction would be conducted in conjunction with air sparging, the top layer of NAPL would also become solidified (see Section 3.1.8 for additional discussion regarding vacuum extraction). As a result, the middle portion of the NAPL layer would become inaccessible to treatment and would remain mobile.

In addition, use of this technology could result in off-Site migration of product and VOCs. Solidification of discrete areas of product could result in the movement of product to more "open" pathways, and injection of air could promote off-Site migration of constituents through preferential pathways (i.e., numerous conduits at and around facility).

Vacuum extraction with air sparging may be effective in removing VOCs from the bottom layer of the NAPL and solidifying this portion of the NAPL. By solidifying the NAPL, both the potential impacts to ground water caused by NAPL and the impacts to fish in the Bronx River caused by on-Site NAPL could be reduced. However, because: (1) the middle portion of the NAPL layer would not be addressed, would remain mobile and would become inaccessible to treatment; and (2) use of this technology could result in off-Site migration of product and VOCs, vacuum extraction with air sparging cannot be considered to be effective in attaining the remedial action goals for on-Site NAPL.

3.1.9.3 *Implementability*

Installation of a vacuum extraction system with air sparging for on-Site NAPL would require installation of vapor extraction and air injection wells in Areas C and D of the Site. Since these areas are located within the Site building and numerous storage lockers are located within these areas, installation of a vacuum extraction system with air sparging would not be readily implementable without significant disruption of the current Site operation.

Furthermore, use of this technology could result in off-Site migration of product and VOCs. Solidification of discrete areas of product could result in the movement of product to more "open" pathways, and injection of air could promote off-Site migration of VOCs through preferential pathways (i.e., numerous conduits at and around facility). Because the air flow through the subsurface follows the path of least resistance (i.e., flows to lower pressure areas), injected air tends to flow through media of lower density and into open subsurface areas (e.g., basements). Subsurface utility conduits are generally installed in backfill, a low density material. As a result, installation of air sparging systems in developed areas having subsurface conduit lines and/or basements is generally not recommended.

3.1.9.4 *Evaluation Summary*

Use of vacuum extraction with air sparging would result in solidification of the bottom and top layers of product which would, in turn: (1) impede the movement of injected air to other portions of the product; and (2) result in an inaccessible middle layer of mobile product. As a result, this technology would not be effective in treating the entire NAPL body. In addition, it is possible that this technology, through the injection of air, could promote off-Site migration of VOCs through preferential pathways (i.e., numerous conduits at and around facility). This technology will not be carried forward to the Development of Alternatives Section.

3.1.10 *Passive Soil Venting*

Passive soil venting, also known as barometric pumping, can be used to remove VOCs from covered subsurface soil. Like vacuum extraction, passive soil venting utilizes venting wells screened through the subsurface soil to remove soil vapor. However, unlike vacuum extraction, which is an active soil venting technology, passive soil venting does not utilize mechanical equipment to remove soil vapor from subsurface soil. Instead, passive soil venting utilizes changes in the atmospheric pressure to inject air into subsurface soil and to remove soil vapor from subsurface soil (i.e., as the atmospheric pressure increases and decreases, gas flows into and out of the subsurface, respectively, through the venting wells to equalize the subsurface pressure).

This technology is being considered for soils located in Area A only. Although the RA does not specifically identify risks posed by this area, a passive soil venting system will be proposed in Area A to respond to NYSDEC's request (NYSDEC, 1994a; NYSDEC, 1994b).

3.1.10.1 *Ability to Meet the Medium-Specific Remedial Action Objectives*

Pursuant to NYSDEC's request, addressing soils in Area A via installation and operation of a passive soil venting system is an OU-I specific remedial action objective. Although the NYSDEC has agreed that the need for soil remediation will be determined after NAPL has been addressed (ERM, 1994a; NYSDEC, 1994b), at the request of NYSDEC, a passive soil venting system will be installed in Area A since NAPL recovery is not being conducted in this area. This technology will therefore meet the OU-I specific remedial action objective for Area A soil.

3.1.10.2 Short-Term and Long-Term Effectiveness

Passive venting is effective for removing small amounts of VOCs from covered subsurface soil over an extended period of time. This technology has been used at numerous landfills.

3.1.10.3 Implementability

As per an agreement with NYSDEC (ERM, 1994a; NYSDEC, 1994b), soils below the subsurface concrete slab in Area A will be identified for passive venting. This area, which is situated on the east side of the Site off North Street, is located in an open courtyard/loading dock area. Installation of venting wells in this open area would be implementable.

3.1.10.4 Evaluation Summary

As previously discussed, per an agreement with NYSDEC (ERM, 1994a; NYSDEC, 1994b), soils below the subsurface concrete slab in Area A will be identified for passive venting. This technology would be both effective and easily implementable and would not conflict with any future objectives. This technology will be carried forward to the Development of Alternatives Section.

3.1.11 Off-Site Product Disposal

This technology would entail off-Site disposal of the product recovered via both active and passive product recovery system. Non-Hazardous materials would be disposed at a non-hazardous land disposal facility and hazardous materials would be disposed at a RCRA permitted hazardous waste management facility. Liquid NAPL collected via the on-Site active product recovery system and the off-Site surface water NAPL collected via the passive off-Site product recovery system are both currently being disposed via fuels blending (i.e., combustion) at cement kiln facilities.

3.1.11.1 *Ability to Meet Medium-Specific Remedial Action Objectives*

The OU-I specific remedial action objective for on-Site NAPL and off-Site surface water NAPL will be to mitigate the potential impact to ground water posed by NAPL, to the extent practicable, and to prevent off-Site surface water NAPL exposure to fish in the Bronx River, respectively. Off-Site disposal can therefore be used along with product recovery technologies to achieve the OU-I specific remedial action objectives for both on-Site NAPL and off-Site surface water NAPL and will be consistent with anticipated future remedial objectives.

3.1.11.2 *Short-Term and Long-Term Effectiveness*

Off-Site disposal is a proven and effective treatment technology. This technology has been used at numerous sites.

3.1.11.3 *Implementability*

Material collected via the existing IRM product recovery systems is currently being disposed off-Site. This technology is therefore implementable.

3.1.11.4 *Evaluation Summary*

This technology, used along with product recovery technologies, would achieve the OU-I specific remedial action objectives for on-Site NAPL and off-Site surface water NAPL. Furthermore, this technology would be effective and implementable. This technology will therefore be carried forward to the Development of Alternatives Section.

3.2 *EVALUATION AND SELECTION OF APPLICABLE REMEDIAL ACTION TECHNOLOGIES*

Based on the identification and screening presented in Section 3.1, six remedial actions technologies are retained for further analysis and for use in developing remedial action alternatives. The remedial action technologies retained for use in developing OU-I remedial action alternatives are: Access Restrictions, Use Restrictions, Active On-Site Product Recovery, Passive Off-Site Surface Water Product Recovery, Passive Soil Venting and Off-Site Disposal.

Due to access limitations, the physical characteristics and the chemical composition of the NAPL, the number of remedial technologies and associated process options available for on-Site NAPL and off-Site surface water NAPL are limited. Because of these constraints, vertical barriers, in-situ chemical fixation\stabilization, vacuum extraction, vacuum extraction with air sparging and excavation were eliminated from further consideration.

The remaining six technologies are consistent with the general response actions identified in Section 2.0. The OU-I specific remedial action objectives and the overall Site remedial action objectives can be achieved by combining a number of these technologies into remedial action alternatives, as described in Section 4.0.

4.0 *DESCRIPTION AND EVALUATION OF REMEDIAL ACTION ALTERNATIVES*

Section 3.0 identified six remedial action technologies that can be used to address the OU-I specific remedial action objectives and the overall Site remedial action objectives. Each individual technology generally satisfies some but not all of the remedial action objectives defined in Section 2.0. Technologies were therefore combined to form comprehensive approaches to adequately satisfy both the OU-I remedial action objectives and the overall Site remedial action objectives. This section of the report uses the remedial action evaluated in Section 3.0, and retained for use in developing remediation approaches, to develop comprehensive Remedial Action Alternatives for the Site. The technologies retained in Section 3.0 have been combined to form three Remedial Action Alternatives:

Alternative I:	No Action (Section 4.2)
Alternative II:	Access and Use Restrictions (Section 4.3)
Alternative III:	Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery (Section 4.4)

Section 4.1 presents a summary of the media of interest identified in Section 2.0. Sections 4.2 through 4.4 provide descriptions of each of the alternatives under consideration. In accordance with the Revised TAGM - Selection of Remedial Actions at Inactive Hazardous Waste Sites (NYSDEC, 1990), Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/6-89/004; October 1988) and the National Contingency Plan (40 CFR 300.430), each alternative has been evaluated for the following criteria:

- overall protection of human health and the environment;
- compliance with SCGs;
- long-term effectiveness and permanence;

- reduction of toxicity, mobility or volume through treatment;
- short-term effectiveness;
- implementability; and
- cost.

These criteria are evaluated in the section of the report listed above for each alternative. The Remedial Action Alternatives are conceptual approaches to Site remediation. They demonstrate how the technologies selected for this alternative could be used to achieve the remedial action objectives. They also provide a basis on which to estimate the costs that would be incurred in order to implement the alternative.

After selection, these approaches could be modified during the design phase if the modified approach achieves the same level of protection to public health or the environment at similar or lower cost. Cost information is also provided for each alternative (except Alternative I: No Action); preliminary cost estimates are provided in Appendix D. These are conceptual design cost estimates and changes in the area requiring remediation, detailed engineering, as well as other factors not foreseen at the time this report was prepared, could increase costs by as much as 50 percent or decrease costs by as much as 30 percent (refer to Section 6.2.3.7 of Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA). In addition, an discount rate of seven percent was used to compute the present worth of annual operation and maintenance costs. OSWER guidance 9355.3-20 (EPA, 1993f) recommends a seven percent discount rate for estimating the present worth value of potential alternatives in FS studies for CERCLA sites.

4.1 SITE MEDIA TO BE ADDRESSED

The media of interest to be addressed by the remedial actions prescribed in each alternative are as follows: on-Site NAPL, off-Site surface water NAPL, and Area A soil.

4.1.1 On-Site NAPL

Section 2.2.1 identified on-Site NAPL as a media of interest for the Site. Although there are no direct contact receptors for ground water, NYSDEC considers the presence of NAPL on top of the water table to constitute an impact to the ground water (NYSDEC, 1994a). While NAPL at the Site may be a source of dissolved constituents to the ground water, the concentrations of the dissolved constituents found during the RI were relatively low and suggest that the NAPL is not highly soluble. Furthermore, it is suspected that an off-site upgradient source may have a more significant impact on the ground water at the Site than the Site itself. The OU-I specific remedial action objective for the on-Site NAPL will be to mitigate the potential impact to ground water posed by NAPL, to the extent practicable.

During the RI, the extent of on-Site NAPL was delineated. Figures 1-8 and 1-9 present the distribution of on-Site NAPL identified during the two RI product delineation rounds. Based on the information collected during the RI, it has been estimated that there are approximately 12,000 gallons of NAPL under the facility (see Appendix B for calculations).

To address the NAPL discovered at the Site, an on-Site product recovery pilot study was conducted in early 1993 and operation of a full scale on-Site automated product recovery system commenced in Areas C and D of the Site as an IRM in July 1994. A summary of the on-Site NAPL recovered during the pilot study and operation of the full scale product recovery system has been presented in Table 1-17. In total, approximately 3,265 gallons of NAPL has been recovered from Area C of the Site and 265 gallons of NAPL has been recovered from Area D of the Site as of 31 December 1994.

While automated product recovery has been successful in Area C, numerous operational difficulties have been encountered in Area D due to the viscous and variable nature of product found in this area. As a result of these problems and as approved by NYSDEC, automated product recovery in Area D was discontinued in November 1994. Additional testing is currently being conducted with Area D NAPL to determine modifications and/or revisions to the existing product recovery system.

4.1.2 Off-Site Surface Water NAPL

The OU-I specific remedial action objective for this media will be to prevent off-Site surface water NAPL exposure to fish in the Bronx River. NAPL seeps into the Bronx River from a 250 feet stretch of the southeast face of the Bronx River embankment. As of December 1994, approximately 22 yd^3 of off-Site surface water NAPL has been collected from the Bronx River. Approximately 0.25 yd^3 of surface water off-Site NAPL (i.e., solidified seep material) is recovered from the boom each week.

4.1.3 Area A Soil

NYSDEC considers the presence of chemicals in soil to pose a risk to ground water. Although the RA indicates that no unacceptable risks are posed by Site soil (ERM, 1992a), Insilco has agreed, at the request of NYSDEC, to address affected soils in areas where NAPL recovery is not currently being conducted, Area A (ERM, 1994a; NYSDEC, 1994b). The OU-I specific remedial action objective for Area A soil will be to address soils in Area A during NAPL recovery activities. The approximate extent of affected soil in Area A is 66 yd^3 (refer to Appendix B for calculations).

4.2 ALTERNATIVE I: NO ACTION

The National Contingency Plan (NCP), upon which the USEPA feasibility study guidance is based, recommends describing and evaluating a no action alternative as a measure of identifying the potential problems posed by a site if no remedial actions were to be implemented (NYSDEC, 1990, Section 5)(NCP, Section 300.68). Because Section 375-1.10(c) of the Inactive Hazardous Waste Disposal Site Remedial Program states that the remedy selection process for a site must not be inconsistent with the NCP, evaluation of a No Action Alternative has been included in this FS.

4.2.1 *Description*

Under the No Action alternative, existing access restrictions (e.g., Site pavement and building foundations) and use restrictions (e.g., existing City of Mount Vernon domestic well restrictions) would not be maintained and the existing IRM activities (i.e., on-Site NAPL and off-Site surface water NAPL recovery) would be discontinued.

4.2.2 *Evaluation*

In accordance with NYSDEC FS guidance (NYSDEC, 1990), USEPA RI/FS guidance (1988b) and Section 300.430 of the NCP, this alternative is evaluated for the seven criteria listed in Section 4.1.

4.2.2.1 *Overall Protection of Human Health and the Environment*

The RA indicated that the seep material (i.e., surface water NAPL) could represent a physical threat to aquatic life associated with the Bronx River (ERM, 1992a). Furthermore, the RA also stated that existing access restrictions and use restrictions would adequately ensure that no significant human exposures to Site ground water and soil would occur (ERM, 1992a).

As discussed in Section 2.4.4, the OU-I specific remedial action objectives include:

- <u>on-Site NAPL:</u> mitigating potential impacts to ground water posed by NAPL, to the extent practicable;

- off-Site surface water NAPL: preventing exposure to fish in the Bronx River; and
- Area A soil: addressing soils in Area A during NAPL recovery activities.

In addition, the overall Site remedial action objectives include maintaining the existing exposure barriers to direct human contact exposure with soil and ground water in all areas of the Site.

This alternative would not address the OU-I specific remedial action objectives or the overall Site remedial action objectives. In particular, on-Site and off-Site NAPL would not be removed and barriers to potential exposure to soil and ground water would not be maintained. As a result, the No Action alternative would not provide an adequate level of protection for human health and the environment and would not adequately address all of the remedial action objectives for the Site.

4.2.2.2 *Compliance with SCGs*

Table 2-1 lists the potential federal and state regulatory requirements which may be applicable or relevant and appropriate to remedial actions at the Site. While the majority of these SCGs and TBCs apply to actions which are not proposed under this alternative, regulations governing surface water discharges and bulk storage would apply to this alternative.

Because the NYSDEC Water Quality Regulations for Surface Waters prohibit the discharge of floatable materials to surface water bodies and this alternative does not address off-Site surface water NAPL, this alternative would not comply with all relevant and appropriate SCGs. In addition, this alternative would not comply with the NYSDEC Chemical Bulk Storage Regulations. This TBC requires corrective actions to be implemented after investigation of a suspected tank release. However, because this regulation is not provided in the

NYSDEC List of SCGs (Appendix A), it is considered to be a TBC; hence, consideration of this regulation in this FS is not mandatory.

The majority of the remaining SCGs and TBCs contained in Table 2-1 define responsibilities for hazardous waste treatment, storage and disposal facilities. Although some of the recovered product has been identified as a hazardous waste (i.e., characteristic hazardous waste), this alternative does not include recovery or disposal of this material. As a result, the NYSDEC hazardous waste regulatory requirements are not applicable or relevant and appropriate to this alternative.

4.2.2.3 Long Term Effectiveness and Permanence

Long-term effectiveness and permanence is measured by the magnitude of the residual risk and the adequacy and reliability of controls. Under this alternative, surface water off-Site NAPL would present an unacceptable long-term risk to fish in the Bronx River. The RA, approved by the NYSDEC, determined that soil and ground water were not media of interest because human exposure to these media did not exist. Although Site pavement and building foundations preclude human contact with soil and the absence of downgradient wells precludes human contact with ground water, provisions to maintain these restrictions should be maintained. Because this alternative does not include these provisions, the potential, although very small, exists for soil and/or ground water to present future risks. As a result, the long-term effectiveness of this alternative with regard to soil and ground water may be inadequate.

4.2.2.4 Reduction of Toxicity, Mobility or Volume

The No Action alternative would have no affect on the current toxicity, mobility or volume of the chemicals present in soil, NAPL or ground water.

4.2.2.5 *Short-Term Effectiveness*

Since there are no actions proposed for this alternative, there are no short term effects.

4.2.2.6 *Implementability*

Because no action would be taken, there are no implementability concerns posed by this alternative. This alternative would not prevent additional remedial actions to be taken, if needed.

4.2.2.7 *Cost*

The are no costs associated with implementation of this alternative.

4.3 *ALTERNATIVE II: ACCESS AND USE RESTRICTIONS*

4.3.1 *Description*

This alternative would entail providing access and use restrictions for the Site. As such, this alternative consists of the following technologies:

- Access Restrictions (Task No. 1)
- Use Restrictions (Task No. 2)

Task No. 1: Access Restrictions

Access restrictions would entail restricting access to soil located below the Site via maintenance of existing pavement and building foundations at the Site. This work would be on-going and would be conducted for a period of five years. This is consistent with CERCLA practice for evaluating Site conditions at five year intervals.

Task No. 2: Use Restrictions

Use restrictions would include: (1) restricting subsurface construction and utility work and disturbance of any cover constructed at the Site; and (2) restricting installation of domestic wells between the Site and the Bronx River (i.e., downgradient of the Site). The City of Mount Vernon Water District currently does not allow installation of private domestic wells within the water district boundaries. Use restrictions would be on-going and conducted for a period of five years. This is consistent with CERCLA practice for evaluating Site conditions at five year intervals.

4.3.2 *Evaluation*

In accordance with NYSDEC FS guidance (NYSDEC, 1990), USEPA RI/FS guidance (1988b) and Section 300.430 of the NCP, this alternative is evaluated for the seven criteria listed in Section 4.1.

4.3.2.1 Overall Protection of Human Health and the Environment

The RA indicated that the seep material (i.e., surface water NAPL) could represent a physical threat to aquatic life associated with the Bronx River (ERM, 1992a). Furthermore, the RA also stated that existing access restrictions and use restrictions would adequately ensure that no significant human exposures to Site ground water and soil would occur (ERM, 1992a).

As discussed in Section 2.4.4, the OU-I specific remedial action objectives include:

- on-Site NAPL: mitigating potential impacts to ground water posed by NAPL, to the extent practicable;
- off-Site surface water NAPL: preventing exposure to fish in the Bronx River; and

- Area A soil: addressing soils in Area A during NAPL recovery activities.

In addition, the overall Site remedial action objectives include maintaining the existing exposure barriers to direct human contact exposure with soil and ground water in all areas of the Site.

By maintaining existing barriers to soil and ground water exposure, this alternative would be protective of potential direct human contact impacts posed by soil and ground water and would address the overall Site remedial action objectives. However, this alternative would not provide sufficient protection to fish in the Bronx River related to potential exposures to off-Site surface water NAPL and would not address on-Site NAPL. As a result, this alternative would not provide an adequate protection level for the environment and would not address the OU-I specific remedial action objectives for the Site.

4.3.2.2 *Compliance with SCGs*

Table 2-1 lists the potential federal and state regulatory requirements which may be applicable or relevant and appropriate to remedial actions at the Site. While the majority of these SCGs and TBCs apply to actions which are not proposed under this alternative, regulations governing surface water discharges and bulk storage would apply to this alternative.

Because the NYSDEC Water Quality Regulations for Surface Waters prohibit the discharge of floatable materials to surface water bodies and this alternative does not address off-Site surface water NAPL, this alternative would not comply with all relevant and appropriate SCGs. In addition, this alternative would not comply with the NYSDEC Chemical Bulk Storage Regulations. This TBC requires corrective actions to be implemented after investigation of a suspected tank release. However, because this regulation is not provided in the

NYSDEC List of SCGs (Appendix A), it is considered to be a TBC; hence, consideration of this regulation in this FS is not mandatory.

The majority of the remaining SCGs and TBCs contained in Table 2-1 define responsibilities for hazardous waste treatment, storage and disposal facilities. Although some of the recovered product has been identified as a D001 RCRA hazardous waste (i.e., characteristic hazardous waste), this alternative does not include recovery or disposal of this material. As a result, the NYSDEC hazardous waste regulatory requirements are not applicable or relevant and appropriate to this alternative.

4.3.2.3 *Long Term Effectiveness and Permanence*

These risk management controls would reduce the mobility of Site related constituents in soil and ground water. Site building foundations and pavement would be maintained to prevent access to Site soil. Notice of Site conditions to potential buyers and tenants has been provided and will continue to be provided. The ability of this alternative to continue to protect against potential risks is dependant on the effectiveness of the cover maintenance. If the cover (i.e., the building foundation and adjacent paved areas) is maintained properly it would function as intended and continue to provide protection against potential human health risks from Site soil.

Use restrictions would prevent construction activities that might increase the mobility of Site related chemicals and would prevent ingestion of Site ground water through well installation prohibitions. The existing use restrictions are reliable in preventing development of the property for any non-industrial purpose, such as residential, recreational or agricultural use. In addition, regional restrictions on the installation of wells to be used for water supply and the inaccessibility of downgradient off-Site areas for well installation are reliable methods to prevent ingestion of ground water.

While potential long-term risks posed by contact with soil and ground water would be mitigated by this alternative, off-Site surface water NAPL would continue to present an unacceptable long-term potential risk to fish in the Bronx River.

4.3.2.4 *Reduction of Toxicity, Mobility or Volume*

Continued containment of soil would be achieved by maintaining access restrictions to Site soil and the City of Mount Vernon monitoring well installation restrictions. The existing pavement and building foundation would continue to reduce the mobility of Site related chemicals in soil by serving as a cover mechanism, thereby providing a potential physical barrier to movement of soil. The pavement and foundation would also serve to prevent direct human contact with and inhalation of chemicals in soil.

The protection provided by the pavement and foundation would be reversible for the reasons discussed for long-term effectiveness. That is, if the pavement and foundation are not properly maintained or if future Site development disturbs this soil cover, chemicals in soil could be uncovered.

Furthermore, while use restrictions will prevent ingestion of ground water and direct human contact with ground water, this technology will not reduce the mobility, toxicity or volume of ground water. In addition, under this alternative no reduction in the toxicity, mobility or volume of the on-Site NAPL or off-Site surface water NAPL would be realized.

4.3.2.5 *Short-Term Effectiveness*

Pavement and foundation maintenance may generate small amounts of respirable particulates (dust). However, the respirable particulates that may be generated by maintenance activities would result from building and pavement surface disturbance and would not contain chemicals related to the NAPL at the

Site. The result would be a slight temporary increase of potential risk to community and workers during maintenance activities. Dust control measures would be used during these activities, as needed. Workers could also be protected by respirators, if needed, and by protective clothing.

Maintenance activities would be conducted on an as-needed basis. Site inspections would be conducted on a quarterly basis to evaluate the condition of the building foundations and Site pavement. Maintenance activities would be based upon the findings of these inspections. It is anticipated that pavement and building foundation maintenance activities would be conducted approximately once per year and would take one to two days to complete.

4.3.2.6 *Implementability*

No special technology, materials or labor would be required to complete the work proposed under this alternative. Pavement and foundation maintenance are proven technologies and are easily implementable from an engineering perspective. The integrity of the pavement and building foundation and their performance has been adequately addressing the overall Site remedial action objectives and would be monitored through periodic Site visits, inspection reports and maintenance activities in the future.

In addition, difficulties are not anticipated with regard to water supply restrictions. As discussed in Section 1.2.5, the City of Mount Vernon Water District does not allow the installation of private domestic wells within the Water District's boundaries in order to ensure the safety of the water supply (Westchester County Health Department, 1993).

4.3.2.7 *Cost*

The total cost of this alternative is estimated to be approximately $ 21,600. The total capital cost, including a 25 percent contingency, is $11,250. The total annual cost for this alternative is approximately $ 2,000. The present worth of the total annual cost for this alternative, based on a seven percent interest rate (USEPA, 1993f) and a 25% contingency, is approximately $ 10,350. As previously discussed, a five year time period was assumed for access and use restrictions. This time period is consistent with CERCLA practice for evaluating Site conditions at five year intervals. A detailed description of these costs is provided in Appendix D.

4.4 ALTERNATIVE III: ACTIVE ON-SITE PRODUCT RECOVERY AND PASSIVE OFF-SITE SURFACE WATER PRODUCT RECOVERY

4.4.1 Description

This alternative would entail providing both access and use restrictions for the Site, conducting on-Site product recovery, off-Site passive surface water product recovery, and passive soil venting in Area A of the Site. This alternative consists of the following tasks:

- Access Restrictions (Task No. 1);
- Use Restrictions (Task No. 2);
- Active On-Site Product Recovery (Task No. 3);
- Passive Off-Site Surface Water Product Recovery (Task No. 4); and
- Passive Soil Venting of Area A Soils (Task No. 5).

Access Restrictions (Task No. 1), Use Restrictions (Task No. 2), Active On-Site Product Recovery (Task No. 3) and Passive Off-Site Surface Water Product Recovery (Task No. 4) are currently being conducted as part of the IRM and on-going operations at the Site.

<u>Task No. 1: Access Restrictions</u>

Refer to Section 4.3.1 for a description of this task.

Task No. 2: Use Restrictions

Refer to Section 4.3.1 for a description of this task.

Task No. 3: Active On-Site Product Recovery

This task would entail active product recovery in Areas C and D of the Site. In Area C of the Site, this task would entail continued operation of the existing automated IRM product recovery system servicing this area of the Site. This system includes three product recovery wells, two to four product-only Spillbuster^{R} pumps, one 500 gallon above ground product storage tank for Area C product, piping, tubing and controls. It is anticipated that active product recovery would be conducted in Area C for approximately three years, until NAPL has been recovered to the extent practicable.

In Area D of the Site, this task would entail on-Site product recovery via either automated or manual product methods, if feasible. Operational difficulties have been encountered using automated product recovery methods in Area D due to the viscous and variable nature of product found in this area. As a result of these problems, automated product recovery in Area D was discontinued in November 1994 with NYSDEC approval. Additional testing is currently being conducted with Area D NAPL to evaluate modifications and/or revisions to the existing product recovery system. This work will continue to be conducted in conjunction with the IRM.

On-Site active product recovery will be discontinued after collection of on-Site NAPL, to the extent practical, has been completed. For cost estimation purposes, it has been estimated that on-Site product recovery will be conducted for approximately three years in both Areas C and D.

Task No. 4: Off-Site Passive Surface Water Product Recovery

This task will entail continued operation of the existing off-Site passive surface water product recovery IRM. This system utilizes a disposable 300 foot inner adsorbent boom along with an outer marine boom to contain and recover surface water NAPL entering the southeast embankment face of the Bronx River. Off-Site passive surface water product recovery will be discontinued once seepage of NAPL into the Bronx River downgradient of the Site has ceased. For cost estimation purposes, it has been estimated that the off-Site passive surface water product recovery system will be in operation for approximately three years.

Task No. 5: Passive Soil Venting of Area A Soils

Although the NYSDEC has agreed that the need for soil remediation will be determined after NAPL has been addressed (ERM, 1994a; NYSDEC, 1994b) and the RA stated that no significant direct contact exposures to Site soil are expected to occur under either current or projected future conditions, at NYSDEC's request a passive soil venting system will be installed in Area A since NAPL recovery is not being conducted in this area (NYSDEC, 1994a; NYSDEC, 1994b). This task will entail installation of a passive vent in the vicinity of soil boring location HP-6. The sampling data for Area A (Table 1-7) indicates elevated toluene concentrations were detected in soil boring HP-6 at a depth of 16 to 18 feet. This sample, which is located below the subsurface concrete slab previously used as a base for the former underground storage tanks, contained toluene at a concentration of 2,200 mg/kg.

The following remedial actions will be implemented as part of this remedial alternative: (1) soils below the subsurface concrete slab in Area A will be identified for passive soil venting; the passive vent will be placed below the subsurface concrete slab in Area A, extend up to the side of the building and vent to the atmosphere; and (2) the passive vent would be maintained for the duration of on-Site product recovery. These actions are consistent with the existing agreement with the NYSDEC (ERM, 1994a; NYSDEC, 1994b). Review of the analytical results for soil samples located adjacent to HP-6 (i.e., A-1 and A-2) indicates that the area of elevated toluene concentrations is limited to an area about 12 feet in diameter around boring HP-6.

The passive vent system will include a passive vent well, above ground vent piping and vapor controls, if required. The passive vent well would be installed to a depth of approximately 20 feet, screened from 15 feet to 20 feet and constructed out of PVC piping. Based on a comparison of the projected emissions from the passive vent system and New York State Air Guide-1 ambient guideline concentration (AGC) and short-term guideline concentration (SGC) for toluene (see Appendix E for calculations and comparison), vapor controls would not be needed for the passive vent system. However, to confirm that emissions from this passive vent system do not result in unacceptable off-Site ambient air concentrations, an air emissions survey would be conducted after system start-up.

This survey would include: (1) collection of one air sample from the passive vent exhaust stack; (2) screening of the passive vent exhaust stack with a photoionization detector (PID) during sample collection; (3) analysis of this air sample for toluene; (4) estimation of both the maximum potential off-Site annual impact (C_P) and the maximum short-term off-Site impact (C_{ST}) for toluene using the air sampling results and the NYSDEC air dispersion formulas found in Appendix B of Air Guide-1; and (5) comparison of these maximum off-Site impacts to the NYS air quality guidance values (i.e., the AGC and SGC) for toluene. If this effort indicates that emissions from the passive vent system result in an unacceptable off-Site ambient air impact (i.e., the C_P for toluene is greater than its AGC or the C_{ST} for toluene is greater than its SGC), vapor controls would be installed on the passive vent system.

4.4.2 *Evaluation*

In accordance with NYSDEC FS guidance (NYSDEC, 1990), USEPA RI/FS guidance (1988b) and Section 300.430 of the NCP, this alternative is evaluated for the seven criteria listed in Section 4.1.

4.4.2.1 *Overall Protection of Human Health and the Environment*

The RA indicated that the seep material (i.e., surface water NAPL) could represent a physical threat to aquatic life associated with the Bronx River (ERM, 1992a). Furthermore, the RA also stated that existing access restrictions and use restrictions would adequately ensure that no significant human exposures to Site ground water and soil would occur (ERM, 1992a).

As discussed in Section 2.4.4, the OU-I specific remedial action objectives include:

- <u>on-Site NAPL:</u> mitigating potential impacts to ground water posed by NAPL, to the extent practicable;
- <u>off-Site surface water NAPL:</u> preventing exposure to fish in the Bronx River; and
- <u>Area A soil:</u> addressing soils in Area A during NAPL recovery activities.

In addition, the overall Site remedial action objectives include maintaining the existing exposure barriers to direct contact human exposure with soil and ground water in all areas of the Site.

This alternative would address the potential physical threat fish in the Bronx River, and would address all the OU-I specific remedial action objectives and all the overall Site remedial action objectives in the following manner:

- by continuing the use of the existing IRM on-Site product recovery system (Task No. 3) and the off-Site passive surface water product recovery system (Task No. 4), this alternative would address the OU-I specific remedial action objectives for both on-Site NAPL and off-Site surface water NAPL and would mitigate potential impacts caused by these media of interest; and

- by providing passive soil venting in Area A (Task No. 5), this alternative would address the OU-I specific remedial action objective for Area A soil; and

- by maintaining existing barriers to soil and ground water exposure (Task Nos. 1 and 2), this alternative would be protective of potential direct contact impacts posed by soil and ground water and would address the overall Site remedial action objectives for soil and ground water.

As a result, this alternative would provide an adequate level of protection for human health and the environment for this operable unit.

4.4.2.2 Compliance with SCGs

Table 2-1 lists the potential federal and state regulatory requirements which may be applicable or relevant and appropriate to remedial actions at the Site. The SCGs and TBCs that were considered to be relevant and appropriate for this alternative include the following:

<u>SCGs</u>

1. Waste Transporter Permits, 6 NYCRR Part 364;
2. Hazardous Waste Management Regulations, 6 NYCRR Part 370 through 373;
3. Land Disposal Restrictions, 6 NYCRR Part 376;

4. Inactive Hazardous Waste Disposal Site Remedial Program, 6 NYCRR Part 375;
5. Selection of Remedial Actions at Inactive Hazardous Waste Sites, TAGM HWR-90-4030;
6. NYSDEC Water Quality Regulations for Surface Waters and Ground Water, 6 NYCRR Parts 700 through 705;
7. Ambient Water Quality Standards and Guidance Values, TOGS 1.1.1;
8. Air Pollution Regulations General Provision and Permits and Certificates, 6 NYCRR Part 200 through 201;
9. Air Pollution Regulations General Prohibitions and Process Emission Sources, 6 NYCRR Part 211 through 212;
10. Air Quality Standards, 6 NYCRR Part 257; and
11. Guidelines for the Control of Toxic Ambient Air Contaminants, Air Guide I.

<u>TBCs</u>

1. Guidelines and Requirements for Workers at Hazardous Waste Sites (Subpart 120), OSHA 29 CFR 1910; and
2. Chemical Bulk Storage Regulations, 6NYCRR Part 595;
3. Safety and Health Regulations for Construction, OSHA; 29 CFR 1926; and
3. 1992-1993 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, ACGIH Threshold Limit Values.

Because this alternative includes a number of different technologies and tasks, a number of SCGs listed in Table 2-1 are applicable and many of the SCGs and TBCs are relevant and appropriate for this alternative. This alternative complies with the requirements of the Inactive Hazardous Waste Disposal Site Remedial Program (6 NYCRR Part 375), and the NYSDEC TAGM Selection of Remedial Actions at Inactive Hazardous Waste Sites (HWR-90-4030).

In addition, all activities will be conducted in accordance with the Guidelines and Requirements for Workers at Hazardous Waste Sites (Subpart 120), the Safety and Health Regulations for Construction, and the ACGIH Threshold Limit Values. To that end, as part of the IRM, air sampling was conducted in December 1994 to confirm that the concentrations of constituents in the air related to the former operations at the facility after implementation of the IRM do not present a health hazard to an adult worker. Results from this effort will be contained in the SRI Report to be submitted to NYSDEC for review and approval.

Storage, transport, treatment and disposal of any recovered product characterized as RCRA hazardous waste would comply with the requirements contained in the regulations pertaining to management of hazardous waste (i.e., Waste Transporter Permits (6 NYCRR Part 364), Hazardous Waste Management Regulations (6 NYCRR Part 370 through 373) and Land Disposal Restrictions (6 NYCRR Part 376)) and the regulatory requirements for chemical bulk storage (6NYCRR Part 595). As such, the substantive requirements of any required permits will be met. In accordance with Section 375-1.7 of the Inactive Hazardous Waste Disposal Site Remedial Program regulation, NYSDEC permits are not required for remedial actions that are: (1) on-site; (2) satisfies all the substantive requirements of the permit; and (3) selected by a process complying with the public participation program requirements of Section 375-1.5, to the extent applicable.

Off-Site passive surface water product recovery activities would comply with the SCGs pertaining to surface water (i.e., NYSDEC Water Quality Regulations for Surface Waters (6 NYCRR Parts 700 through 705), and Ambient Water Quality Standards and Guidance Values (TOGS 1.1.1)). Through collection of off-Site surface water product, the narrative surface water standards for floatable materials will be met.

Operation of the passive soil venting system would comply with the SCGs and TBCs pertaining to air quality and air pollution control (i.e., Air Pollution Regulations General Provision and Permits and Certificates (6 NYCRR Part 200 through 201), Air Pollution Regulations General Prohibitions and Process Emission Sources (6 NYCRR Part 211 through 212), Air Quality Standards (6 NYCRR Part 257) and Guidelines for the Control of Toxic Ambient Air Contaminants (Air Guide I)). Standards contained in these regulations and guidance documents will be complied with, the substantive requirements of air pollution control permits will be met and, if required, air pollution control equipment will be installed for the passive soil venting system.

4.4.2.3 *Long Term Effectiveness and Permanence*

Long-term effectiveness and permanence is measured by the magnitude of the residual risk and the adequacy and reliability of controls. Implementation of this alternative would remove on-Site NAPL and mitigate the off-Site surface water NAPL potential impact to wildlife. Off-site treatment, if needed, and subsequent off-site disposal of this material would also reduce any potential long term risks attributable to these materials.

In addition, access and use restrictions would reduce the mobility of Site related chemicals in soil since use restrictions would prevent construction activities that might create the mobility of Site related chemicals. The use restriction is reliable in preventing development of the property for any non-industrial purpose. The reliability of the pavement and building foundation to prevent access to Site soil depends on how well these covers are maintained. The pavement and building foundation may require periodic repair based on quarterly inspections. Because the City of Mount Vernon maintains domestic well use restrictions and the downgradient property has limited access, the reliability of use restrictions to prevent ground water contact is high.

4.4.2.4 *Reduction of Toxicity, Mobility or Volume*

Through product recovery and off-Site disposal, this alternative would reduce the toxicity, mobility and volume of on-Site NAPL and off-Site surface water NAPL. In addition, the mobility and volume of VOCs in Area A soil would be reduced (via passive soil venting) and the mobility of chemicals in Site soil and ground water would be reduced (via access restrictions and use restrictions) by implementation of this alternative.

4.4.2.5 *Short-Term Effectiveness*

Possible short-term exposures could result from the following activities:

To community and workers: product recovery and passive soil venting.
To community and the environment: recovered product transportation.

There is a potential for a temporary increase of risk to the community and workers due to VOC emissions during product recovery activities and passive soil venting. As previously discussed, air sampling has been conducted, as part of the IRM, to confirm that the concentrations of constituents in the air related to the former operations at the facility after implementation of the on-Site product IRMs do not present a health hazard to an adult worker. Should these results indicate unacceptable risks to workers, workers would be provided with respirators (if needed) and protective clothing. In addition, if required, vapor controls will be installed on the passive vent system to mitigate any short-term effects to the community.

Potential short-term risks to the community would be posed by this alternative from transportation of product to a off-Site disposal facilities. Automotive related injuries, as well as potential exposure of spilled material to the community and the environment along the transportation route would be potential concerns.

The estimated time periods during which the Alternative III tasks would occur are as follows: on-Site product recovery (3 years); off-Site passive surface water product recovery (3 years); and passive soil venting of Area A soils (3 years). Because these tasks would be conducted simultaneously, the overall time period for completion of these activities is approximately three years.

4.4.2.6 *Implementability*

With the exception of high viscosity active NAPL recovery, no special technologies, materials, or labor would be required to complete the work proposed under this alternative. Pavement and foundation repair, passive surface water product recovery, and passive soil venting are proven technologies and are easily implementable from an engineering perspective. There are no unknown design factors or technology difficulties associated with using these technologies.

Active product recovery of high viscosity on-Site NAPL (i.e., Area D NAPL) may require implementation of more specialized recovery technologies. Because of the properties of this NAPL (i.e., high viscosity, propensity to solidify when subjected to air), conventional product-only recovery pumps have not been effective in addressing this NAPL. As a result, recovery system modifications and manual product recovery technologies are being investigated for this material.

In summary, with the exception of Area D NAPL, the services, material and technologies needed to implement the various work components of this alternative, are readily available, technically feasible and reliable. The permits (off-site only) and regulatory approvals needed prior to beginning this work are not difficult to obtain and contractors and specialists needed to perform the key components of this alternative are readily available.

4.4.2.7 *Cost*

The total cost of this alternative is estimated to be approximately $ 971,500. The total capital cost is $ 290,700. Where applicable, this cost includes a 65 percent increase over base costs to reflect the following additional cost factors: mobilization, Site preparation and demobilization (10 percent); engineering design and construction oversight (30 percent); and contingency (25 percent). The total annual cost for this alternative is approximately $ 207,900. The present worth of the total annual cost for this alternative, based on a seven percent interest rate (USEPA, 1993f) and a 25% contingency, is approximately $ 544,600. A detailed description of these costs is provided in Appendix D.

5.0 COMPARISON OF ALTERNATIVES AND SELECTION OF PREFERRED REMEDIAL ACTION ALTERNATIVE

This section uses the results of the evaluation of remedial action alternatives presented in Section 4.0 to compare alternatives and select a preferred remedial action alternative. The NCP (40 CFR 300.430) and the NYSDEC FS guidance (NYSDEC, 1990) require that alternatives be developed that protect human health and the environment by eliminating, reducing and controlling potential risks posed through each pathway by a site. As discussed in Section 1.0, the only risk identified in the RA was potential physical harm posed to fish in the Bronx River.

With respect to developing remedial alternatives, the NCP provides for a review of remedial alternatives that: (1) involve little or no treatment but protect human health and the environment by preventing or controlling potential exposures to hazardous substances through engineering or institutional controls {40 CFR 300.430(e)(3)(ii)}; and (2) reduce the toxicity, mobility or volume of hazardous substances through treatment {40 CFR 300.430(e)(3)(i)}.

The NCP also recommends considering innovative treatment technologies if the technology offers the potential for comparable or superior performance or implementability; or fewer or lesser adverse impacts or lower costs than demonstrated treatment technologies {40 CFR 300.430(e)(4). Last, the NCP requires that a no action alternative be developed and evaluated {40 CFR 300.430(e)(6)}.

The no action approach evaluated in this FS in Alternative I complies with the NCP requirement to evaluate the applicability of not implementing additional remedial actions at the Site. Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) complies with the NCP requirements to evaluate, where applicable, alternatives which reduce the toxicity, mobility or volume of hazardous substances. Furthermore, Alternative II (Access and Use Restrictions) and Alternative III (Active On-Site Product Recovery and

Passive Off-Site Surface Water Product Recovery) comply with the NCP requirement to evaluate alternatives which protect public health or the environment through engineering or institutional controls.

No innovative treatment technologies were identified that would perform better, reduce to a greater extent adverse impacts from implementation or cost less than the technologies used in this FS to develop remedial action alternatives. Due to access limitations, the physical characteristics and the chemical composition of the NAPL, the number of available technologies was limited and emerging (i.e., not fully demonstrated) technologies were not applicable to conditions at the Site. A detailed description of technologies evaluated for this OU-I FS and a discussion of the reasons these technologies are not appropriate for use at the Site is presented in Section 3.0.

Each of the alternatives were evaluated for the seven items identified in the NCP {40 CFR 300.430(e)(9)} and the NYSDEC FS guidance (NYSDEC, 1990) as performance criteria to be considered during the preparation of a feasibility study. The NYSDEC FS guidance also identified an additional criteria, community acceptance, which is to be evaluated by the NYSDEC after a feasibility study has been reviewed by interested parties in the community.

Two of the initial seven performance criteria are considered threshold criteria. That is, alternatives must: (1) protect human health and the environment; and (2) comply with SCGs, unless a waiver is justified. The remaining five criteria are referred to as primary balancing criteria and address the following issues:

1. How will the remedial actions perform in the future (long-term effectiveness)?
2. Does the alternative reduce the toxicity, mobility or volume of hazardous substances?
3. Does the implementation of the alternative create adverse impacts (short-term effectiveness)?

4. Can the alternative be implemented (implementability)?

5. What is the total cost of the alternative?

Addressing these criteria for each alternative provided a comparative analysis by which a preferred remedial alternative was selected. A summary of the evaluation performed in Section 4.0 for each of the seven criteria, emphasizing and comparing the particular advantages or disadvantages of each alternative for specific criteria, is provided in Sections 5.1 through 5.7. Section 5.8 uses the conclusions drawn in Section 4.0 and summarized below to compare alternatives and select a preferred remedial action alternative.

As part of this analysis, scoring of each alternatives ability to address the above seven criteria was conducted in accordance with NYSDEC FS guidance (NYSDEC, 1990). Scoring sheets for each alternative are provided in Appendix F and a summary of the scores for the alternatives is presented as Table 5-1. In scoring these alternatives, the implementability of the major components of each alternative were considered (e.g., active on-Site product recovery and passive off-Site surface water product recovery for Alternative III).

5.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The RA indicated that the seep material (i.e., surface water NAPL) could represent a physical threat to aquatic life associated with the Bronx River (ERM, 1992a). In addition, the OU-I FS remedial action objectives include:

- on-Site NAPL: mitigating potential impacts to ground water posed by NAPL, to the extent practicable;
- off-Site surface water NAPL: preventing exposure to fish in the Bronx River; and
- Area A soil: addressing soils in Area A during NAPL recovery activities.

In addition, the overall Site remedial action objectives include maintaining the existing exposure barriers to direct contact exposure with soil and ground water in all areas of the Site.

Alternative I (No Action) would not address the OU-I specific remedial action objectives or the overall Site remedial action objectives. In particular, on-Site NAPL and off-Site surface water NAPL would not be removed and barriers to potential exposure to soil and groundwater would not be maintained. As a result, the No Action alternative would not provide an adequate level of protection for human health and the environment and would not adequately address the remedial action objectives for the Site.

By maintaining existing barriers to soil and ground water exposure, Alternative II (Access and Use Restrictions) would be protective of potential direct contact impacts posed by soil and ground water and would address the overall Site remedial action objectives. However, this alternative would not provide sufficient protection to fish in the Bronx River related to potential exposures to off-Site surface water NAPL and would not address NYSDEC's remedial action objective for on-Site NAPL. As a result, this alternative would not provide an adequate level of protection for the environment and would not address the OU-I specific remedial action objectives for the Site.

Finally, Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would address both the OU-I specific and the overall Site remedial action objectives, and provide an adequate level of protection for human health and the environment by: (1) continuing the use of the existing IRM on-Site product recovery system and the off-Site passive surface water product recovery system; (2) maintaining existing barriers to soil and ground water exposure; and (3) providing passive soil venting in Area A.

The alternatives were scored using the procedure established by NYSDEC (NYSDEC, 1990). Refer to Appendix F for copies of the scoring worksheets for each alternative. The NYSDEC established a total of 20 points for an alternatives ability to protect human health and the environment. The protection of human health and the environment scores for Alternative I (No Action) and Alternative II (Access and Use Restrictions) were both 11 out of 20 available points. The protection of human health and the environment score for Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Recovery) was 20 out of 20 available points.

5.2 *COMPLIANCE WITH SCGs*

Table 2-1 contains a list of potential SCGs and TBCs for current Site conditions and for remedial actions that were considered in Section 4.0. Compliance with SCGs, like the need to protect human health and the environment, is a threshold criteria that determines whether an alternative satisfies regulatory and risk management requirements. In addition to SCGs, TBCs have also been identified for the Site; however, as discussed in Section 2.0, SCGs do not have the same weight as SCGs and, thus, consideration of TBCs is not required in the FS procedure. In accordance with NYSDEC procedures, TBCs have been identified as regulations and guidance documents not identified in the NYSDEC listing of SCGs (Appendix A).

The NYSDEC Water Quality Regulations for Surface Waters prohibit the discharge of floatable materials to surface water bodies and neither Alternative I (No Action) nor Alternative II (Access and Use Restrictions) address off-Site surface water NAPL. As a result, neither of these alternatives would comply with all relevant and appropriate SCGS. In addition, these alternatives would not comply with the NYSDEC Chemical Bulk Storage Regulations. This TBC requires corrective actions to be implemented after investigation of a suspected tank release. However, because this regulation is not provided in the NYSDEC List of SCGs (Appendix A), it is considered to be a TBC; hence, consideration of this regulation in this FS is not mandatory.

As discussed in Section 4.4.2.2, Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would comply will all applicable or relevant and appropriate SCGs as defined by NYSDEC and with all the TBCs identified in this FS for the Site.

The alternatives were scored using the procedure established by NYSDEC (NYSDEC, 1990). Refer to Appendix F for copies of the scoring worksheets for each alternative. The NYSDEC established a total of 10 points for an alternative's ability to comply with SCGs. The compliance with SCGs scores for Alternative I (No Action) and Alternative II (Access and Use Restrictions) were both 6 out of 10 available points. The compliance with SCGs score for Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Recovery) was 10 out of 10 available points.

5.3 LONG-TERM EFFECTIVENESS

Long-term effectiveness and permanence is measured by the magnitude of the residual risk and the adequacy and reliability of controls. Under Alternative I (No Action) and Alternative II (Access and Use Restrictions), surface water off-Site NAPL would present an unacceptable long-term risk to fish in the Bronx River. Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery), through off-Site surface water product recovery, would provide an adequate long-term level of protection to fish in the Bronx River.

Furthermore, the RA, which was approved by the NYSDEC, determined that soil and ground water were not media of interest because human exposure to these media did not exist. Although Site pavement and building foundations preclude human contact with soil and the absence of downgradient wells precludes human contact with ground water, provisions to maintain these restrictions are needed. Because Alternative I (No Action) does not include these provisions, the potential exists for soil and/or ground water to present potential future risks. As a result, the long-term effectiveness of Alternative I (No Action) with regard to soil and ground water may not be adequate. However, Alternative II (Access and Use Restrictions) and Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would continue to eliminate the potential exposure pathways for human contact with on-Site soil and groundwater, assuming the pavement and building foundations are properly maintained, and would continue to provide a level of protection against potential human health risks over the long-term.

Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would provide long-term effectiveness and permanence for all media of concern, and consequently would provide a greater degree of protection to human health and the environment than Alternative I (No Action) and Alternative II (Access and Use Restrictions).

The alternatives were scored using the procedure established by NYSDEC (NYSDEC, 1990). Refer to Appendix F for copies of the scoring worksheets for each alternative. The NYSDEC established a total of 15 points for an alternative's long-term effectiveness. The long-term effectiveness scores for Alternative I (No Action) and Alternative II (Access and Use Restrictions) were both 6 out of 15 available points. The long-term effectiveness score for Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Recovery) was 13 out of 15 available points.

5.4 *REDUCTION OF TOXICITY, MOBILITY OR VOLUME*

Alternative I (No Action) would have no affect on the current toxicity, mobility or volume of the chemicals present in soil, NAPL or ground water. Alternative II (Access and Use Restrictions) and Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would affect a reduction in the mobility of Site related chemicals in soil through maintenance of the existing Site pavement and building foundations. These soil covers (i.e., pavement and building foundations) would provide a potential physical barrier to movement of Site chemicals in soil and would also serve to prevent direct contact with and inhalation of chemicals in soil. In addition, Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would reduce both the toxicity and volume of affected media in Area A via passive soil venting.

Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would affect a reduction in the toxicity, mobility and volume of on-Site NAPL and off-Site surface water NAPL. This would be accomplished through removal of on-Site NAPL and off-Site surface water NAPL and off-Site disposal of these recovered materials.

In conclusion, by providing a reduction in the toxicity, mobility and volume of on-Site NAPL and off-Site surface water NAPL, Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would provide a higher level of protection than Alternative I (No Action) and Alternative II (Access and Use Restrictions).

The alternatives were scored using the procedure established by NYSDEC (NYSDEC, 1990). Refer to Appendix F for copies of the scoring worksheets for each alternative. The NYSDEC established a total of 15 points for an alternative's ability to reduce the toxicity, mobility or volume of chemicals present. The reduction of mobility, toxicity or volume scores for Alternative I (No Action) and Alternative II (Access and Use Restrictions) were both 0 out of 15 available points. The reduction of mobility, toxicity or volume score for Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Recovery) was 15 out of 15 available points.

5.5 SHORT-TERM EFFECTIVENESS

Short-term effectiveness refers to the potential effects and related risks associated with the implementation of the remedy. These potential short-term risks are limited to the period of remedial activities, ranging from two days for a typical pavement or building repair related to access restrictions (Alternative II) to three years for active on-Site product recovery and passive off-Site surface water product recovery (Alternative III). Since there are no actions proposed for the No Action alternative (Alternative I), there are no short-term effects. Under Alternative II (Access and Use Restrictions) and Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery), there is a potential for a temporary increase in potential risk to workers during building foundation and pavement maintenance activities. These potential exposures would be mitigated by protective clothing and respirators, if needed.

In addition, there is a potential for a temporary increase of risk to the community and workers due to VOC emissions during product recovery activities and passive soil venting (Alternative III). Air sampling has been conducted, as part of the IRM, to confirm that the concentrations of constituents in the air related to the former operations at the facility after implementation of the on-Site product IRM does not present a health hazard to an adult worker. Should these results indicate unacceptable risks to workers, workers would be provided with respirators (if needed) and protective clothing. In addition, if required, vapor controls will be installed on the passive vent system defined in Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) for Area A soils to mitigate any short-term effects to the community.

Potential short-term risks to the community would be posed by Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) from transportation of product to a off-Site disposal facilities. Automotive related injuries, as well as potential exposure to the community and the environment of spilled material along the transportation route would be potential concerns.

In summary, there are no short-term effects related to the No Action alternative (Alternative I) since there are no remedial actions associated with this alternative.

In addition, there is a potential for only a slight increase in short-term risks related to implementation of Alternative II (Access and Use Restrictions). Potential short-term effects from air emissions posed by Alternative II (Access and Use Restrictions) and III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) can be mitigated using personnel protection measures or by controlling dust. Accidents and spills related to transportation components of Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) also present a potential for short-term effects.

The alternatives were scored using the procedure established by NYSDEC (NYSDEC, 1990). Refer to Appendix F for copies of the scoring worksheets for each alternative. The NYSDEC established a total of 10 points for an alternative's short-term effectiveness. The short-term effectiveness score for Alternative I (No Action) was 10 out of 10 available points and the score for Alternative II (Access and Use Restrictions) was 9 out of 10 available points. The short-term effectiveness score for Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Recovery) was 7 out of 10 available points.

5.6 IMPLEMENTABILITY

Implementability concerns are related to potential technical and institutional problems associated with a remedial action alternative. Since there are no actions proposed for the No Action alternative (Alternative I), there are no implementability concerns. There are also no technical implementability concerns related to Alternative II (Access and Use Restrictions). However, there are a few implementability concerns related to Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery). The following statements regarding implementability are applicable to the key components of Alternative II (Access and Use Restrictions) and Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery):

- with the possible exception of active product recovery of high viscosity on-Site NAPL (i.e., Area D NAPL), no special technologies, materials or labor would be required to complete the work associated with these remedial actions;

- pavement and building foundation repair, passive surface water product recovery and passive soil venting are proven technologies and are easily implementable from an engineering perspective;

- the consistency with which access restrictions are maintained can be determined through periodic on-site inspections;

- difficulties are not anticipated with regard to the continued implementation of existing water supply restrictions;

- there are no unknown design factors or technical difficulties associated with using these technologies; and

- there should be no difficulties in obtaining the necessary approvals from USEPA, NYSDEC or from other regulatory agencies to implement these remedial actions.

With regard to Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery), if after testing it is determined that the recovered product is a RCRA characteristic D001 (i.e., ignitable) waste, land disposal of this material would not be permitted unless the material is treated via either combustion or organics recovery in accordance with the Land Disposal Restrictions. There are no implementability concerns associated with off-Site RCRA permitted disposal since disposal facilities for this material are readily available.

The alternatives were scored using the procedure established by NYSDEC (NYSDEC, 1990). Refer to Appendix F for copies of the scoring worksheets for each alternative. The NYSDEC established a total of 15 points for an alternative's implementability. The implementability score for Alternative I (No Action) was 12 out of 15 available points, the score for Alternative II (Access and Use Restrictions) was 14 out of 15 available points and the score for Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Recovery) was 13 out of 15 available points.

5.7 *COST*

Detailed cost estimates for these alternatives, with the exception of the No Action alternative, are presented in Appendix D. The capital costs and the present worth of annual costs for Alternative II (Access and Use Restrictions) were effectively equal. The present worth of the annual costs for Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) were considerably higher than the capital costs. Annual costs (i.e., the present worth) accounted for 70% of the total present worth cost for Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery).

In a comparison to the other alternatives:

- capital costs for Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) were approximately 26 times higher than capital costs for Alternative II;
- annual costs for Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) were approximately 103 times higher than annual costs for Alternative II (Access and Use Restrictions); and
- the total present worth of all costs for Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product

Recovery) was approximately 45 times higher than the total present worth of all costs for Alternative II (Access and Use Restrictions).

The alternatives were scored using the procedure established by NYSDEC (NYSDEC, 1990). Refer to Appendix F for copies of the scoring worksheets for each alternative. The NYSDEC established a total of 15 points for an alternative's cost. In accordance with NYSDEC guidance, the alternative with the lowest cost (i.e., Alternative I (No Action)) was given a score of 15 out of 15 available points and the alternative with the highest cost (i.e., Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery)) was given a score of 0 out of 15 available points. Cost scores for other alternatives (e.g., Alternative II (Access and Use Restrictions)) were then given scores inversely proportional to their present worth costs. Based on this analysis, Alternative II (Access and Use Restrictions) was given a score of 14.7 out of 15 available points.

5.8 SELECTION OF PREFERRED REMEDIAL ACTION ALTERNATIVE

As discussed in Section 2.4, the RA indicated that the seep material (i.e., surface water NAPL) could represent a physical threat to aquatic life associated with the Bronx River (ERM, 1992a). Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery), which mitigates potential risks to fish in the Bronx River posed by off-Site surface water NAPL, provides the highest degree of protection to human health and the environment. Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) scored 20 out of 20 available points for this criteria; Alternatives I (No Action) and Alternative II (Access and Use Restriction) scored only 11 out of 20 available points for this criteria.

With respect to the second threshold criteria, Compliance with SCGs, only Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) complies with all the SCGs relating to the Site and to remedial actions posed by the alternatives. In addition, this alternative also complied with the TBCs identified in this FS for the Site. Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) scored 10 out of 10 for this criteria; Alternatives I (No Action) and Alternative II (Access and Use Restriction) scored 6 out of 10 available points for this criteria.

A comparison of the five balancing criteria for each of the alternatives evaluated, except the No Action alternative (Alternative I), is presented below.

<u>Long-Term Effectiveness and Permanence</u>. Both Alternative II (Access and Use Restrictions) and Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would continue to provide a long-term protection against potential risks posed by Site and ground water. However, only Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would provide long-term protection to fish in the Bronx River by mitigating potential impacts caused by off-Site surface water NAPL. Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) scored 13 out of 15 available points for this criteria; Alternatives I (No Action) and Alternative II (Access and Use Restriction) scored 6 out of 15 available points for this criteria.

<u>Reduction of Mobility, Toxicity or Volume</u>. Both Alternative II (Access and Use Restrictions) and Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would provide a reduction in the mobility of chemicals in Site soil. However, only Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) would provide a reduction in the mobility, toxicity and volume of on-Site NAPL and off-Site surface water NAPL and would provide a reduction in toxicity and mobility for Area A soil. Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) scored 15 out of 15 for this criteria;

Alternatives I (No Action) and Alternative II (Access and Use Restriction) scored 0 out of 15 available points for this criteria.

Short-term Effectiveness. Alternative II (Access and Use Restrictions) and Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) both present potential short-term effects to workers during building foundation and pavement activities. In addition, Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) also would present a potential for a temporary increase of risk to the community and workers due to VOC emissions during product recovery activities and passive soil venting and potential short-term risks to the community from transportation of product to a RCRA permitted off-Site disposal facilities. Potential short-term effects posed by air emissions generated during product recovery activities and passive soil venting would be mitigated by protective clothing and respirators and/or vapor controls, if needed. Alternative I (No Action) scored 10 out of 10 points for this criteria; Alternative II (Access and Use Restrictions) scored 9 out of 10 points for this criteria; and Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) scored 7 out of 10 available points for this criteria.

Implementability. Other than the product recovery in Area D, none of the alternatives present potential technical implementability problems. Active product recovery of Area D NAPL may require implementation of more specialized recovery technologies. Because of the properties of this NAPL (i.e., high viscosity, propensity to solidify when subjected to air), conventional product-only recovery pumps have not been effective in addressing this NAPL. Alternative I (No Action) scored 12 out of 15 available points for this criteria; Alternative II (Access and Use Restrictions) scored 14 out of 15 available points for this criteria; and Alternative III (Active On-Site Product Recovery and Passive Off-Site

Surface Water Product Recovery) scored 13 out of 15 available points for this criteria.

Cost. The total present worth of Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) is approximately 45 times the cost of Alternative II (Access and Use Restrictions). Alternative I (No Action) scored 15 out of 15 available points for this criteria; Alternative II (Access and Use Restrictions) scored 14.7 out of 15 available points for this criteria; and Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) scored 0 out of 15 available points for this criteria.

Although Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) has more significant short-term effects, presents more implementability problems and is considerably more expensive than Alternative I (No Action) and Alternative II (Access and Use Restrictions), benefits of Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) are as follows: (1) provides the highest degree of protection to human health and the environment; (2) complies with the SCGs and the TBCs identified in this FS for the Site; (3) provides the highest degree of long-term protection to human health and the environment; and (4) provides the greatest reduction in toxicity, mobility or volume of on-Site NAPL, off-Site surface water NAPL and Site chemicals in soil. The differences in the manner in which each alternative satisfies the seven criteria are demonstrated by the scores presented in Table 5-1. As previously discussed, the scoring worksheets are presented in Appendix F. As shown in Table 5-1, the total scores for these three alternatives were 60 (Alternative I), 60.7 (Alternative II) and 78 (Alternative III). Based on the above comparative analysis of alternatives and the scoring of the criteria, Alternative III (Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery) is the preferred remedial action alternative for this OU-I FS.

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Acronyms

ERM	ERM-Northeast
IRM	Interim Remedial Measures
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
RI/FS	Remedial Investigation/Feasibility Study
TAGM	NYSDEC Technical and Administrative Guidance Manual
USEPA	US Environmental Protection Agency

FIGURES

TITLE

SITE LOCATION MAP
FORMER RED DEVIL FACILITY
MT. VERNON, NY

PREPARED FOR

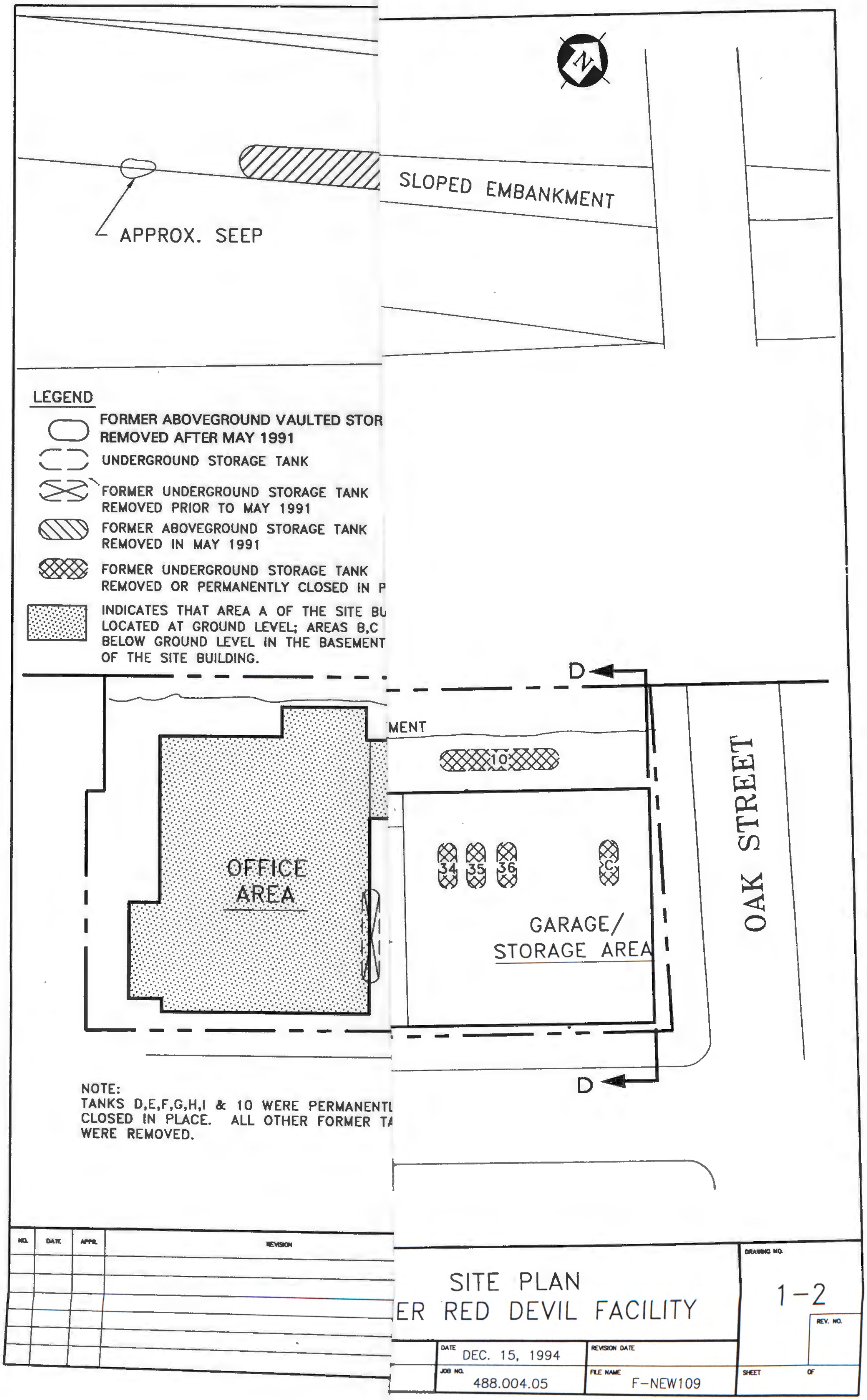
INSILCO CORPORATION

ERM–Northeast
Environmental Resources Management

SCALE	FIGURE
1" = 2000'	1–1
DATE 11/11/94	

DRAWN:	JOB NO.:	FILE NAME:	DATE
S.P.	488.004.05	GEN–V	11/11/94

SOURCE: U.S.G.S. Quadrangle Map, Mt. Vernon, NY


SLOPED EMBANKMENT
APPROX. SEEP
LEGEND
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REMOVED AFTER MAY 1991
UNDERGROUND STORAGE TANK
FORMER UNDERGROUND STORAGE TANK
REMOVED PRIOR TO MAY 1991
FORMER ABOVEGROUND STORAGE TANK
REMOVED IN MAY 1991
FORMER UNDERGROUND STORAGE TANK
REMOVED OR PERMANENTLY CLOSED IN P
INDICATES THAT AREA A OF THE SITE BU
LOCATED AT GROUND LEVEL; AREAS B,C
BELOW GROUND LEVEL IN THE BASEMENT
OF THE SITE BUILDING.
D
MENT
10
OFFICE
AREA
34
35
36
C
GARAGE/
STORAGE AREA
OAK STREET
D
NOTE:
TANKS D,E,F,G,H,I & 10 WERE PERMANENTL
CLOSED IN PLACE. ALL OTHER FORMER TA
WERE REMOVED.
NO.
DATE
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ER RED DEVIL FACILITY
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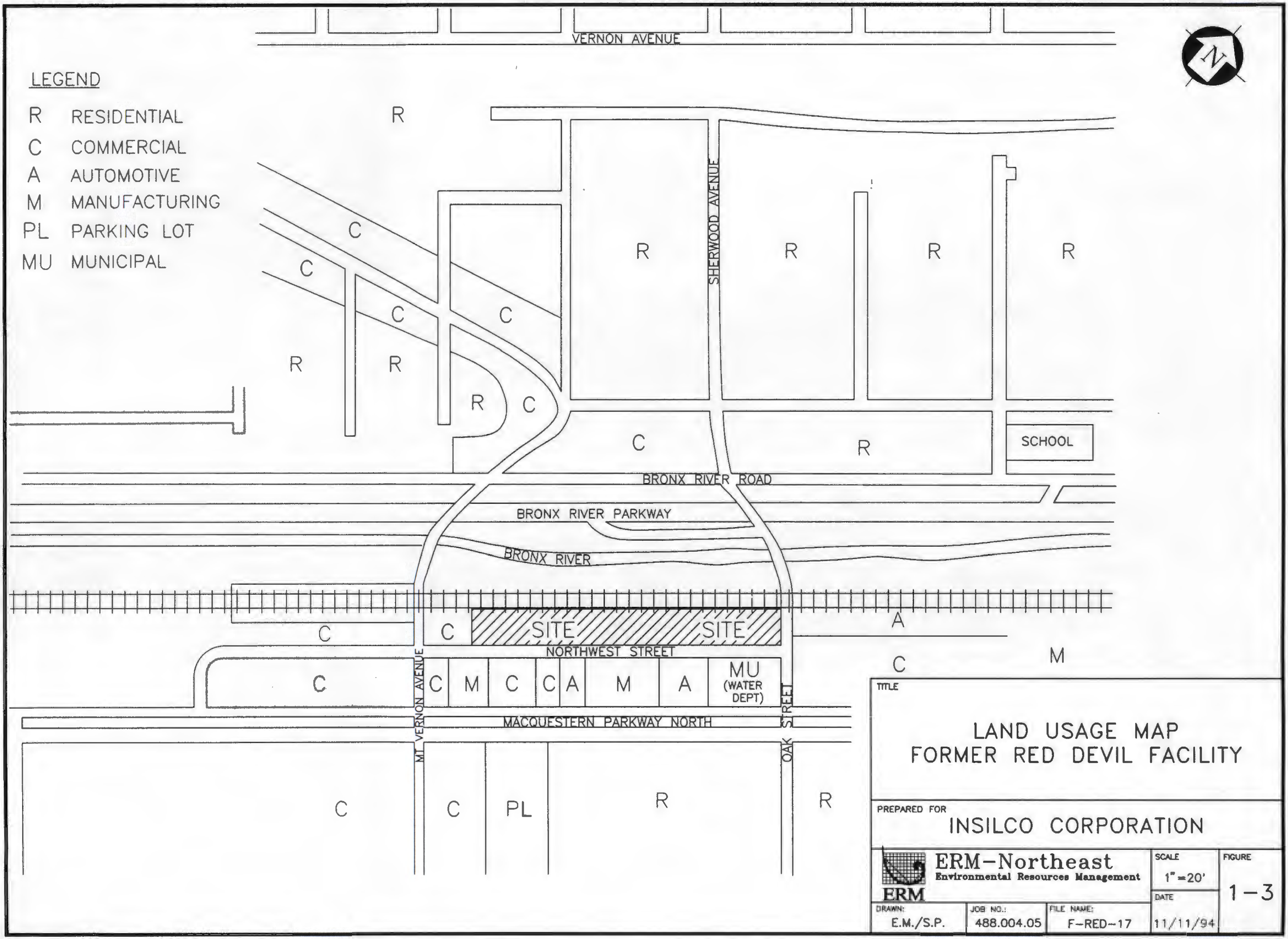

TITLE
LAND USAGE MAP
FORMER RED DEVIL FACILITY

PREPARED FOR
INSILCO CORPORATION

ERM-Northeast
Environmental Resources Management
ERM

SCALE	FIGURE
1" = 20'	1-3
DATE 11/11/94	

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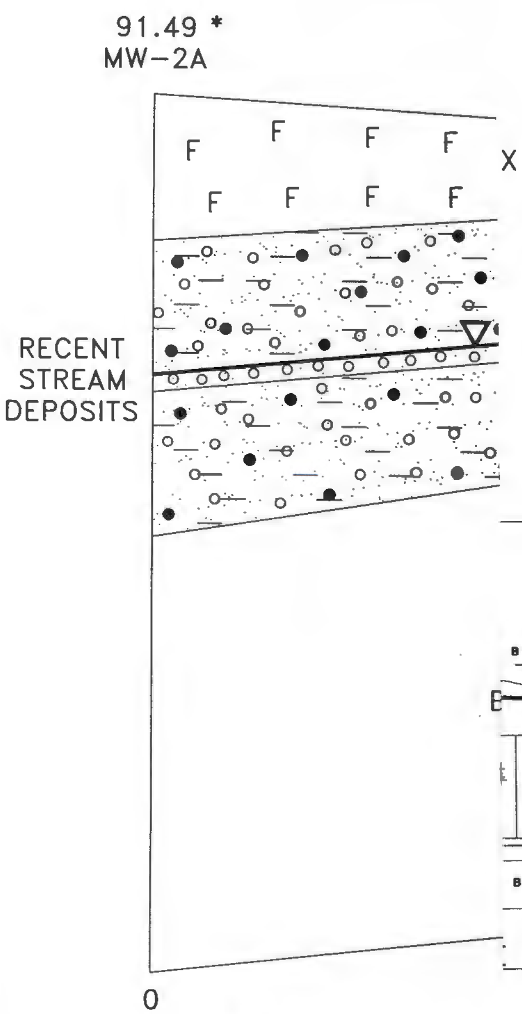
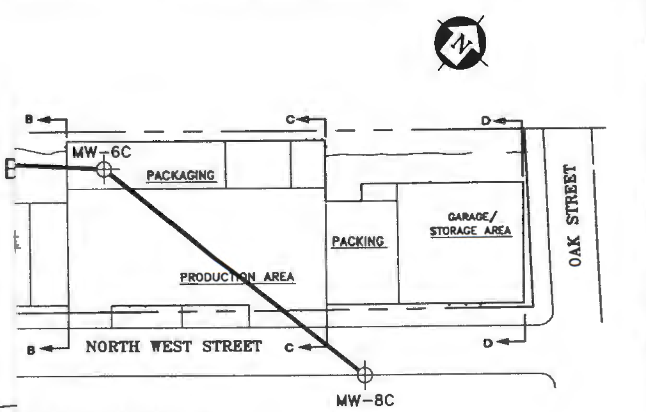


LEGEND

- F — FILL MATERIAL
- COARSE SAND
- SILT
- COARSE GRAVEL AND COBBLES
- SAND
- WATER TABLE



LOCATION MAP

* NOTE:
TOP OF MONITORING
IN FEET ABOVE MEAN

80' 160'

CALE IN FEET

NO.	DATE	APPR.	REVISION

CE DIAGRAM SHOWING
NERALIZED GEOLOGY
ER RED DEVIL FACILITY

DATE JAN. 27, 1995	REVISION DATE	DRAWING NO. 1-4	REV. NO.
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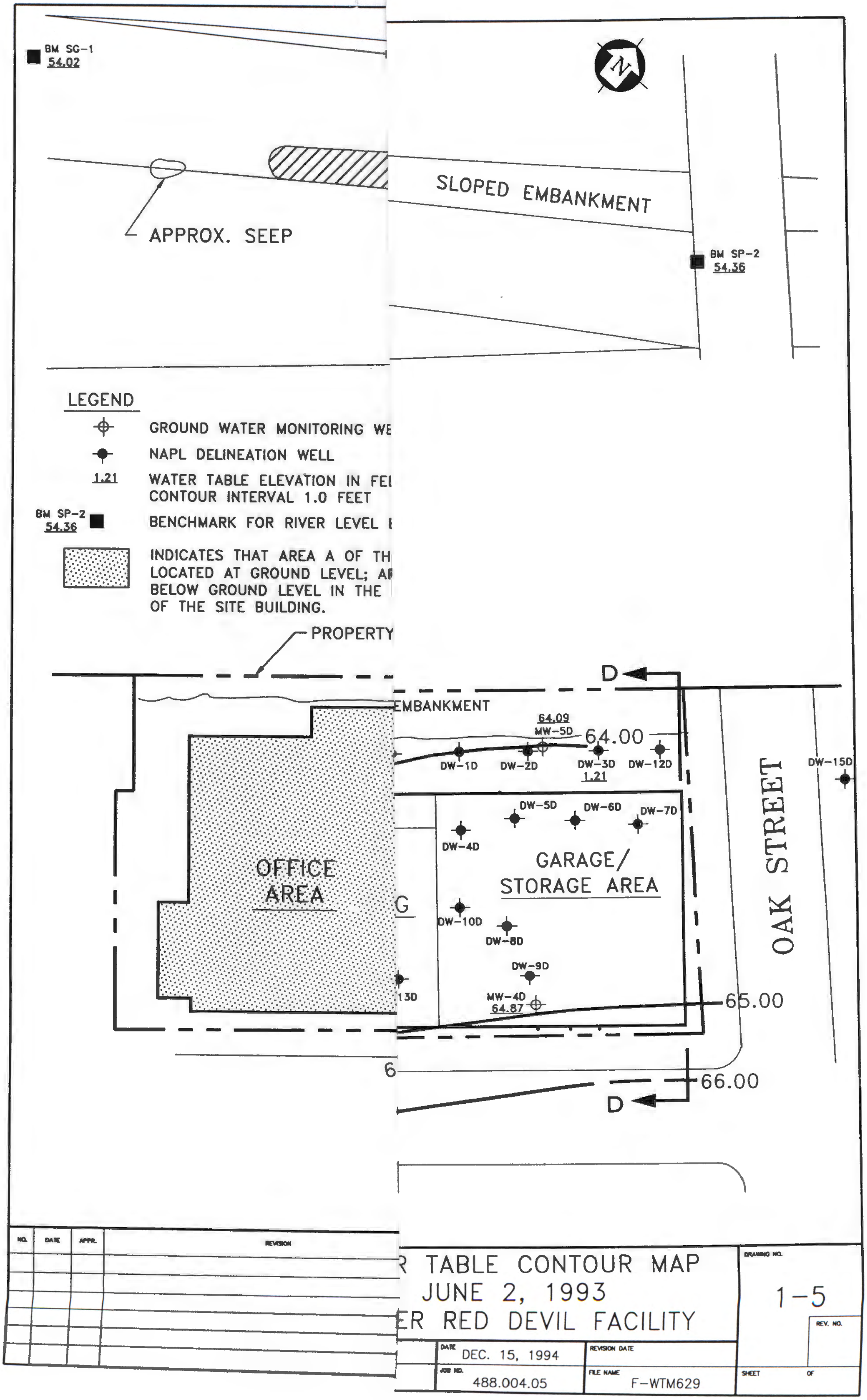
BM SG-1
54.02
APPROX. SEEP
SLOPED EMBANKMENT
BM SP-2
54.36
LEGEND
GROUND WATER MONITORING WE
NAPL DELINEATION WELL
1.21
WATER TABLE ELEVATION IN FE
CONTOUR INTERVAL 1.0 FEET
BM SP-2
54.36
BENCHMARK FOR RIVER LEVEL
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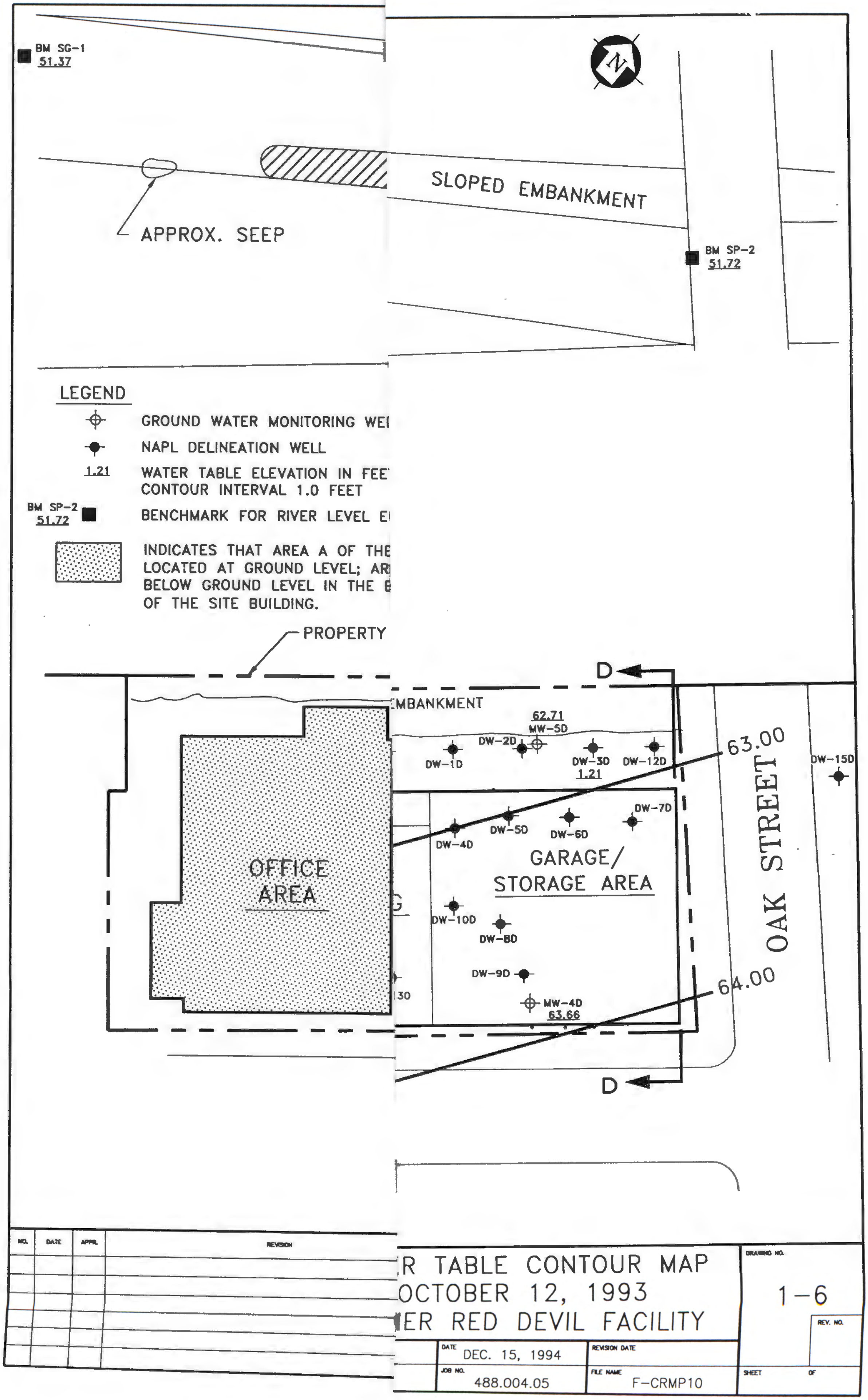
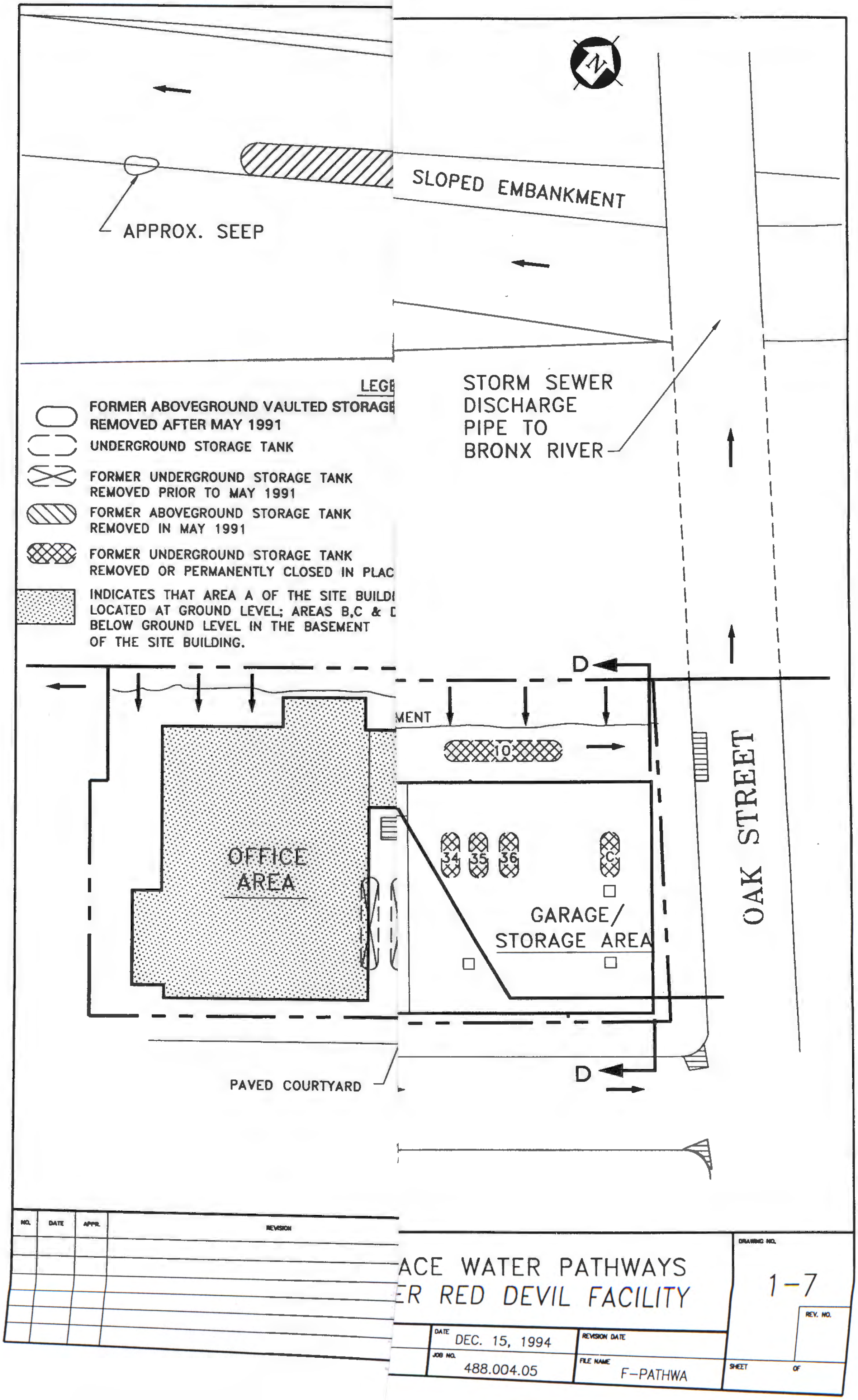
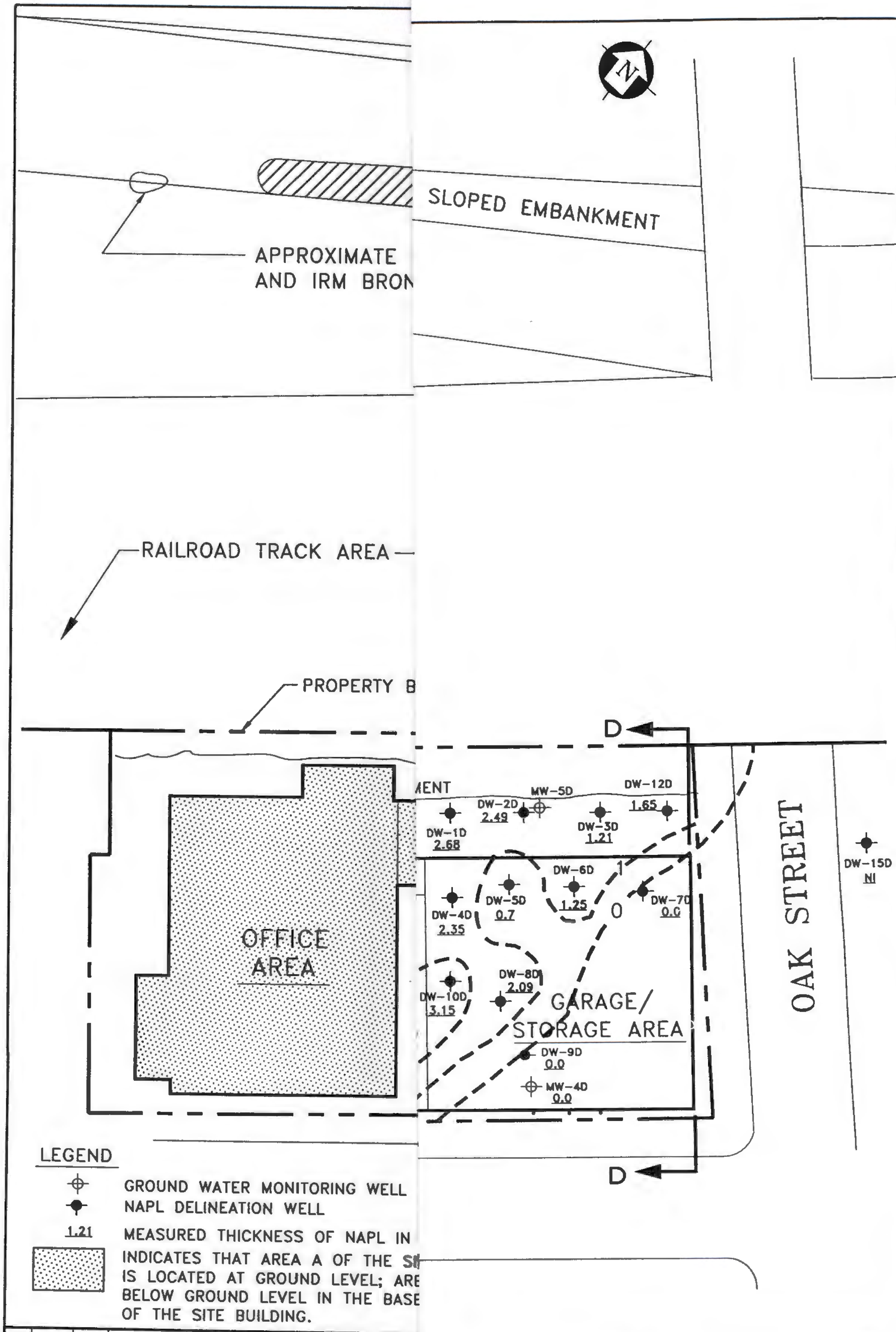
LOCATED AT GROUND LEVEL; AR
BELOW GROUND LEVEL IN THE
OF THE SITE BUILDING.
PROPERTY
D
EMBANKMENT
64.09
MW-5D
64.00
DW-1D
DW-2D
DW-3D
1.21
DW-12D
DW-15D
DW-5D
DW-6D
DW-7D
DW-4D
GARAGE/
STORAGE AREA
OFFICE
AREA
OAK STREET
DW-10D
DW-8D
DW-9D
MW-4D
64.87
13D
65.00
66.00
D
NO.
DATE
APPR.
REVISION
R TABLE CONTOUR MAP
JUNE 2, 1993
ER RED DEVIL FACILITY
DRAWING NO.
1-5
REV. NO.
DATE
DEC. 15, 1994
REVISION DATE
JOB NO.
488.004.05
FILE NAME
F-WTM629
SHEET
OF


BM SG-1
51.37
SLOPED EMBANKMENT
APPROX. SEEP
BM SP-2
51.72
LEGEND
GROUND WATER MONITORING WEI
NAPL DELINEATION WELL
1.21
WATER TABLE ELEVATION IN FEE
CONTOUR INTERVAL 1.0 FEET
BM SP-2
51.72
BENCHMARK FOR RIVER LEVEL E
INDICATES THAT AREA A OF THE
LOCATED AT GROUND LEVEL; AR
BELOW GROUND LEVEL IN THE
OF THE SITE BUILDING.
PROPERTY
D
EMBANKMENT
62.71
MW-5D
DW-2D
DW-1D
DW-3D
1.21
DW-12D
63.00
DW-15D
DW-7D
DW-5D
DW-6D
DW-4D
GARAGE/
STORAGE AREA
OFFICE
AREA
OAK STREET
DW-10D
DW-8D
DW-9D
MW-4D
63.66
64.00
D
NO.
DATE
APPR.
REVISION
R TABLE CONTOUR MAP
OCTOBER 12, 1993
ER RED DEVIL FACILITY
DRAWING NO.
1-6
REV. NO.
DATE
DEC. 15, 1994
REVISION DATE
JOB NO.
488.004.05
FILE NAME
F-CRMP10
SHEET
OF


APPROX. SEEP
SLOPED EMBANKMENT
STORM SEWER DISCHARGE PIPE TO BRONX RIVER
LEGE
FORMER ABOVEGROUND VAULTED STORAGE REMOVED AFTER MAY 1991
UNDERGROUND STORAGE TANK
FORMER UNDERGROUND STORAGE TANK REMOVED PRIOR TO MAY 1991
FORMER ABOVEGROUND STORAGE TANK REMOVED IN MAY 1991
FORMER UNDERGROUND STORAGE TANK REMOVED OR PERMANENTLY CLOSED IN PLAC
INDICATES THAT AREA A OF THE SITE BUILDI LOCATED AT GROUND LEVEL; AREAS B,C & D BELOW GROUND LEVEL IN THE BASEMENT OF THE SITE BUILDING.
D
MENT
10
OFFICE AREA
34
35
36
C
GARAGE/ STORAGE AREA
OAK STREET
PAVED COURTYARD
D
NO.
DATE
APPR.
REVISION
ACE WATER PATHWAYS
ER RED DEVIL FACILITY
DRAWING NO.
1-7
REV. NO.
DATE
DEC. 15, 1994
JOB NO.
488.004.05
REVISION DATE
FILE NAME
F-PATHWA
SHEET
OF



NO.	DATE	APPR.	REVISION

PROXIMATE DISTRIBUTION OF NAPL
MARCH 23, 1993
MER RED DEVIL FACILITY

DRAWING NO. 1-8

REV. NO.

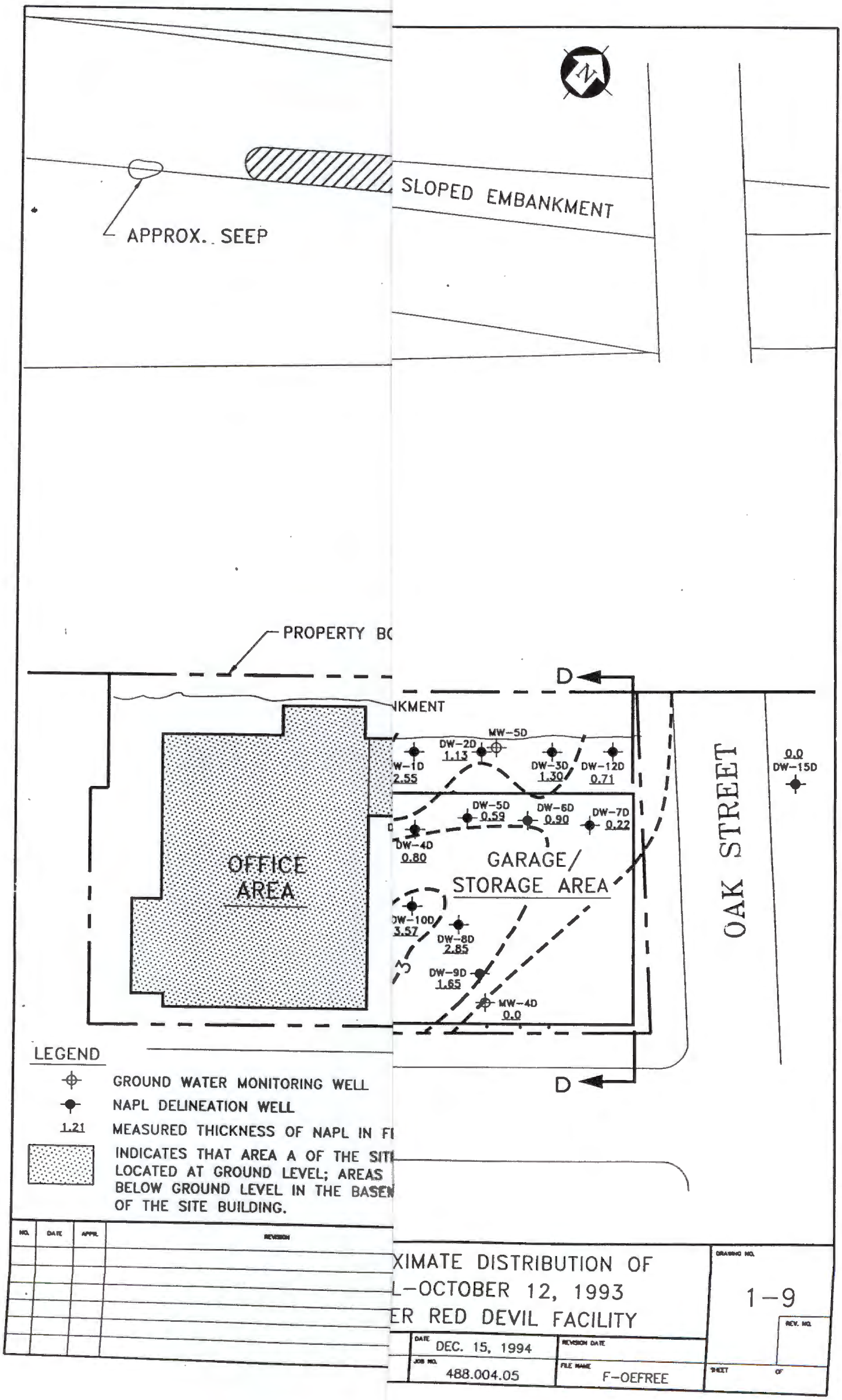
DATE DEC. 15, 1994

REVISION DATE

JOB NO. 488.004.05

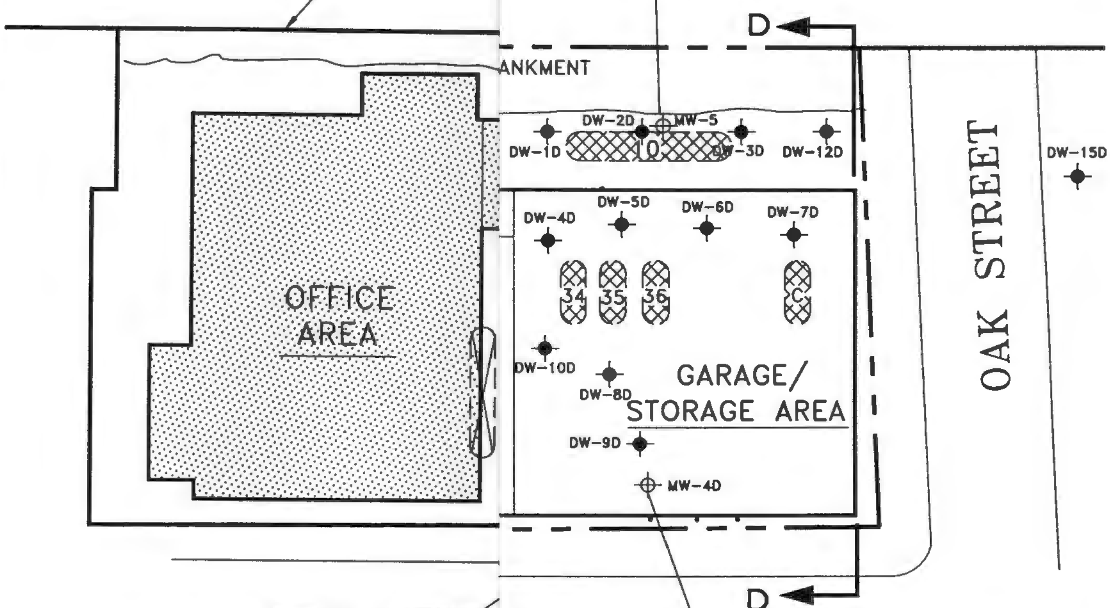
FILE NAME F-DELN32

SHEET OF



SLOPED EMBANKMENT
APPROX. SEEP
PROPERTY BO
D
KMENT
MW-5D
DW-2D 1.13
W-1D 2.55
DW-3D 1.30
DW-12D 0.71
0.0 DW-15D
DW-5D 0.59
DW-6D 0.90
DW-7D 0.22
DW-4D 0.80
OFFICE AREA
GARAGE/ STORAGE AREA
OAK STREET
DW-10D 3.57
DW-8D 2.85
DW-9D 1.65
MW-4D 0.0
D
LEGEND
GROUND WATER MONITORING WELL
NAPL DELINEATION WELL
1.21 MEASURED THICKNESS OF NAPL IN FE
INDICATES THAT AREA A OF THE SITE LOCATED AT GROUND LEVEL; AREAS BELOW GROUND LEVEL IN THE BASEM OF THE SITE BUILDING.
NO. DATE APPR. REVISION
XIMATE DISTRIBUTION OF
L-OCTOBER 12, 1993
ER RED DEVIL FACILITY
DATE DEC. 15, 1994
REVISION DATE
JOB NO. 488.004.05
FILE NAME F-OEFREE
DRAWING NO. 1-9
REV. NO.
SHEET OF

MW-5D	1	2
BTEX	1380	920
TOTAL CHLOR	200	40
PAHS	28	38
PHENOLS	218	14
DEHP	ND	3



MW-1A	1
BTEX	ND
TOTAL CHLOR	ND
PAHS	ND
PHENOLS	ND
DEHP	ND

MW-4D	1	2
BTEX	34	2
TOTAL CHLOR	4	3
PAHS	4	ND
PHENOLS	5	ND
DEHP	ND	3

LEGEND

GROUND WATER MONITORING WELL

NAPL DELINEATION WELL

FORMER ABOVEGROUND VAULTED STORAGE TANK REMOVED AFTER MAY 1991

UNDERGROUND STORAGE TANK

FORMER UNDERGROUND STORAGE TANK REMOVED PRIOR TO MAY 1991

FORMER ABOVEGROUND STORAGE TANK REMOVED IN MAY 1991

FORMER UNDERGROUND STORAGE TANK REMOVED OR PERMANENTLY CLOSED IN PLACE IN 1991

INDICATES THAT AREA A OF THE SITE BUILDING IS LOCATED AT GROUND LEVEL; AREAS B,C & D ARE BELOW GROUND LEVEL IN THE BASEMENT OF THE SITE BUILDING.

NOTE:

BTEX=BENZENE, TOLUENE, ETHYLBENZ

TOTAL CHLOR=TRICHLORETHENE, TETRA
1,1 DICHLOROETHANE A

PAH=NAPHTHALENE CONCENTRATION IN

PHENOLS=2-METHYLPHENOL, 4-METHY

DEHP=BIS(2-ETHYLHEXYL) PHTHALATE

NO.	DATE	APPR.	REVISION

RIBUTION OF ORGANIC
JNDS IN GROUND WATER
ER RED DEVIL FACILITY

DRAWING NO. 1-10

REV. NO.

DATE DEC. 15, 1994

REVISION DATE

JOB NO. 488.004.05

FILE NAME F-DORGCM

SHEET OF

(23–25 FT)
0.18B
0.009
17.29

	(16–18 FT)
NE	2.9
R	0.28
(	2261

(17–19 FT)
1.3J
ND
2.8

5	(17–19 FT)
ONE	0.033
OR	ND
OM	ND

4–26 FT)
0.018B
ND
ND

LEGEND

A5 ○ PSI SOIL BORING LOCATION

A9 ● RI SOIL BORIING LOCATION

UNDERGROUND STORAGE TANK

FORMER UNDERGROUND STORAGE TAN
REMOVED PRIOR TO MAY 1991

FORMER UNDERGROUND STORAGE TANI
REMOVED OR PERMANENTLY CLOSED I

CHLOR–CHLORINATED HYDROCARBONS: CHLOF
TETRACHLOROETHENE, TRICHLOROETHI
1,1,1 TRICHLORETHANE, IN mg/kg

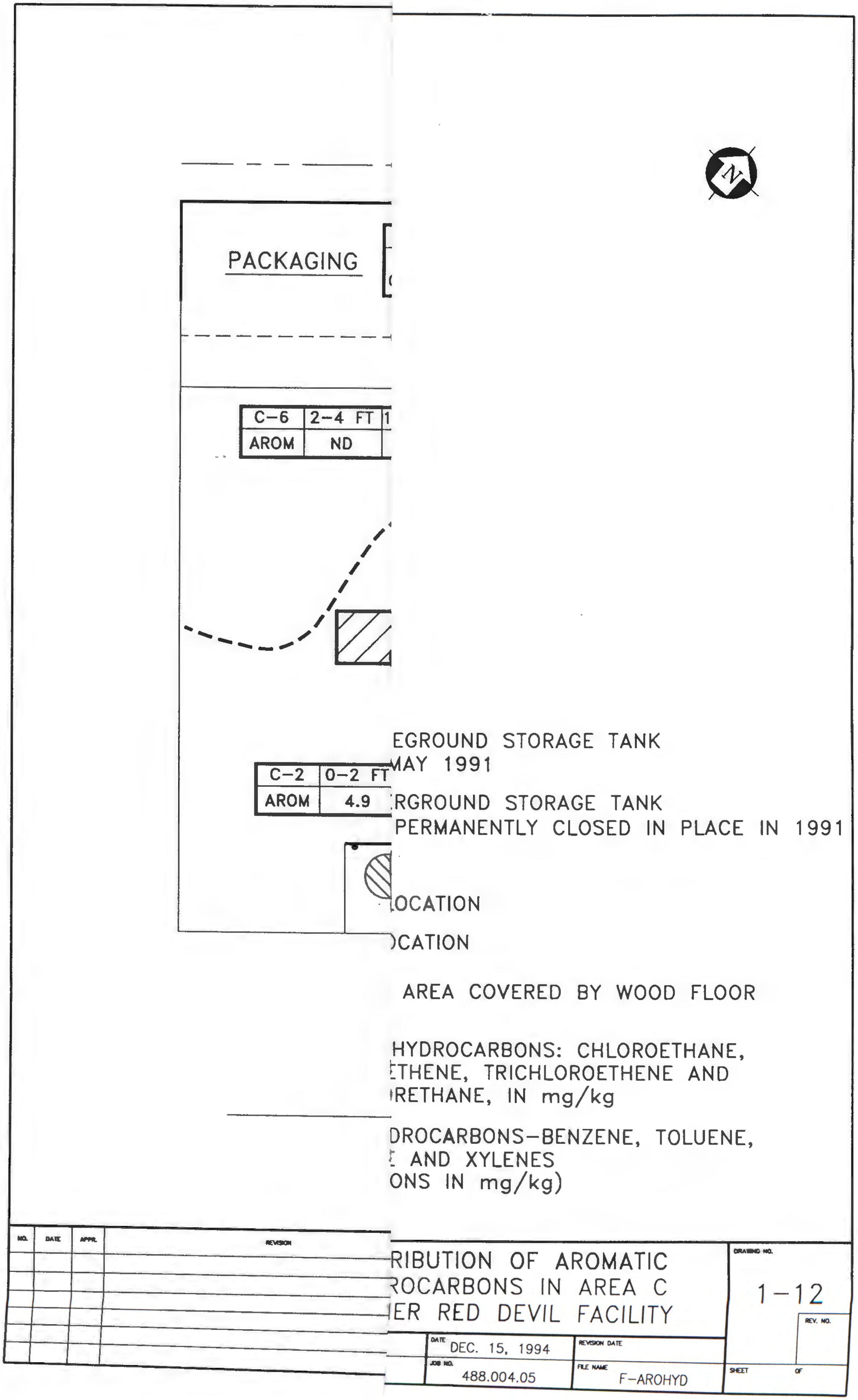
AROM–AROMATIC HYDROCARBONS: BENZENE,
TOLUENE AND XYLENE IN mg/kg

INDICATES THAT AREA A OF THE SITE BU
LOCATED AT GROUND LEVEL; AREAS B,C
BELOW GROUND LEVEL IN THE BASEMENT

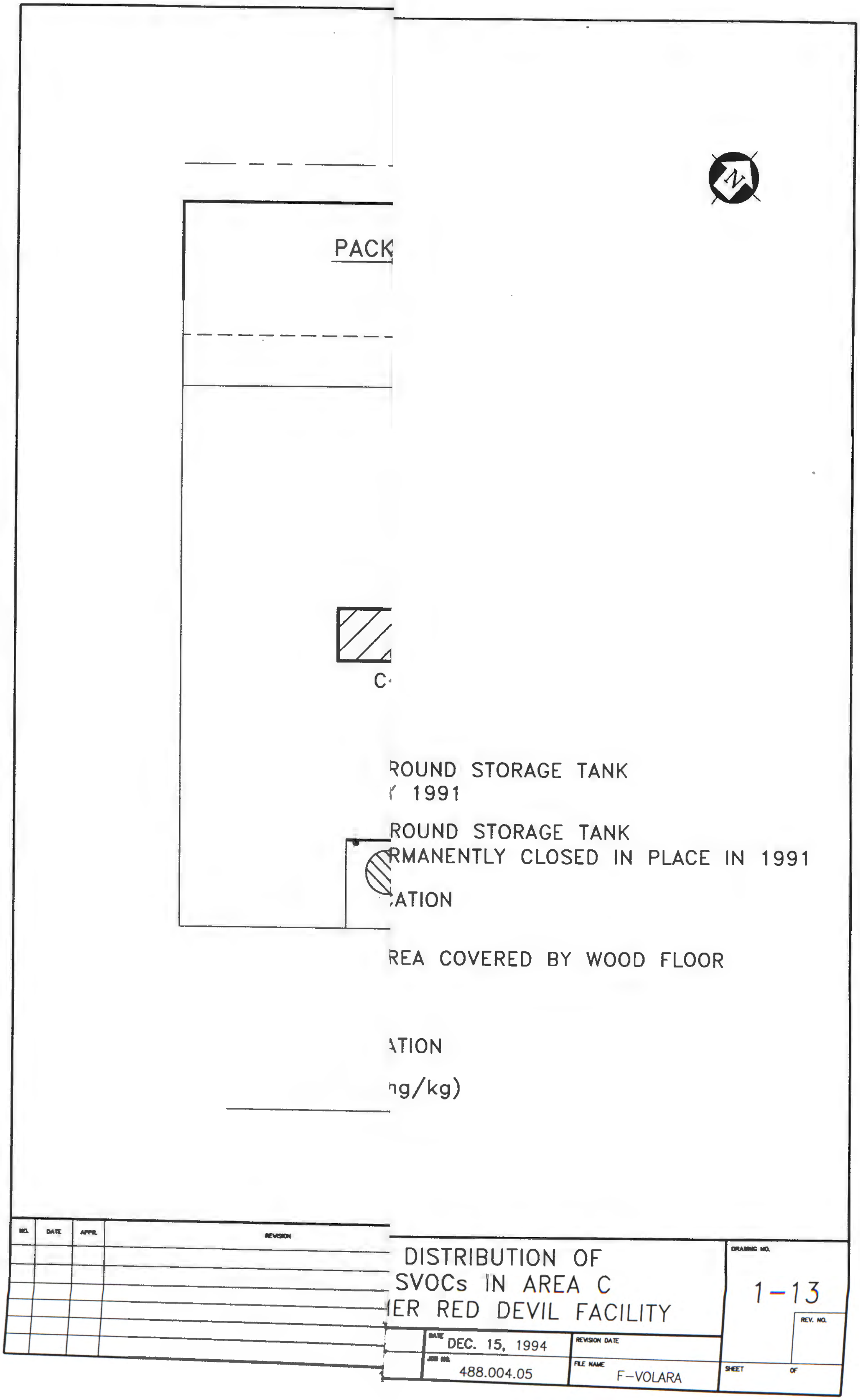
NO.	DATE	APPR.	REVISION

TRIBUTION OF VOCs
IN AREA A
ER RED DEVIL FACILITY

DATE DEC. 15, 1994	REVISION DATE	DRAWING NO. 1–11
JOB NO. 488.004.05	FILE NAME F–ARAVOL	REV. NO.
		SHEET OF



PACKAGING
C-6 | 2-4 FT
AROM | ND
C-2 | 0-2 FT
AROM | 4.9
EGROUND STORAGE TANK
MAY 1991
RGROUND STORAGE TANK
PERMANENTLY CLOSED IN PLACE IN 1991
OCATION
CATION
AREA COVERED BY WOOD FLOOR
HYDROCARBONS: CHLOROETHANE,
THENE, TRICHLOROETHENE AND
RETHANE, IN mg/kg
DROCARBONS-BENZENE, TOLUENE,
AND XYLENES
ONS IN mg/kg)
NO. DATE APPR. REVISION
RIBUTION OF AROMATIC
ROCARBONS IN AREA C
ER RED DEVIL FACILITY
DRAWING NO. 1-12
REV. NO.
DATE DEC. 15, 1994
REVISION DATE
JOB NO. 488.004.05
FILE NAME F-AROHYD
SHEET OF



PACK
C-
ROUND STORAGE TANK
(1991
ROUND STORAGE TANK
RMANENTLY CLOSED IN PLACE IN 1991
ATION
REA COVERED BY WOOD FLOOR
ATION
ng/kg)
NO.
DATE
APPR.
REVISION
DISTRIBUTION OF
SVOCs IN AREA C
ER RED DEVIL FACILITY
DRAWING NO.
1-13
REV. NO.
DATE
DEC. 15, 1994
REVISION DATE
JOB NO.
488.004.05
FILE NAME
F-VOLARA
SHEET
OF

OT

OUND STORAGE TANK

UNDERGROUND STORAGE TANK
OR PERMANENTLY CLOSED IN PLACE IN 1991

NSTALLED DURING PSI

NSTALLED DURING RI

CONCENTRATIONS IN 11–16 FT
THAT ARE BELOW 50 MG/KG

CONCENTRATIONS IN 11–16 FT
THAT ARE BETWEEN
300 MG/KG

CONCENTRATIONS IN 11–16 FT
THAT EXCEED 1000 MG/KG

TED COMPOUNDS WERE DETECTED
BORING

S IN mg/kg)

NO.	DATE	APPR.	REVISION

DISTRIBUTION OF VOCs
IN AREA D
MER RED DEVIL FACILITY

DRAWING NO. 1–14

REV. NO.

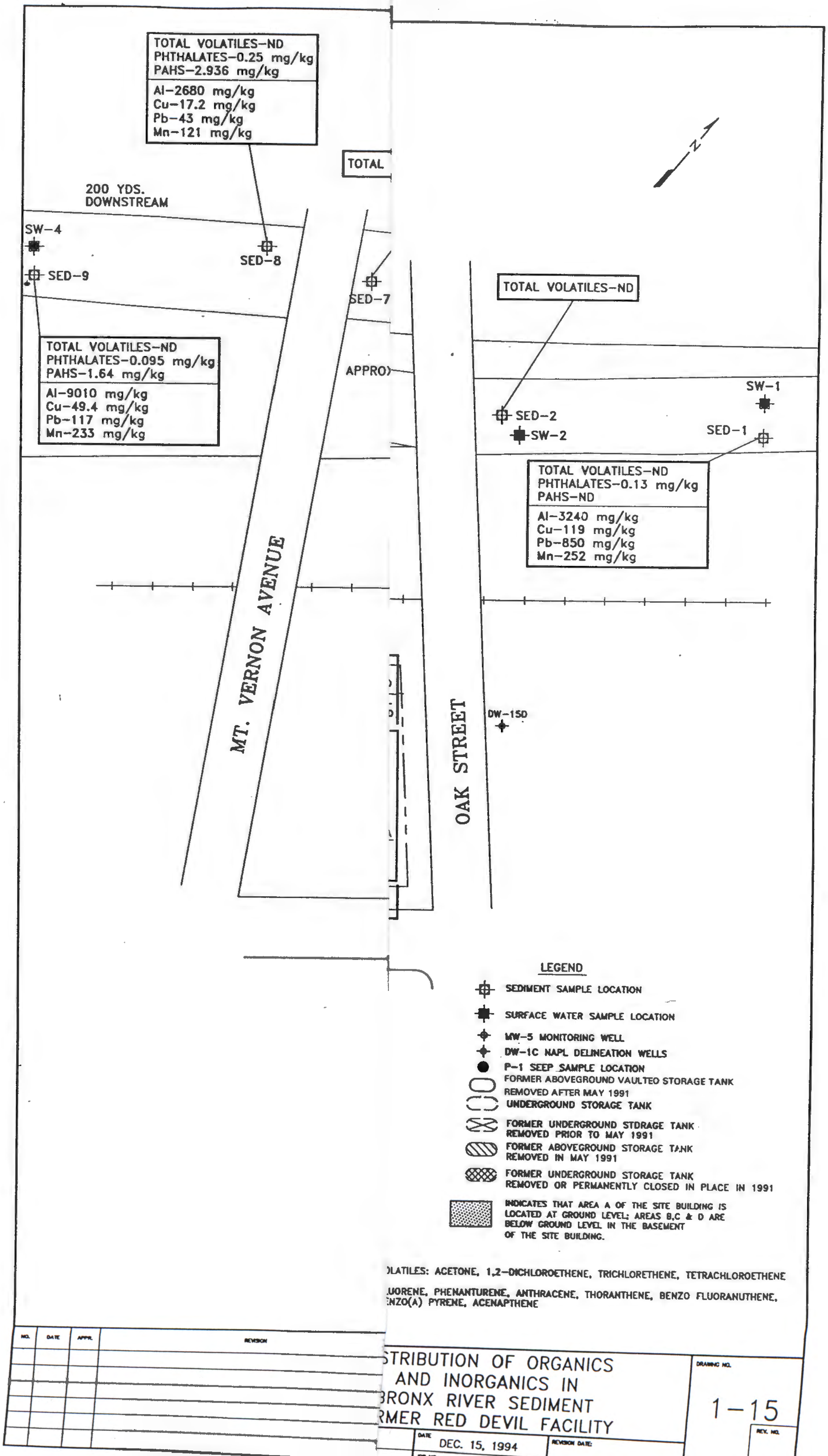
DATE DEC. 7, 1994

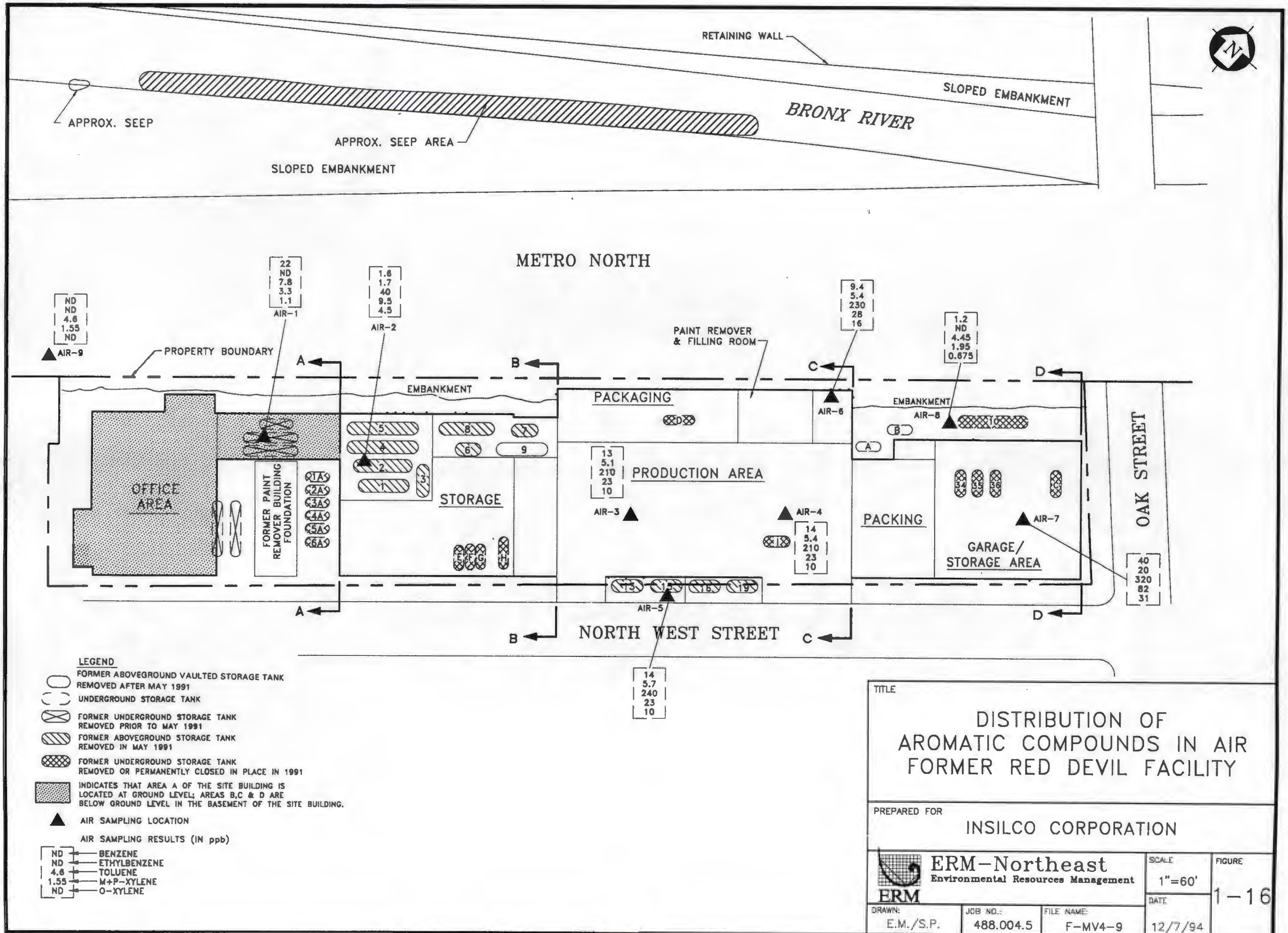
REVISION DATE

JOB NO. 488.004.05

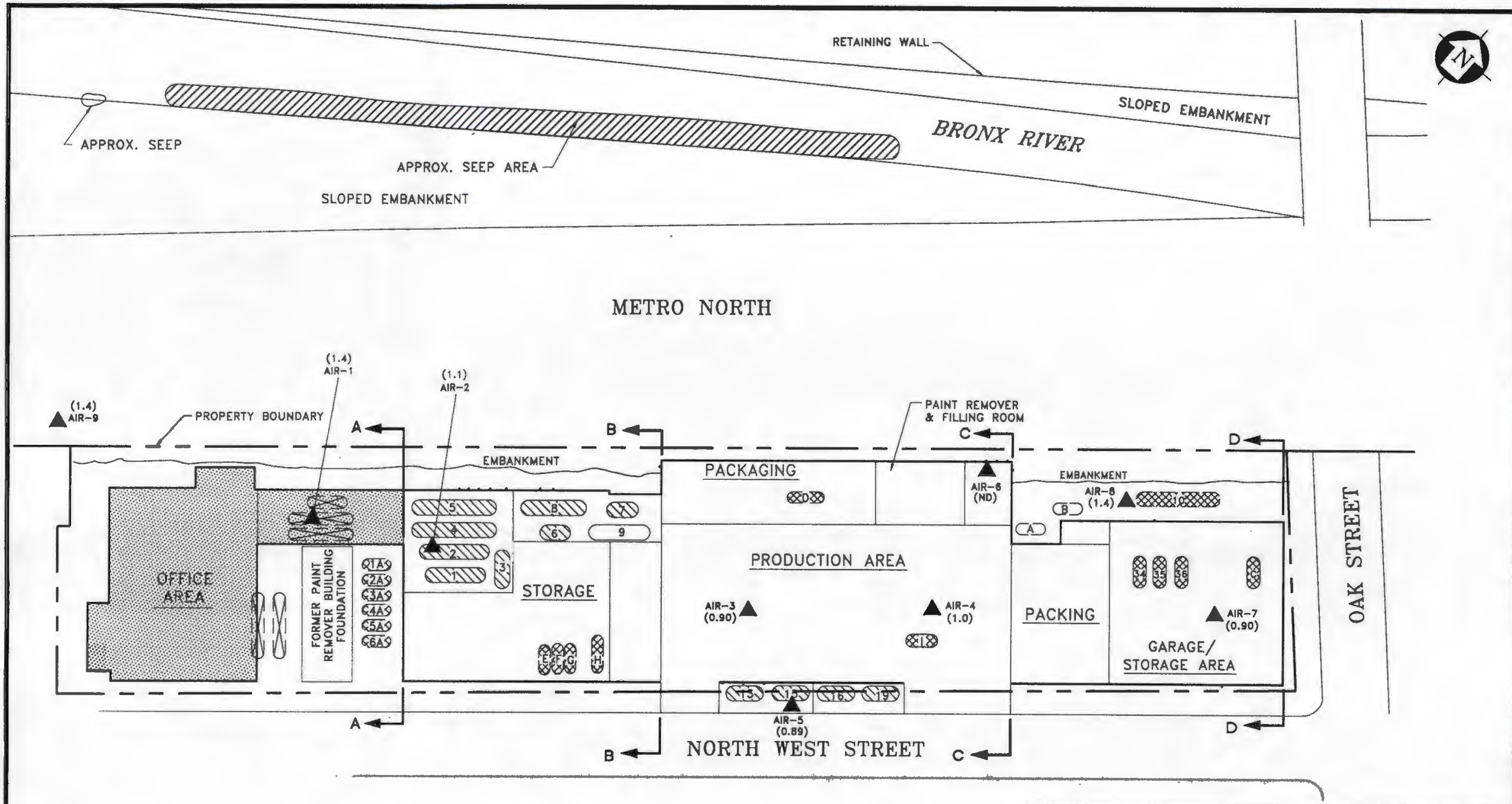
FILE NAME F–VOL4–4

SHEET OF


TOTAL VOLATILES-ND
PHTHALATES-0.25 mg/kg
PAHS-2.936 mg/kg
Al-2680 mg/kg
Cu-17.2 mg/kg
Pb-43 mg/kg
Mn-121 mg/kg
TOTAL
N
200 YDS.
DOWNSTREAM
SW-4
SED-8
SED-9
SED-7
TOTAL VOLATILES-ND
PHTHALATES-0.095 mg/kg
PAHS-1.64 mg/kg
Al-9010 mg/kg
Cu-49.4 mg/kg
Pb-117 mg/kg
Mn-233 mg/kg
APPRO
TOTAL VOLATILES-ND
SW-1
SED-2
SW-2
SED-1
TOTAL VOLATILES-ND
PHTHALATES-0.13 mg/kg
PAHS-ND
Al-3240 mg/kg
Cu-119 mg/kg
Pb-850 mg/kg
Mn-252 mg/kg
MT. VERNON AVENUE
OAK STREET
DW-15D
LEGEND
SEDIMENT SAMPLE LOCATION
SURFACE WATER SAMPLE LOCATION
MW-5 MONITORING WELL
DW-1C NAPL DELINEATION WELLS
P-1 SEEP SAMPLE LOCATION
FORMER ABOVEGROUND VAULTED STORAGE TANK REMOVED AFTER MAY 1991
UNDERGROUND STORAGE TANK
FORMER UNDERGROUND STORAGE TANK REMOVED PRIOR TO MAY 1991
FORMER ABOVEGROUND STORAGE TANK REMOVED IN MAY 1991
FORMER UNDERGROUND STORAGE TANK REMOVED OR PERMANENTLY CLOSED IN PLACE IN 1991
INDICATES THAT AREA A OF THE SITE BUILDING IS LOCATED AT GROUND LEVEL; AREAS B,C & D ARE BELOW GROUND LEVEL IN THE BASEMENT OF THE SITE BUILDING.
LATILES: ACETONE, 1,2-DICHLOROETHENE, TRICHLORETHENE, TETRACHLOROETHENE
UORENE, PHENANTURENE, ANTHRACENE, THORANTHENE, BENZO FLUORANUTHENE,
NZO(A) PYRENE, ACENAPTHENE
NO. DATE APPR. REVISION
STRIBUTION OF ORGANICS
AND INORGANICS IN
BRONX RIVER SEDIMENT
RMER RED DEVIL FACILITY
DATE DEC. 15, 1994
REVISION DATE
DRAWING NO.
1-15
REV. NO.



RETAINING WALL
SLOPED EMBANKMENT
BRONX RIVER
APPROX. SEEP
APPROX. SEEP AREA
SLOPED EMBANKMENT
METRO NORTH
AIR-9: ND, ND, 4.6, 1.55, ND
AIR-1: 22, ND, 7.8, 3.3, 1.1
AIR-2: 1.6, 1.7, 40, 9.5, 4.5
AIR-6: 9.4, 5.4, 230, 28, 16
AIR-8: 1.2, ND, 4.45, 1.95, 0.675
AIR-3: 13, 5.1, 210, 23, 10
AIR-4: 14, 5.4, 210, 23, 10
AIR-7: 40, 20, 320, 82, 31
AIR-5: 14, 5.7, 240, 23, 10
PROPERTY BOUNDARY
PAINT REMOVER & FILLING ROOM
EMBANKMENT
PACKAGING
OFFICE AREA
FORMER PAINT REMOVER BUILDING FOUNDATION
STORAGE
PRODUCTION AREA
PACKING
GARAGE/ STORAGE AREA
OAK STREET
NORTH WEST STREET
LEGEND
FORMER ABOVEGROUND VAULTED STORAGE TANK REMOVED AFTER MAY 1991
UNDERGROUND STORAGE TANK
FORMER UNDERGROUND STORAGE TANK REMOVED PRIOR TO MAY 1991
FORMER ABOVEGROUND STORAGE TANK REMOVED IN MAY 1991
FORMER UNDERGROUND STORAGE TANK REMOVED OR PERMANENTLY CLOSED IN PLACE IN 1991
INDICATES THAT AREA A OF THE SITE BUILDING IS LOCATED AT GROUND LEVEL; AREAS B,C & D ARE BELOW GROUND LEVEL IN THE BASEMENT OF THE SITE BUILDING.
AIR SAMPLING LOCATION
AIR SAMPLING RESULTS (IN ppb)
ND — BENZENE
ND — ETHYLBENZENE
4.6 — TOLUENE
1.55 — M+P-XYLENE
ND — O-XYLENE
TITLE
DISTRIBUTION OF AROMATIC COMPOUNDS IN AIR FORMER RED DEVIL FACILITY
PREPARED FOR
INSILCO CORPORATION
ERM-Northeast
Environmental Resources Management
ERM
SCALE 1"=60'
FIGURE 1-16
DATE 12/7/94
DRAWN: E.M./S.P.
JOB NO.: 488.004.5
FILE NAME: F-MV4-9



LEGEND

- FORMER ABOVEGROUND VAULTED STORAGE TANK REMOVED AFTER MAY 1991
- UNDERGROUND STORAGE TANK
- FORMER UNDERGROUND STORAGE TANK REMOVED PRIOR TO MAY 1991
- FORMER ABOVEGROUND STORAGE TANK REMOVED IN MAY 1991
- FORMER UNDERGROUND STORAGE TANK REMOVED OR PERMANENTLY CLOSED IN PLACE IN 1991
- INDICATES THAT AREA A OF THE SITE BUILDING IS LOCATED AT GROUND LEVEL; AREAS B,C & D ARE BELOW GROUND LEVEL IN THE BASEMENT OF THE SITE BUILDING.
- ▲ AIR SAMPLING LOCATION
- (0.90) TETRACHLOROETHENE RESULTS (IN ppb)

TITLE

DISTRIBUTION OF TETRACHLOROETHENE IN AIR FORMER RED DEVIL FACILITY

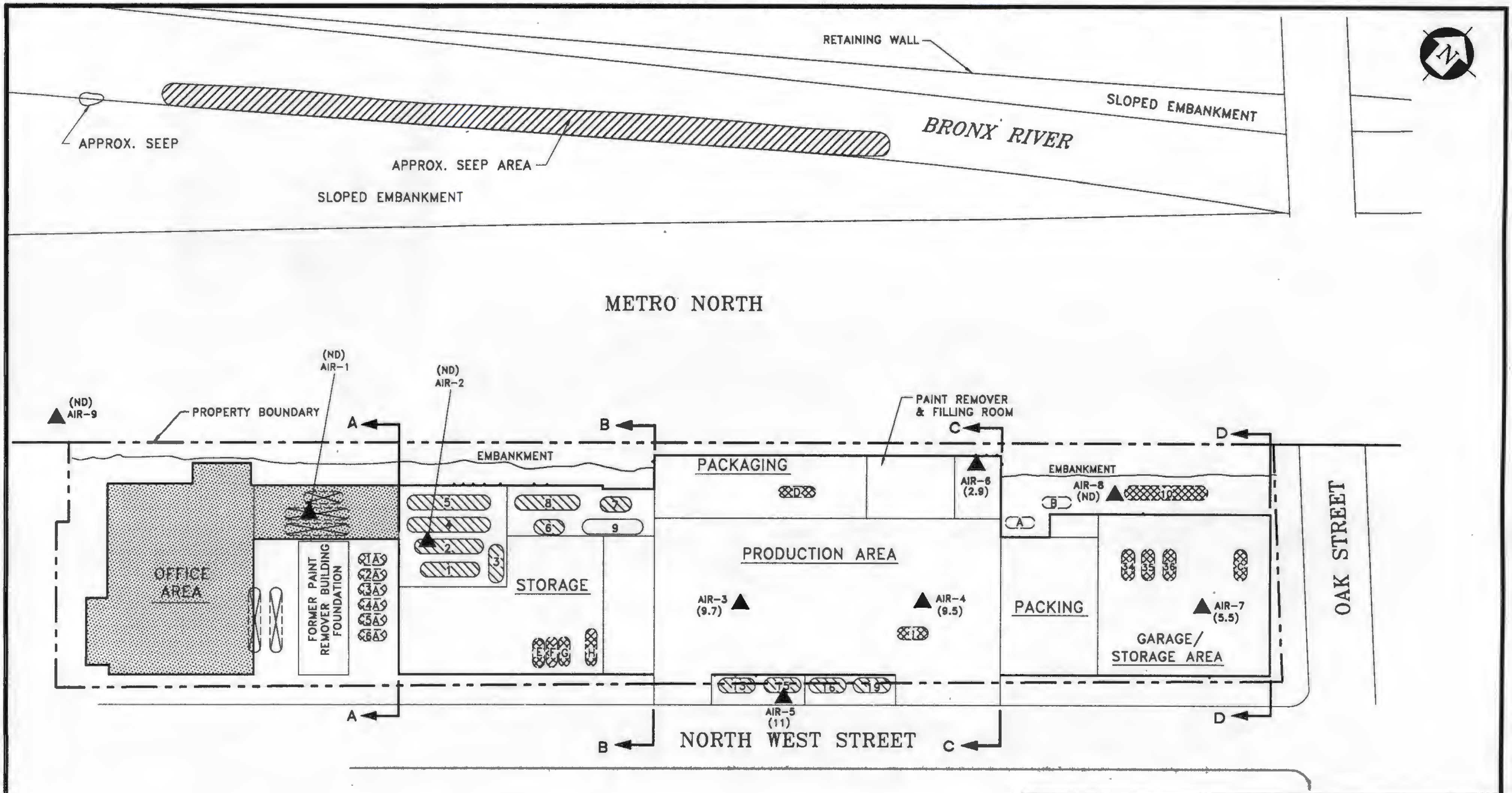
PREPARED FOR

INSILCO CORPORATION

ERM–Northeast
Environmental Resources Management

SCALE	FIGURE
1"=60'	1–17
DATE 12/7/94	

DRAWN:	JOB NO.:	FILE NAME:
E.M./S.P.	488.004.5	F–MV4–10



LEGEND

- FORMER ABOVEGROUND VAULTED STORAGE TANK REMOVED AFTER MAY 1991
- UNDERGROUND STORAGE TANK
- FORMER UNDERGROUND STORAGE TANK REMOVED PRIOR TO MAY 1991
- FORMER ABOVEGROUND STORAGE TANK REMOVED IN MAY 1991
- FORMER UNDERGROUND STORAGE TANK REMOVED OR PERMANENTLY CLOSED IN PLACE IN 1991
- INDICATES THAT AREA A OF THE SITE BUILDING IS LOCATED AT GROUND LEVEL; AREAS B,C & D ARE BELOW GROUND LEVEL IN THE BASEMENT OF THE SITE BUILDING.
- ▲ AIR SAMPLING LOCATION
- (2.9) METHYLOENE CHLORIDE RESULTS (IN ppb)

TITLE

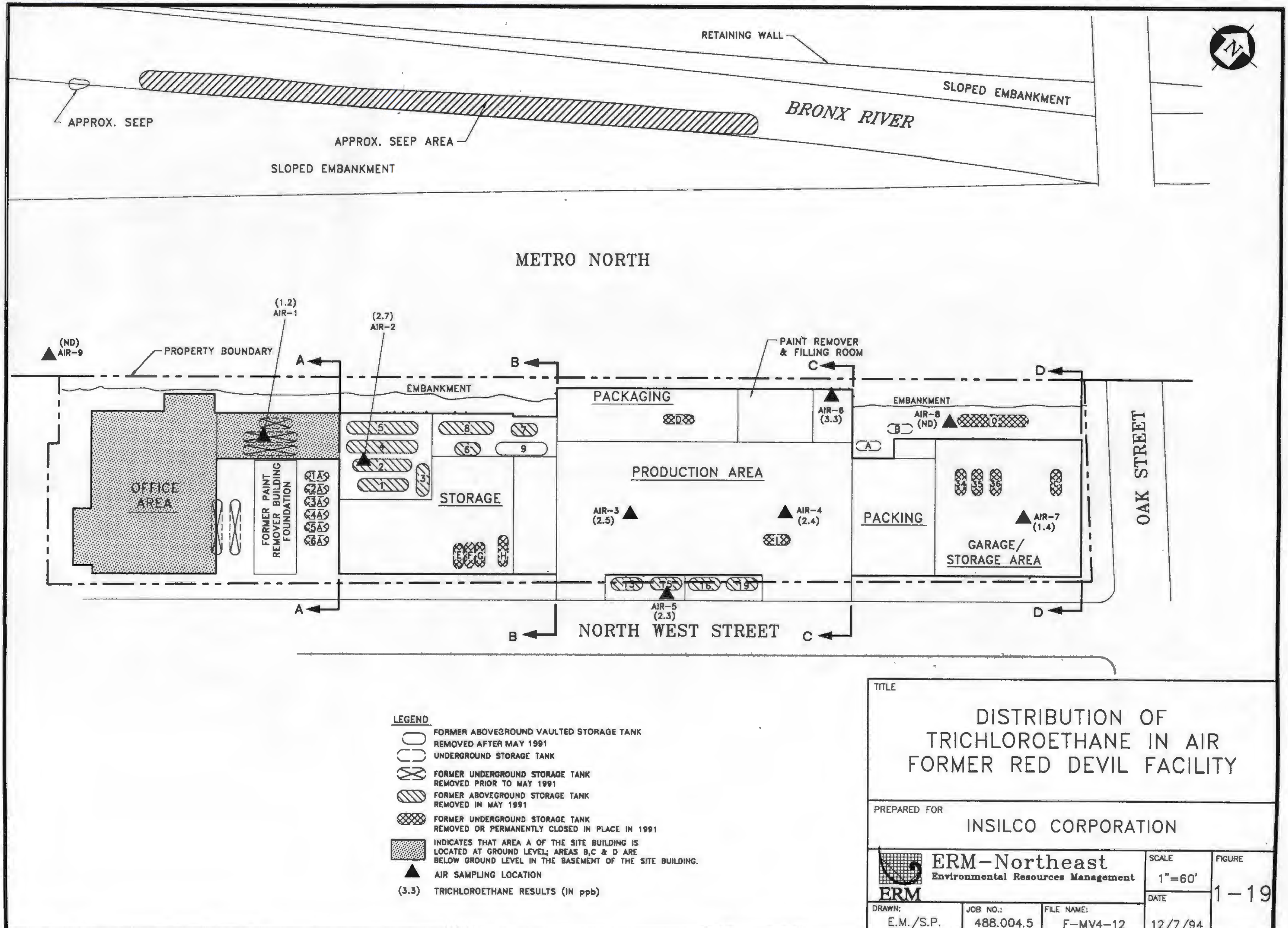
DISTRIBUTION OF METHYLENE CHLORIDE IN AIR FORMER RED DEVIL FACILITY

PREPARED FOR

INSILCO CORPORATION

ERM–Northeast
Environmental Resources Management

DRAWN:	JOB NO.:	FILE NAME:	SCALE	FIGURE
E.M./S.P.	488.004.3	F–MV4–11	1"=60'	1–18
			DATE: 12/7/94	

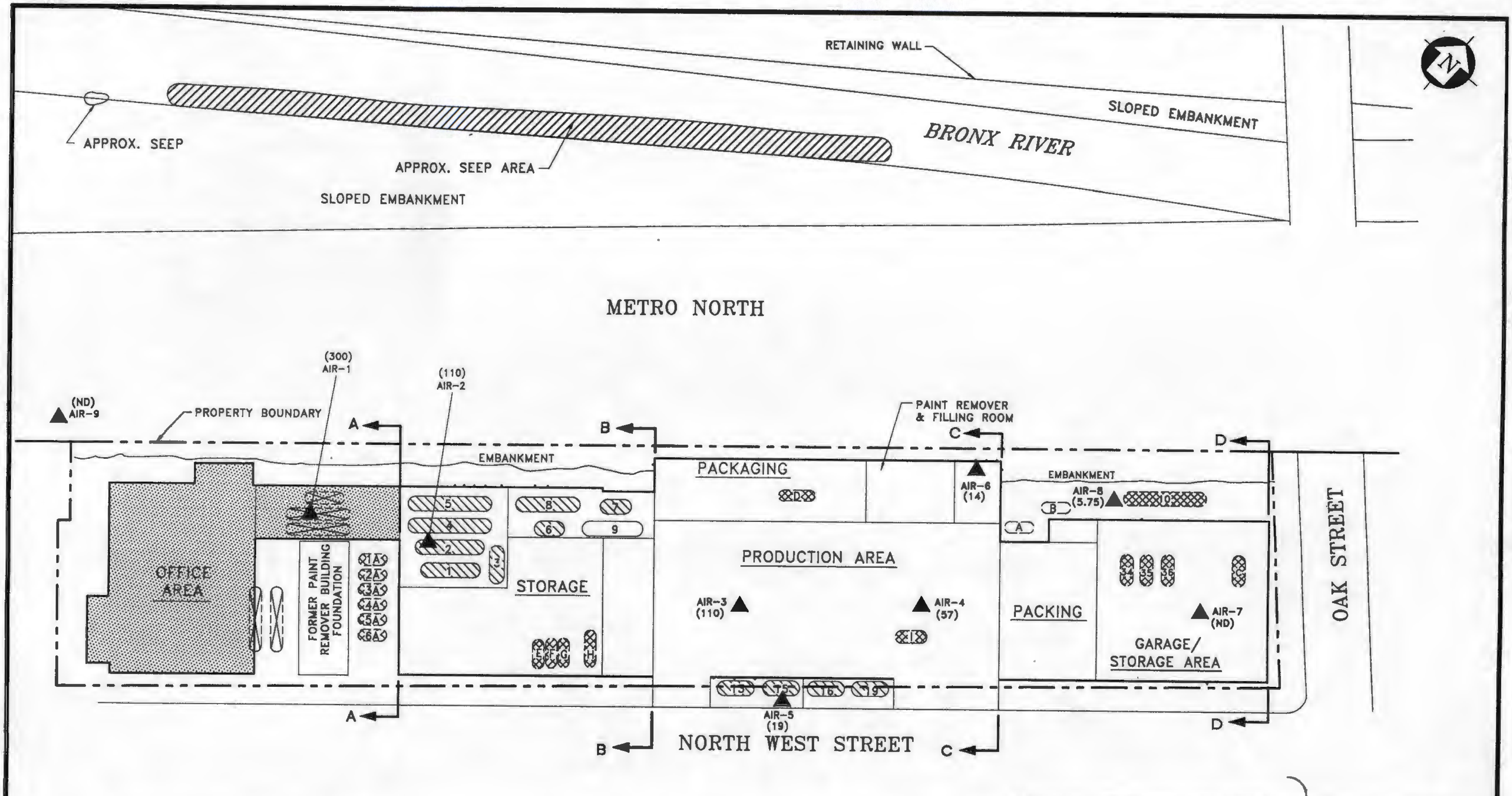


TITLE: DISTRIBUTION OF TRICHLOROETHANE IN AIR FORMER RED DEVIL FACILITY

PREPARED FOR: INSILCO CORPORATION

ERM-Northeast
Environmental Resources Management

DRAWN:	JOB NO.:	FILE NAME:	SCALE	DATE	FIGURE
E.M./S.P.	488.004.5	F-MV4-12	1"=60'	12/7/94	1-19



LEGEND

- FORMER ABOVEGROUND VAULTED STORAGE TANK REMOVED AFTER MAY 1991
- UNDERGROUND STORAGE TANK
- FORMER UNDERGROUND STORAGE TANK REMOVED PRIOR TO MAY 1991
- FORMER ABOVEGROUND STORAGE TANK REMOVED IN MAY 1991
- FORMER UNDERGROUND STORAGE TANK REMOVED OR PERMANENTLY CLOSED IN PLACE IN 1991
- INDICATES THAT AREA A OF THE SITE BUILDING IS LOCATED AT GROUND LEVEL; AREAS B,C & D ARE BELOW GROUND LEVEL IN THE BASEMENT OF THE SITE BUILDING.
- ▲ AIR SAMPLING LOCATION
- (14) ACETONE RESULTS (IN ppb)

TITLE

DISTRIBUTION OF ACETONE IN AIR FORMER RED DEVIL FACILITY

PREPARED FOR

INSILCO CORPORATION

ERM–Northeast
Environmental Resources Management

DRAWN:	JOB NO.:	FILE NAME:	SCALE	DATE	FIGURE
E.M./S.P.	488.004.5	F-MV4-13	1"=60'	12/7/94	1-20

TABLES

Table 1-1 *Apparent Thickness Measurements in NAPL Delineation Wells*
Former Red Devil Facility
Mount Vernon, New York

Well	NAPL THICKNESS IN FEET			
	1/22/93	3/23/93	5/25/93	10/12/93
DW-1A	0.01	0.02	0.04	0.05
DW-2A	0.03	0.00	0.00	0.00
DW-3A	0.00	0.00	0.00	0.00
DW-1C	1.12	NA	1.31	2.95
DW-2C	1.24	NA	1.40	1.13
DW-3C	0.06	NA	0.05	1.06
DW-4C	0.03	0.00	0.00	0.00
DW-5C	0.34	0.51	0.45	0.16
DW-6C	1.65	1.93	1.71	2.01
DW-7C	0.02	0.00	0.00	0.05
DW-1D	1.66	2.68	2.22	2.55
DW-2D	2.29	2.49	1.98	1.13
DW-3D	1.08	1.21	1.11	1.30
DW-4D	NA	2.35	2.52	0.80
DW-5D	0.46	0.70	0.62	0.59
DW-6D	0.55	1.25	1.13	0.90
DW-7D	0.04	0.00	0.00	0.22
DW-8D	1.77	2.09	1.95	2.85
DW-9D	0.03	0.00	0.00	1.65
DW-10D	3.07	3.15	2.97	3.57
DW-11D	1.31	1.47	1.52	3.69
DW-12D	0.86	1.65	1.43	0.71
DW-13D	2.75	3.00	2.87	3.84
DW-14D	0.02	0.15	0.11	0.16
DW-15D	NI	NI	0.00	0.00

Notes:
NA - Not accessable
NI - Not installed
All measurements in feet.

Table 1-2 Total Compound Analyses of NAPL Samples
Former Red Devil Facility, Mount Vernon, New York

Well Number	DW-1C	DW-6C	DW-1D	DW-2D	DW-6D	DW-10D	DW-13D
VOLATILE ORGANIC COMPOUNDS (% by volume)							
Acetone	0.0076	0.0075	0.0089	0.0080	0.0070	0.0069	0.0074
Benzene	0.0011	0.0018	0.0003	0.0003	0.0002	0.0002	0.0002
1,1-Dichloroethene	ND	ND	ND	0.0004	ND	ND	ND
1,1-Dichloroethane	0.0005	0.0004	0.0014	0.0130	0.0042	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	0.0002	ND	ND	ND
Ethylbenzene	0.0220	0.0290	0.0370	0.0480	ND	0.0480	0.0480
4-Methyl-2-Pentanone	ND	ND	0.0047	ND	ND	ND	ND
2-Hexanone	ND	0.0290	ND	ND	ND	ND	0.0260
Trichloroethene	ND	ND	0.0003	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	0.0011	ND	0.0008	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	0.0250	ND	ND	ND
Toluene	0.0260	0.0180	0.0230	0.0300	0.0230	0.0140	0.0036
Styrene	ND	ND	0.0028	ND	ND	ND	ND
Xylenes (total)	0.1700	0.1400	0.1800	0.2100	0.2000	0.2000	0.2100
C8H10 Aromatic Hydrocarbon	0.2700	ND	0.2700	ND	ND	ND	ND
C9H12 Aromatic Hydrocarbon	0.3560	0.9500	0.3560	0.5990	0.7900	1.2900	0.6500
C10H18 Aromatic Hydrocarbon	ND	ND	ND	ND	ND	ND	0.1700
Trimethylbenzene Isomer	ND	ND	ND	ND	ND	ND	0.2800
Unknown Alkenes	0.3200	ND	ND	ND	ND	ND	ND
Unknowns	1.4730	1.8300	1.4730	3.9200	3.2120	0.9700	1.2300
SEMI-VOLATILE COMPOUNDS (% by volume)							
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	ND	0.0050	ND
2-Methylnaphthalene	0.0063	0.0078	0.0053	0.0054	0.0040	0.0034	0.0046
Naphthalene	0.0210	0.0220	0.0260	0.0330	0.0040	0.0310	0.0280
Substituted Benzene	0.0250	0.0350	0.4100	0.1400	ND	ND	0.5900
Unknown Acid	ND	ND	ND	ND	ND	ND	0.3300
Unknown Alkane	0.5770	0.7680	0.8780	1.9390	1.5310	0.7363	0.6860
Unknown Alkene	ND	0.0370	0.0980	ND	0.1600	0.0410	ND
Unknown Cycloalkane	0.3750	0.3510	0.2580	0.4980	0.5740	0.4360	0.2240
Unknowns	0.2480	0.0200	0.2440	0.1200	0.0490	0.1080	0.0430
NAPL PHYSICAL PARAMETERS							
pH	6.6700	6.7100	6.7500	6.7200	6.6200	6.7100	6.7700
Specific Gravity, g/cc	0.8100	0.8000	0.8900	0.8700	0.9000	0.8700	0.8900

NOTES:
Methylene Chloride was detected in the method blanks and samples at concentrations indicating laboratory contamination.
ND: the compound was analyzed for but not detected.

Table 1-3 TCLP Analyses of NAPL Samples
Former Red Devil Facility, Mount Vernon, New York

TCLP Compound/Analyte	Regulatory Levels (mg/l)	DW-1C (mg/l)	DW-6C (mg/l)	DW-1D (mg/l)	DW-2D (mg/l)	DW-6D (mg/l)	DW-10D (mg/l)	DW-13D (mg/l)
VOLATILE ORGANIC COMPOUNDS								
Benzene	0.5	**11***	**16***	ND	**4.4***	ND	**4.4**	ND
Carbon tetrachloride	0.5	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	100	ND	ND	ND	ND	ND	ND	ND
Chloroform	6	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.5	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	0.7	ND	ND	ND	ND	ND	ND	ND
Methyl ethyl ketone	200	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	0.7	ND	ND	ND	**4.1**	ND	**3.4**	ND
Trichloroethylene	0.5	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND	ND
SEMI-VOLATILE ORGANIC COMPOUNDS								
Cresol	200	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	7.5	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	0.13	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	0.13	ND	ND	ND	ND	ND	ND	ND
Hexachloro-1,3-butadiene	0.5	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	3	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	2	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	100	ND	ND	ND	ND	ND	ND	ND
Pyridine	5	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	400	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	2	ND	ND	ND	ND	ND	ND	ND
PESTICIDES								
Chlordane	0.03	ND	ND	ND	ND	ND	ND	ND
Endrin	0.02	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.008	ND	ND	ND	ND	ND	ND	ND
Lindane	0.4	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	10	ND	ND	ND	ND	ND	ND	ND
Toxaphene	0.5	ND	ND	ND	ND	ND	ND	ND
HERBICIDES								
2,4-D	10	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP(Silvex)	1	0.18	0.1	ND	ND	ND	ND	ND
METALS								
Arsenic	5	ND	ND	ND	ND	ND	ND	ND
Barium	100	ND	ND	ND	ND	ND	ND	ND
Cadmium	1	ND	ND	ND	ND	ND	ND	ND
Chromium	5	ND	ND	ND	ND	ND	ND	ND
Lead	5	4.2	ND	ND	ND	ND	ND	ND
Mercury (ug/l)	0.2	ND	ND	ND	ND	ND	ND	ND
Selenium	1	ND	ND	ND	ND	ND	ND	ND
Silver	5	ND	ND	ND	ND	ND	ND	ND
Corrosivity	inches/year	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ignitability	Degrees F	108.00	104.00	122.00	113.00	113.00	118.00	113.00
Reactivity to Cyanide	PPM	<1	<1	<1	<1	<1	<1	<1
Reactivity to Sulfide	PPM	<1	<1	<1	<1	<1	<1	<1

NOTES:
Shaded bold numbers indicate a concentration at or above regulatory guideleines.
*** Denotes highest detected concentration of multiple analytical runs of samples.***
ND: the compound was analyzed for but not detected.

Table 1-4 ***Summary of Seep Sampling Results***
Former Red Devil Facility, Mount Vernon, New York

Fingerprint Analysis			
Sample No.	**Date**	**TPHC, ppm**	**Match to Standard**
P-1	Jun-94	94.4	Mineral Spirits
P-2	Jun-94	70.7	Mineral Spirits
P-3	Jun-94	88.3	Mineral Spirits

Waste Characterization							
Sample No. **Date Collected**	Regulatory Level	-- 6/7/94	01 9/8/94	02 9/8/94	03 9/8/94	04 9/8/94	05 9/8/94
Ignitability							
Flash Point, F	<140 (1)	>140	>200	**115**	**125**	**123**	**123**
TCLP Volatiles, ug/l							
Benzene	500	ND	ND	ND	ND	ND	ND
2-Butanone	200,000	25J	ND	ND	ND	ND	ND
Carbon Tetrachloride	500	ND	ND	ND	ND	ND	ND
Chlorobenzene	100,000	ND	ND	ND	ND	ND	ND
Chloroform	6,000	ND	11J	7J	18J	23J	21J
1,2-Dichloroethane	500	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	700	ND	ND	ND	ND	ND	ND
Tetrachloroethene	700	ND	ND	ND	ND	ND	ND
Tichloroethene	50	ND	ND	ND	ND	ND	ND
Vinyl Chloride	20	ND	ND	ND	ND	ND	ND

Notes:
(1) Regulatory level applies to liquid, non-aqueous wastes.
ND: not detected

[shaded box] *exceeds the Regulatory Level*

Table 1-5 ***Ground Water Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

	MW-1 6/2/93	MW-1 9/21/93	MW-2 6/2/93	MW-2A* 6/2/93	MW-2 9/21/93	MW-4 6/3/93	MW-4 9/21/93	MW-5 6/3/93	MW-5 9/21/93
Volatiles, ug/l									
Vinyl Chloride	ND	ND	6 J	6 J	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	74	97	ND	19	ND	24 J	ND
1,1-Dichloroethene	ND	ND	19	21	ND	ND	ND	ND	ND
1,1-Dichlorethane	ND	ND	10	11	ND	ND	ND	200	40 J
1,2-Dichloroethene (total)	ND	ND	4 J	4 J	ND	ND	ND	ND	ND
Chloroform	11	ND	2 J	2 J	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	74	79	ND	ND	ND	ND	ND
Benzene	ND	ND	5 J	5 J	67 J	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	10 J
Tetrachloroethene	ND	ND	ND	ND	ND	4 J	3J	ND	ND
Toluene	ND	96,000 D	200 D	200 D	10,000 D	ND	ND	ND	120
Ethylbenzene	ND	ND	ND	ND	25 J	6 J	1J	180	100
Xylenes (total)	ND	ND	ND	ND	55 J	28	1J	1200	700
1,1,1-Trichloroethane	ND	ND	260 D	270 D	ND	ND	ND	ND	ND
Total TICs	41 J		86 J	41 J	134 J	369 J	39 J	2686 J	3140 J
Semi-Volatiles, ug/l									
2-Methylphenol	ND	ND	9 J	7 J	160 D	ND	ND	ND	ND
4-Methylphenol	ND	ND	6 J	4 J	180 D	ND	ND	85	5 J
2,4-Dimethylphenol	ND	ND	ND	ND	ND	5 J	ND	130 J	3 J
Naphthalene	ND	ND	ND	ND	3 J	4 J	ND	28	37
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND	ND	ND	1 J
Phenol	ND	ND	ND	ND	ND	ND	ND	3 J	6 J
bis (2-ethylhexyl) phthalate	ND	ND	ND	ND	2 J	ND	3 J	ND	3 J
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total TICs	22 J	3 J	303 J	1033 J	158 J	278 J	57 J	2524 J	424 J

Table 1-5 ***Ground Water Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

	MW-6 6/2/93	MW-6 9/21/93	DUP** 9/21/93	MW-7 6/2/93	MW-7 9/21/93	MW-8 6/2/93	MW-8 9/21/93
Volatiles, ug/l							
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND
1,1-Dichlorethane	16	5 J	5 J	ND	ND	ND	ND
1,2-Dichloroethene (total)	2 J	ND	ND	ND	ND	ND	ND
Chloroform	2 J	1 J	2 J	2 J	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND
Benzene	4 J	ND	ND	ND	13 J	ND	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	6 J	7 J	6 J	ND	ND	ND	ND
Toluene	150	40	52	ND	16,000 D	ND	ND
Ethylbenzene	18	7 J	10	ND	ND	ND	ND
Xylenes (total)	77	25	37	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND
Total TICs	503 J	318 J	398 J	42 J		32 J	
Semi-Volatiles, ug/l							
2-Methylphenol	ND	ND	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	1 J	ND	ND	ND	ND	ND	ND
Naphthalene	7 J	7 J	8 J	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND	ND
Phenol	ND	ND	ND	ND	ND	ND	ND
bis (2-ethylhexyl) phthalate	ND	5 J	6 J	ND	2 J	ND	2 J
Nitrobenzene	3 J	ND	ND	ND	ND	ND	ND
Total TICs	316 J	180 J	153 J		18 J	8 J	38 J

Table 1-5 *Ground Water Sampling Results*
Former Red Devil Facility
Mount Vernon, New York

NOTES:
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.
**MW-2A is duplicate of MW-2*
*** DUP is duplicate of MW-6*

Table 1-6 ***Background Soil Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

	MW-7 (20'-22') 4/27/93	MW-7 (20'-22')D 4/27/93	MW-8 (10'-12') 4/27/93	Average Background Concentration
VOLATILES in mg/kg				
all compounds were below limit of detection	ND	ND	ND	ND
SEMIVOLATILES in mg/kg				
Diethylphthalate	NA	0.01 J	ND	0.005
Total TICs	NA	1.829 J	1.285 J	
INORGANICS in mg/kg				
Aluminum	NA	6,090	7,680	6,885
Antimony	NA	ND	ND	ND
Barium	NA	52.0	76.3	64.15
Beryllium	NA	0.24 B	0.38 B	0.31
Cadmium	NA	ND	ND	ND
Calcium	NA	1,710	1,690	1,700
Chromium	NA	13.4	14.6	14
Cobalt	NA	3.4 BJ	5.6 BJ	4.5
Copper	NA	11.4	18.5	14.95
Iron	NA	10,600	12,700	11,650
Lead	NA	2.8	5.1	3.95
Magnesium	NA	7,690	2,890	5,290
Manganese	NA	213	232	222.5
Mercury	NA	ND	0.16	0.08
Nickel	NA	ND	15.2	7.6
Potassium	NA	1,150	1,400	1,275
Sodium	NA	ND	ND	ND
Vanadium	NA	14.3	16.6	15.45
Zinc	NA	37.8	37.8	37.8

NOTES:
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.

Table 1-7 ***Area A Soil Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	HP-6 5/20/91 16-18 feet	B-1A 1/20/92 23-25 feet	B-1AR 2/7/92 23-25 feet	B-2A 1/20/92 17-19 feet	B-3A 1/20/92 24-26 feet	B-4A 1/20/92 19-21 feet	B-5A 2/11/92 17-19 feet	B-6A 2/19/92 21-23 feet	B-7A 1/20/92 20-22 feet
Volatile Organic Compounds, mg/kg									
Acetone	2.9	0.18 B	0.086	1.3J	0.018 B	0.02 B	0.033	ND	ND
Benzene	0.73 J	0.003 J	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	0.018	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	12	0.071	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	0.019 J	ND	ND	0.023	0.018	ND	ND	ND
Methylene Chloride	ND	0.67 B	0.007 B	0.51 BJ	0.005 BJ	0.007 BJ	0.012 B	0.01 B	0.43 BJ
Tetrachloroethene	ND	0.009 J	ND	ND	ND	ND	0.005 J	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	0.003 J	ND	ND
1,1,1-Trichloroethane	0.28 J	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	2200 D	17 E	0.007	2.8	ND	ND	ND	0.007	15
Xylenes (total)	60 JD	0.22	ND	ND	ND	ND	ND	ND	ND
TOTAL VOLATILES	**2275.91**	**18.172**	**0.1**	**4.61**	**0.046**	**0.045**	**0.05**	**0.035**	**15.43**
TICs	314.57 J	1.44 J	0.183 J	ND	0.01 J	0.01 J	ND	0.049	ND
Semi-Volatile Compounds, mg/kg									
Benzo(b)flouranthene	NA	ND	NA	ND	ND	NA	NA	NA	NA
Benzo(a)pyrene	NA	ND	NA	ND	ND	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	ND	NA	ND	ND	NA	NA	NA	NA
Chrysene	NA	ND	NA	ND	ND	NA	NA	NA	NA
Di-n-butyl phthalate	NA	ND	NA	ND	ND	NA	NA	NA	NA
Naphthalene	NA	ND	NA	ND	ND	NA	NA	NA	NA
Phenanthrene	NA	ND	NA	ND	ND	NA	NA	NA	NA
Pyrene	NA	ND	NA	ND	ND	NA	NA	NA	NA
TOTAL B/Ns	**NA**	**ND**	**NA**	**ND**	**ND**	**NA**	**NA**	**NA**	**NA**
B/N TICs	NA	2.3 BJ	NA	2.0 BJ	2.0 BJ	NA	NA	NA	NA
Total Petroleum Hydrocarbons, mg/kg									
Total	92	NA	NA	NA	NA	NA	NA	NA	NA

Table 1-7 ***Area A Soil Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	B-8A 2/7/92 20-22 feet	TB-1 1/20/92	TB 2/7/92	FB 2/7/92	IIA-1 12/30/96 (0'-2')	IIA-1 12/30/96 (2'-4')	IIA-2 12/30/96 (4'-6')	IIA-4* 12/30/96 (4'-6')	IIA-2 12/30/96 (22'-24')	IIA-3 12/29/96 (19'-21')	IIA-3 12/29/96 (21'-23')
Volatile Organic Compounds, mg/kg											
Acetone	0.19	0.013	ND	0.065	ND	ND	0.100 J	0.160 J	0.084 J	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.005 B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	0.005 B	0.013 B	0.012 BJ	0.004 BJ	0.019 BJ	0.018 BJ	0.023 BJ	0.032 BJ	0.013 BJ	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	0.003 J	0.002 J	0.003 J	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	0.001 J	0.019	0.016	0.027	ND	0.032	0.002 J
Xylenes (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL VOLATILES	**0.024**	**0.026 B**	**0.012 B**	**0.069**	**0.020B**	**0.040B**	**0.141B**	**0.222B**	**0.097B**	**0.032**	**0.002**
TICs	ND	ND	0.008	ND	ND	ND	ND	ND	ND	ND	ND
Semi-Volatile Compounds, mg/kg											
Benzo(b)flouranthene	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
TOTAL B/Ns	**NA**	**NA**	**NA**	**ND**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
B/N TICs	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons, mg/											
Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1-7 Area A Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	HP-6 5/20/91 16-18 feet	B-1A 1/20/92 23-25 feet	B-1AR 2/7/92 23-25 feet	B-2A 1/20/92 17-19 feet	B-3A 1/20/92 24-26 feet	B-4A 1/20/92 19-21 feet	B-5A 2/11/92 17-19 feet	B-6A 2/19/92 21-23 feet	B-7A 1/20/92 20-22 feet
Metals, mg/kg									
Aluminum	NA	5240	NA	6900	4230	NA	NA	NA	NA
Antimony	NA	ND	NA	ND	ND	NA	NA	NA	NA
Arsenic	NA	ND	NA	ND	ND	NA	NA	NA	NA
Barium	NA	50.5	NA	74	39.6 B	NA	NA	NA	NA
Beryllium	NA	ND	NA	ND	ND	NA	NA	NA	NA
Cadmium	NA	ND	NA	ND	ND	NA	NA	NA	NA
Calcium	NA	1780	NA	1860	1450	NA	NA	NA	NA
Chromium	NA	13.7	NA	18.8	12.3	NA	NA	NA	NA
Cobalt	NA	ND	NA	ND	ND	NA	NA	NA	NA
Copper	NA	11.6	NA	14.8	9.1	NA	NA	NA	NA
Iron	NA	12200	NA	17200	11300	NA	NA	NA	NA
Lead	NA	2.5 J	NA	4.0 J	4.4 J	NA	NA	NA	NA
Magnesium	NA	3540	NA	3780	1890	NA	NA	NA	NA
Manganese	NA	192	NA	351	149	NA	NA	NA	NA
Mercury	NA	ND	NA	ND	ND	NA	NA	NA	NA
Nickel	NA	13.3	NA	16.7	ND	NA	NA	NA	NA
Potassium	NA	1320	NA	1910	ND	NA	NA	NA	NA
Selenium	NA	ND	NA	ND	ND	NA	NA	NA	NA
Silver	NA	ND	NA	ND	ND	NA	NA	NA	NA
Sodium	NA	ND	NA	ND	ND	NA	NA	NA	NA
Thallium	NA	ND	NA	ND	ND	NA	NA	NA	NA
Vanadium	NA	18	NA	25	14.5	NA	NA	NA	NA
Zinc	NA	46.1	NA	60.7	50.7	NA	NA	NA	NA

NOTES:
** IIA-4 (4-6') is a duplicate of IIA-2 (4-6")*
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.

Table 1-7 ***Area A Soil Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	B-8A 2/7/92 20-22 feet	TB-1 1/20/92	TB 2/7/92	FB 2/7/92	IIA-1 12/30/96 (0'-2')	IIA-1 12/30/96 (2'-4')	IIA-2 12/30/96 (4'-6')	IIA-4* 12/30/96 (4'-6')	IIA-2 12/30/96 (22'-24')	IIA-3 12/29/96 (19'-21')	IIA-3 12/29/96 (21'-23')
Metals, mg/kg											
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:
** IIA-4 (4-6') is a duplicate of IIA-2 (4-6")*
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.

ND: the compound was analyzed for but not detected.

NA: the compound was not analyzed for.

D: result is from secondary dilution analysis.

Table 1-8 Area B Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	B-5 5/2/91 6-8 feet	B-6 5/21/91 16-18 feet

Volatile Organic Compounds, mg/kg

Acetone	ND	NA
Benzene	ND	NA
Carbon Disulfide	ND	NA
Chloroethane	ND	NA
1,1-Dichloroethane	ND	NA
1,1-Dichloroethene	ND	NA
Ethylbenzene	ND	NA
4-Methyl-2-Pentanone	ND	NA
Methylene Chloride	0.076	NA
Tetrachloroethene	ND	NA
1,1,1-Trichloroethane	ND	NA
Toluene	ND	NA
Xylenes (total)	ND	NA
TOTAL VOLATILES	0.076	NA
TICs	0.116	NA

Semi-Volatile Compounds, mg/kg

Benzo(b)flouranthene	0.06 J	ND
Benzo(a)pyrene	0.05 J	ND
Bis(2-ethylhexyl)phthalate	0.03 J	ND
Chrysene	0.05 J	ND
Di-n-butyl·phthalate	0.25 JB	ND
Naphthalene	ND	ND
Phenanthrene	ND	ND
Pyrene	0.06 J	ND
TOTAL B/Ns	0.5 J	ND
TICs	ND	1.1 J

Boring No. Date Collected Depth Collected	B-5 5/2/91 6-8 feet	B-6 5/21/91 16-18 feet

Total Petroleum Hydrocarbons, mg/kg

Total	15	92

Metals, mg/kg

Aluminum	NA	NA
Antimony	NA	NA
Arsenic	NA	NA
Barium	NA	NA
Beryllium	NA	NA
Cadmium	NA	NA
Calcium	NA	NA
Chromium	NA	NA
Cobalt	NA	NA
Copper	NA	NA
Iron	NA	NA
Lead	NA	NA
Magnesium	NA	NA
Manganese	NA	NA
Mercury	NA	NA
Nickel	NA	NA
Potassium	NA	NA
Selenium	NA	NA
Silver	NA	NA
Sodium	NA	NA
Thallium	NA	NA
Vanadium	NA	NA
Zinc	80	NA

NOTES:
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.

Table 1-9 Area C Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	SB-1 5/1/87 8-10 feet	IIC-1 12/18/92 (0'-2')	IIC-1 12/18/92 (4'-6')	IIC-8* 12/18/92	IIC-2 12/17/92 (0'-2')	IIC-2 12/17/92 (2'-4')	IIC-3 12/15/92 (0'-2')	IIC-3 12/15/92 (12'-14')
Volatile Organic Compounds, mg/kg								
Acetone	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.014	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.067	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	1.0 J	3.4 J	ND	2.5
1,1,1-Trichloroethane	0.036	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	ND	ND	ND	ND	3.9	28.0 J	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatiles	**0.117**	**ND**	**ND**	**ND**	**4.9J**	**31.4J**	**ND**	**2.5**
Total TICs	0.159 J	ND	ND	ND	228.6 J	459.0 J	ND	904.0 J

Table 1-9 ***Area C Soil Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	IIC-4 12/17/92 (0'-2')	IIC-4 12/17/92 (4'-6')	IIC-5 12/16/92 (0'-2')	IIC-5 12/16/92 (8'-10')	IIC-6 12/15/92 (2'-4')	IIC-6 12/15/92 (12'-14')	IIC-7 12/7/92 (7'-9')	IIC-7 12/7/92 (13'-15')
Volatile Organic Compounds, mg/kg								
Acetone	ND	0.12 J	ND	ND	ND	ND	0.045 J	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	110.0 DJ	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	ND	ND	ND	ND	ND	120.0 J	ND	ND
2-Hexanone	0.83 J	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	15.0 J	ND	ND
Total Volatiles	**0.83J**	**ND**	**ND**	**ND**	**ND**	**245.0DJ**	**ND**	**ND**
Total TICs	91.1 J	ND	ND	ND	ND	862.0 J	ND	ND

Table 1-9 ***Area C Soil Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	SB-1 5/1/87 8-10 feet	IIC-1 12/18/92 (0'-2')	IIC-1 12/18/92 (4'-6')	IIC-8* 12/18/92	IIC-2 12/17/92 (0'-2')	IIC-2 12/17/92 (2'-4')	IIC-3 12/15/92 (0'-2')	IIC-3 12/15/92 (12'-14')
Semi-Volatile Compounds, mg/kg								
Diethylphthalate	ND	NA	0.015 J	0.01 J	NA	NA	NA	NA
Di-n-butylphthalate	1.6 B	NA	1.2	0.97	NA	NA	NA	NA
Butylbenzylphthalate	ND	NA	0.027 J	0.062 J	NA	NA	NA	NA
Di-n-octylphthalate	ND	NA	0.01 J	0.01 J	NA	NA	NA	NA
Naphthalene	ND	NA	ND	ND	NA	NA	NA	NA
2-Methylnaphthalene	ND	NA	ND	ND	NA	NA	NA	NA
Fluoranthene	0.44	NA	ND	ND	NA	NA	NA	NA
Pyrene	0.3 J	NA	ND	ND	NA	NA	NA	NA
Acenaphthylene	ND	NA	ND	ND	NA	NA	NA	NA
Acenaphthene	ND	NA	ND	ND	NA	NA	NA	NA
Dibenzofuran	ND	NA	ND	ND	NA	NA	NA	NA
Fluorene	ND	NA	ND	ND	NA	NA	NA	NA
Phenanthrene	0.27 J	NA	ND	ND	NA	NA	NA	NA
Anthracene	0.073 J	NA	ND	ND	NA	NA	NA	NA
N-nitrosodiphenylamine	ND	NA	ND	ND	NA	NA	NA	NA
Benzo(k)fluoranthene	ND	NA	ND	ND	NA	NA	NA	NA
Benzo(a)pyrene	0.18 J	NA	ND	ND	NA	NA	NA	NA
Carbazole	ND	NA	ND	ND	NA	NA	NA	NA
Benzo(a)anthracene	ND	NA	ND	ND	NA	NA	NA	NA
Chrysene	ND	NA	ND	ND	NA	NA	NA	NA
Benzo(b)fluoranthene	0.35	NA	ND	ND	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	NA	NA	NA	NA
Total Semi-Volatiles	3.213JB	NA	1.252J	1.052J	NA	NA	NA	NA
Total TICs	ND	NA	1.388 J	0.517	NA	NA	NA	NA
Total Petroleum Hydrocarbons, mg/kg								
Total	40	NA	NA	NA	NA	NA	NA	NA

Table 1-9 Area C Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	IIC-4 12/17/92 (0'-2')	IIC-4 12/17/92 (4'-6')	IIC-5 12/16/92 (0'-2')	IIC-5 12/16/92 (8'-10')	IIC-6 12/15/92 (2'-4')	IIC-6 12/15/92 (12'-14')	IIC-7 12/7/92 (7'-9')	IIC-7 12/7/92 (13'-15')
Semi-Volatile Compounds, mg/kg								
Diethylphthalate	NA	ND	0.015 J	0.034 J	NA	NA	NA	NA
Di-n-butylphthalate	NA	0.72	0.22 J	0.12 J	NA	NA	NA	NA
Butylbenzylphthalate	NA	0.094 J	ND	0.019 J	NA	NA	NA	NA
Di-n-octylphthalate	NA	ND	ND	ND	NA	NA	NA	NA
Naphthalene	NA	0.074 J	0.14 J	ND	NA	NA	NA	NA
2-Methylnaphthalene	NA	0.013 J	0.21 J	ND	NA	NA	NA	NA
Fluoranthene	NA	0.054 J	23.0 J	ND	NA	NA	NA	NA
Pyrene	NA	0.026 J	17.0 J	ND	NA	NA	NA	NA
Acenaphthylene	NA	ND	0.24 J	ND	NA	NA	NA	NA
Acenaphthene	NA	ND	4.6 J	ND	NA	NA	NA	NA
Dibenzofuran	NA	ND	4.8 J	ND	NA	NA	NA	NA
Fluorene	NA	ND	5.5 J	ND	NA	NA	NA	NA
Phenanthrene	NA	ND	32.0 J	ND	NA	NA	NA	NA
Anthracene	NA	ND	9.6 J	ND	NA	NA	NA	NA
N-nitrosodiphenylamine	NA	ND	0.42 J	ND	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	ND	1.5 J	ND	NA	NA	NA	NA
Benzo(a)pyrene	NA	ND	1.2 J	ND	NA	NA	NA	NA
Carbazole	NA	ND	2.1 J	ND	NA	NA	NA	NA
Benzo(a)anthracene	NA	ND	2.4 J	ND	NA	NA	NA	NA
Chrysene	NA	ND	4.9 J	ND	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	ND	1.6 J	ND	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Total Semi-Volatiles	**NA**	**0.981J**	**111.45J**	**0.173J**	**NA**	**NA**	**NA**	**NA**
Total TICs	NA	1.313 J	18.99 J	1.985 J	NA	NA	NA	NA
Total Petroleum Hydrocarbons, mg/kg								
Total	NA	NA	NA	NA	NA	NA	NA	NA

Table 1-9 ***Area C Soil Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

Boring No. / Date Collected / Depth Collected	SB-1 5/1/87 8-10 feet	IIC-1 12/18/92 (0'-2')	IIC-1 12/18/92 (4'-6')	IIC-8* 12/18/92	IIC-2 12/17/92 (0'-2')	IIC-2 12/17/92 (2'-4')	IIC-3 12/15/92 (0'-2')	IIC-3 12/15/92 (12'-14')
Metals, mg/kg								
Aluminum	NA	NA	10,000	9,410	NA	NA	NA	NA
Antimony	NA	NA	ND	16.9 J	NA	NA	NA	NA
Barium	NA	NA	77.3	80.3	NA	NA	NA	NA
Beryllium	NA	NA	0.46 B	0.26 B	NA	NA	NA	NA
Cadmium	NA	NA	ND	ND	NA	NA	NA	NA
Calcium	NA	NA	7,910	4,870	NA	NA	NA	NA
Chromium	NA	NA	29.3	26	NA	NA	NA	NA
Cobalt	NA	NA	11.9	10 B	NA	NA	NA	NA
Copper	NA	NA	14.6	21.7	NA	NA	NA	NA
Iron	NA	NA	19,900	19,300	NA	NA	NA	NA
Lead	NA	NA	3.9	3.8	NA	NA	NA	NA
Magnesium	NA	NA	8,830	7,800	NA	NA	NA	NA
Manganese	NA	NA	286 J	275 J	NA	NA	NA	NA
Mercury	NA	NA	ND	0.34 J	NA	NA	NA	NA
Nickel	NA	NA	19.2	18.5	NA	NA	NA	NA
Potassium	NA	NA	4,230	3,290	NA	NA	NA	NA
Sodium	NA	NA	133 B	121 B	NA	NA	NA	NA
Vanadium	NA	NA	29.8	32.0	NA	NA	NA	NA
Zinc	45	NA	55	54.6	NA	NA	NA	NA

NOTES:
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.
** Sample C-8 is a duplicate of sample C-1 (4-6 ft)*

Table 1-9 ***Area C Soil Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	IIC-4 12/17/92 (0'-2')	IIC-4 12/17/92 (4'-6')	IIC-5 12/16/92 (0'-2')	IIC-5 12/16/92 (8'-10')	IIC-6 12/15/92 (2'-4')	IIC-6 12/15/92 (12'-14')	IIC-7 12/7/92 (7'-9')	IIC-7 12/7/92 (13'-15')
Metals, mg/kg								
Aluminum	NA	16,400	8,270	7,980	NA	NA	NA	NA
Antimony	NA	19.6 J	13.9 J	13.0 B	NA	NA	NA	NA
Barium	NA	179	101	97.7	NA	NA	NA	NA
Beryllium	NA	0.82 B	0.33 B	0.25 B	NA	NA	NA	NA
Cadmium	NA	ND	ND	ND	NA	NA	NA	NA
Calcium	NA	3,490	19,800	4,590	NA	NA	NA	NA
Chromium	NA	51.30	20.3	22.4	NA	NA	NA	NA
Cobalt	NA	17.8	10.8	9.9 B	NA	NA	NA	NA
Copper	NA	30.4	15.2	20.7	NA	NA	NA	NA
Iron	NA	27,700	16,300	19,200	NA	NA	NA	NA
Lead	NA	4.6	11.1	2.5	NA	NA	NA	NA
Magnesium	NA	11,100	5,230	8,540	NA	NA	NA	NA
Manganese	NA	433 J	208	261	NA	NA	NA	NA
Mercury	NA	ND	0.18	0.16	NA	NA	NA	NA
Nickel	NA	29.7	15.3	18.2	NA	NA	NA	NA
Potassium	NA	7,510	3,120	2,700	NA	NA	NA	NA
Sodium	NA	185 B	190 B	148 B	NA	NA	NA	NA
Vanadium	NA	55.1	24.2	32.7	NA	NA	NA	NA
Zinc	NA	81.7	89.0 J	46.7	NA	NA	NA	NA

NOTES:
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.
** Sample C-8 is a duplicate of sample C-1 (4-6 ft)*

Table 1-10 Area D Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	B-2 5/2/91 5-7 feet	B-3 5/2/91 12-14 feet	B-4 5/2/91 14-16 feet	B-1D 1/28/92 11-13 feet	B-2D 1/28/92 11-13 feet	B-2D (DUP 1/28/92 11-13 feet	B-3D 1/24/92 11-13 feet	B-4D 1/30/92 12-14 feet	B-5D 1/30/92 7-9 feet	B-6D 1/29/92 12-14 feet
Volatile Organic Compounds, mg/kg										
Acetone	ND	ND	ND	2.8 J	5.6 B	4.7 B	0.037 B	2.6	ND	4.4
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	0.004 J	ND	ND	ND
1,1-Dichloroethane	ND	ND	0.039	ND	ND	ND	0.009 J	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	0.11	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	0.005 J	ND	ND	ND
2-Hexanone	ND	ND	ND	10	13	13	0.013	4.2	29	11
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	1.9 B	1.8 B	1.8 B	0.008 B	2.3 B	18 B	3.9 B
Tetrachloroethene	ND	ND	0.007	ND	ND	ND	0.02	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	0.022	ND	ND	ND	0.053	ND	ND	ND
Toluene	ND	ND	ND	13	12	11	ND	3	ND	12
Xylenes (total)	ND	23	0.056	78	100	110	0.086	33	150	74
TOTAL VOLATILES	ND	23	0.124	105.7 JB	132.4 B	140.5 B	0.345 JB	45.1 B	197 B	94.3 B
TICs	ND	2270 J	0.76 J	99 J	599 J	5600 J	0.06 J	73 J	2490 J	400 J
Semi-Volatile Compounds, mg/kg										
Benzo(b)flouranthene	ND	ND	0.083 J	ND	ND	ND	ND	NA	NA	NA
Benzo(a)pyrene	ND	ND	0.06 J	ND	ND	ND	ND	NA	NA	NA
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
Chrysene	ND	ND	0.06 J	ND	ND	ND	ND	NA	NA	NA
Di-n-butyl phthalate	0.45 B	ND	1.2 B	ND	ND	ND	ND	NA	NA	NA
Naphthalene	ND	ND	0.11 J	5.2 J	6.5 J	6.4 J	ND	NA	NA	NA
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
Pyrene	ND	ND	0.04 J	ND	ND	ND	ND	NA	NA	NA
TOTAL B/Ns	0.45 B	ND	1.553 JB	5.2 J	6.5 J	6.4 J	ND	NA	NA	NA
TICs	ND	ND	ND	1600 J	1960 J	1700 J	15.5 J	NA	NA	NA
PCBs										
Total	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Total Petroleum Hydrocarbons, mg/kg										
Total	11	25000	1400	NA	NA	NA	NA	NA	NA	NA

Table 1-10 Area D Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	B-7D 1/28/92 9-11 feet	B-8D 1/27/92 11-13 feet	B-9D 1/27/92 11-13 feet	B-10D 1/24/92 9-11 feet	FB-1 1/24/92	FB-2 1/27/92	FB-3 1/28/92	FB 1/30/92	TB-1 1/24/92	TB-3 1/28/92
Volatile Organic Compounds, mg/kg										
Acetone	1.9 B	4.4 B	38 B	0.054 B	ND	ND	ND	0.84	0.011 B	0.01 B
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	0.031	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	1.6	5.7	30 JD	0.007	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	46	0.013	ND	0.035 J	ND	ND	ND	ND
Methylene Chloride	2.5 B	4.8 B	94 DB	ND	0.008 B	0.023 JB	0.004 JB	0.043 B	0.011B	0.01B
Tetrachloroethene	ND	ND	ND	0.007	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	0.009	ND	ND	ND	ND	ND	ND
Toluene	2.7	7.6	ND	0.005 J	ND	0.37	ND	ND	ND	ND
Xylenes (total)	39	110	1400 E	0.062	ND	ND	ND	ND	ND	ND
TOTAL VOLATILES	**47.7 B**	**132.5 B**	**1608 JDB**	**0.182 JB**	**0.008 B**	**0.428 JB**	**0.004 JB**	**0.883 B**	**0.022 B**	**0.02 B**
TICs	680 J	2600 J	110100 J	0.08 J	ND	ND	ND	ND	ND	ND
Semi-Volatile Compounds, mg/kg										
Benzo(b)flouranthene	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	0.012	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
TOTAL B/Ns	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**0.012**	**NA**	**NA**	**NA**
TICs	NA	NA	NA	NA	NA	NA	0.006 J	NA	NA	NA
PCBs										
Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons, mg/kg										
Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1-10 Area D Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	IID-1 12/9/96 (10'-12')	IID-1 12/9/96 (12'-14')	IID-2 12/10/96 (11'-13')	IID-2 12/10/96 (13'-15')	IID-3 12/10/96 (12'-14')	IID-3 12/10/96 (14'-16')	IID-4 12/15/96 (10'-12')	IID-4 12/15/96 (12'-14')	IID-5 12/15/96 (8'-10')	IID-5 12/15/96 (12'-14')
Volatile Organic Compounds, mg/kg										
Acetone	ND	ND	ND	12.0 J	14.0 J	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5.2	6.6	5.6	15.0	38.0 J	3.6	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	0.021	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.9	2.8	ND	ND	22.0 BJ	ND	ND	ND	ND	2.1 J
Xylenes (total)	41.0	52.0	36 B	130.0 B	270.0 BJ	25.0 B	ND	ND	ND	36.0 J
TOTAL VOLATILES	47.1	61.4	41.6B	157JB	331.4JB	28.6B	ND	0.021	ND	38.1J
TICs	291J	374 J	1,008 J	1,405 J	980.0 J	205.4 J				473.0 J
Semi-Volatile Compounds, mg/kg										
Benzo(b)flouranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL B/Ns	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TICs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs										
Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons, mg/kg										
Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1-10 Area D Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. / Date Collected / Depth Collected	IID-9* 12/15/96	IID-6 12/11/96 (12'-14')	IID-6 12/11/96 (14'-16')	IID-7 12/11/96 (0'-2')	IID-7 12/11/96 (12'-14')	IID-8 12/12/96 (10'-12')	IID-8 12/12/96 (12'-14')
Volatile Organic Compounds, mg/kg							
Acetone	ND	ND	ND	ND	ND	24.0 J	ND
Benzene	ND	ND	ND	ND	ND	1.3 J	0.350 J
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	8.0	ND	15.0	ND	ND	7.4	1.7 J
2-Hexanone	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	4.0 J	5.7 J
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	1.10 J	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	1.3 J	ND
Toluene	1.3 J	ND	ND	0.001 J	ND	160.0 BJ	70.0 BJ
Xylenes (total)	68.0	1.5 BJ	110.0 D	ND	ND	31.0 B	17.0 B
TOTAL VOLATILES	77.3J	1.5JB	125.0D	0.001J	ND	230.1JB	94.75JB
TICs		25.3 J	532.5 J		197.9	196.0 J	130.1 J
Semi-Volatile Compounds, mg/kg							
Benzo(b)flouranthene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA
TOTAL B/Ns	NA	NA	NA	NA	NA	NA	NA
TICs	NA	NA	NA	NA	NA	NA	NA
PCBs							
Total	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons, mg/kg							
Total	NA	NA	NA	NA	NA	NA	NA

Table 1-10 Area D Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	B-2 5/2/91 5-7 feet	B-3 5/2/91 12-14 feet	B-4 5/2/91 14-16 feet	B-1D 1/28/92 11-13 feet	B-2D 1/28/92 11-13 feet	B-2D (DUP 1/28/92 11-13 feet	B-3D 1/24/92 11-13 feet	B-4D 1/30/92 12-14 feet	B-5D 1/30/92 7-9 feet	B-6D 1/29/92 12-14 feet
Metals, mg/kg										
Aluminum	NA	NA	NA	20000	19100	19200	12100	NA	NA	NA
Antimony	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA
Arsenic	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA
Barium	NA	NA	NA	141	114	116	83	NA	NA	NA
Beryllium	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA
Cadmium	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA
Calcium	NA	NA	NA	1900	1430	1560	1570	NA	NA	NA
Chromium	NA	NA	NA	46.9	44.3	43.7	27.2	NA	NA	NA
Cobalt	NA	NA	NA	18.3	17.7	16.4	12.5	NA	NA	NA
Copper	NA	NA	NA	10.6	11	11.1	6.2	NA	NA	NA
Iron	NA	NA	NA	32900	32300	29800	17300	NA	NA	NA
Lead	NA	NA	NA	9.7 J	13.5 J	13.9 J	4.8 J	NA	NA	NA
Magnesium	NA	NA	NA	6980	6540	6550	4450	NA	NA	NA
Manganese	NA	NA	NA	913	787	695	276	NA	NA	NA
Mercury	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA
Nickel	NA	NA	NA	27.2	26.3	26.2	16.2	NA	NA	NA
Potassium	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA
Selenium	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA
Silver	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA
Sodium	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA
Thallium	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA
Vanadium	NA	NA	NA	51.9	46.9	47	29	NA	NA	NA
Zinc	56	52	40	95	93.8	94.1	58.9	NA	NA	NA

NOTES:
** D-9 is a duplicate of IID-5 (12'-14')*
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.
E: concentration of compound exceeds the calibration range of the instrument.
R: data was rejected as a result of data validation requirements.

Table 1-10 Area D Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	B-7D 1/28/92 9-11 feet	B-8D 1/27/92 11-13 feet	B-9D 1/27/92 11-13 feet	B-10D 1/24/92 9-11 feet	FB-1 1/24/92	FB-2 1/27/92	FB-3 1/28/92	FB 1/30/92	TB-1 1/24/92	TB-3 1/28/92
Metals, mg/kg										
Aluminum	NA	NA	NA	NA	200	NA	200	NA	NA	NA
Antimony	NA	NA	NA	NA	R	NA	R	NA	NA	NA
Arsenic	NA	NA	NA	NA	10	NA	10	NA	NA	NA
Barium	NA	NA	NA	NA	25	NA	25	NA	NA	NA
Beryllium	NA	NA	NA	NA	5	NA	5	NA	NA	NA
Cadmium	NA	NA	NA	NA	5	NA	5	NA	NA	NA
Calcium	NA	NA	NA	NA	5000	NA	5000	NA	NA	NA
Chromium	NA	NA	NA	NA	10	NA	10	NA	NA	NA
Cobalt	NA	NA	NA	NA	50	NA	50	NA	NA	NA
Copper	NA	NA	NA	NA	25	NA	25	NA	NA	NA
Iron	NA	NA	NA	NA	3550	NA	434	NA	NA	NA
Lead	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Magnesium	NA	NA	NA	NA	5000	NA	5000	NA	NA	NA
Manganese	NA	NA	NA	NA	74.8	NA	15.1	NA	NA	NA
Mercury	NA	NA	NA	NA	0.2	NA	0.2	NA	NA	NA
Nickel	NA	NA	NA	NA	40	NA	40	NA	NA	NA
Potassium	NA	NA	NA	NA	5000	NA	5000	NA	NA	NA
Selenium	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Silver	NA	NA	NA	NA	R	NA	R	NA	NA	NA
Sodium	NA	NA	NA	NA	5000	NA	5000	NA	NA	NA
Thallium	NA	NA	NA	NA	R	NA	R	NA	NA	NA
Vanadium	NA	NA	NA	NA	50	NA	50	NA	NA	NA
Zinc	NA	NA	NA	NA	14.8	NA	10	NA	NA	NA

NOTES:
** D-9 is a duplicate of IID-5 (12'-14')*
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.
E: concentration of compound exceeds the calibration range of the instrument.
R: data was rejected as a result of data validation requirements.

Table 1-10 Area D Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	IID-1 12/9/96 (10'-12')	IID-1 12/9/96 (12'-14')	IID-2 12/10/96 (11'-13')	IID-2 12/10/96 (13'-15')	IID-3 12/10/96 (12'-14')	IID-3 12/10/96 (14'-16')	IID-4 12/15/96 (10'-12')	IID-4 12/15/96 (12'-14')	IID-5 12/15/96 (8'-10')	IID-5 12/15/96 (12'-14')
Metals, mg/kg										
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:
** D-9 is a duplicate of IID-5 (12'-14')*
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.
E: concentration of compound exceeds the calibration range of the instrument.
R: data was rejected as a result of data validation requirements.

Table 1-10 Area D Soil Sampling Results
Former Red Devil Facility
Mount Vernon, New York

Boring No. Date Collected Depth Collected	IID-9* 12/15/96	IID-6 12/11/96 (12'-14')	IID-6 12/11/96 (14'-16')	IID-7 12/11/96 (0'-2')	IID-7 12/11/96 (12'-14')	IID-8 12/12/96 (10'-12')	IID-8 12/12/96 (12'-14')
Metals, mg/kg							
Aluminum	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA

NOTES:
** IID-9 is a duplicate of IID-5 (12'-14')*
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CR
B (organics): compound detected in sample at a concentration greater than ten times the amount in t
B (inorganics): result is less than contract lab required detection limit, but greater than the instrume
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.
E: concentration of compound exceeds the calibration range of the instrument.
R: data was rejected as a result of data validation requirements.

Table 1-11 *Surface Water Sampling Results*
Former Red Devil Facility
Mount Vernon, New York

Sample Location Relative to the Site	Upstream of the Site			Adjacent to the Site	Downstream of the Site	Within the Boom
Sample No. Date Collected	SW-1 6/10/93	SW-2 6/10/93	SW-10* 6/10/93	SW-3 6/10/93	SW-4 6/10/93	SW-5 6/10/93
Volatiles, ug/l						
Toluene	ND	ND	ND	ND	ND	5 J
Xylene	ND	ND	ND	ND	ND	4 J
Total TICs	24 J	17 J	19 J	27 J	33 J	93 J
Semi-Volatiles, ug/l						
2,6-Dinitrotoluene	ND	8 J	ND	ND	ND	NA
Total TICs	10 J	4 J	4 J		14 J	NA
Metals, ug/l						
Aluminum	ND	105 B	44.0 B	115 B	95.1 B	NA
Barium	68.0 B	63.6 B	69.4 B	69.4 B	69.4 B	NA
Calcium	44,600	45,400	47,300	46,300	46,400	NA
Copper	ND	10.9 B	9.1 B	9.1 B	7.3 B	NA
Iron	296	318	335	334	494	NA
Lead	ND	ND	ND	ND	4.8	NA
Magnesium	14,300	14,500	15,100	14,800	14,800	NA
Manganese	178	178	189	187	225	NA
Potassium	3,270 B	4,880 B	4,410 B	4,740 B	4,220 B	NA
Silver	ND	ND	ND	ND	ND	NA
Sodium	46,300	46,300	47,000	45,600	45,800	NA
Vanadium	ND	7.7 B	ND	ND	ND	NA
Zinc	16.1 B	14.0 B	15.4 B	12.0 B	16.8 B	NA

NOTES:
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.
**** SW-10 is a field duplicate of SW-2***

Table 1-12 ***Sediment Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

Sample Location Relative to the Site	**Upstream of the Site**		**Adjacent to the Site**					**Downstream of the Site**		
Sample Location Date Collected	SED-1 6/10/93	SED-2 6/10/93	SED-3 6/10/93	SED-4 6/10/93	SED-5 6/10/93	SED-6 6/10/93	SED-10* 6/10/93	SED-7 6/10/93	SED-8 6/10/93	SED-9 6/10/93
Volatiles, mg/kg										
Acetone	ND	ND	ND	ND	ND	ND	ND	0.006 J	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	0.004 J	0.015	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	0.004 J	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	0.008 J	ND	ND	ND	ND	ND
Semi-Volatile Compounds, mg/kg										
Fluorene	ND	NA	NA	NA	NA	ND	ND	NA	0.130 J	ND
Phenanthrene	ND	NA	NA	NA	NA	0.053 J	ND	NA	0.7	0.170 J
Anthracene	ND	NA	NA	NA	NA	ND	ND	NA	0.180 J	ND
Carbazole	ND	NA	NA	NA	NA	ND	ND	NA	0.061 J	ND
Fluoranthene	ND	NA	NA	NA	NA	0.078 J	ND	NA	0.560 J	0.310 J
Pyrene	ND	NA	NA	NA	NA	0.060 J	ND	NA	0.380 J	0.310 J
Benzo(a)anthracene	ND	NA	NA	NA	NA	ND	ND	NA	0.280 J	0.280 J
Chrysene	ND	NA	NA	NA	NA	0.064 J	ND	NA	0.320 J	0.280 J
Bis(2-ethylhexyl)phthalate	0.130 J	NA	NA	NA	NA	0.220 J	0.100 J	NA	0.250 J	0.095 J
Benzo(b)fluoranthene	ND	NA	NA	NA	NA	ND	ND	NA	0.160 J	0.240 J
Benzo(k)fluoranthene	ND	NA	NA	NA	NA	0.063 J	ND	NA	0.240 J	0.130 J
Benzo(a)pyrene	ND	NA	NA	NA	NA	ND	ND	NA	0.150 J	0.200 J
2-Methylnaphthalene	ND	NA	NA	NA	NA	ND	ND	NA	0.055 J	ND
Acenaphthene	ND	NA	NA	NA	NA	ND	ND	NA	0.170 J	ND
Total TICs	0.940 J	NA	NA	NA	NA	1.814 J	0.530 J	NA	1.276 J	2.260 J

Table 1-12 ***Sediment Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

Sample Location Relative to the Site	**Upstream of the Site**		**Adjacent to the Site**					**Downstream of the Site**		
Sample Location Date Collected	SED-1 6/10/93	SED-2 6/10/93	SED-3 6/10/93	SED-4 6/10/93	SED-5 6/10/93	SED-6 6/10/93	SED-10* 6/10/93	SED-7 6/10/93	SED-8 6/10/93	SED-9 6/10/93
Metals, mg/kg										
Aluminum	3,240	NA	NA	NA	NA	2,290	1,820	NA	2,680	9,010
Antimony	ND	NA	NA	NA	NA	ND	ND	NA	20.1	46.1
Arsenic	2.1 BJ	NA	NA	NA	NA	1.3 BJ	ND	NA	1.3 BJ	3.4 J
Barium	39.0 B	NA	NA	NA	NA	29.1 B	21.5 B	NA	21.6 B	78.0
Beryllium	2.0 J	NA	NA	NA	NA	ND	ND	NA	0.39 BJ	0.44 BJ
Calcium	2,170	NA	NA	NA	NA	2,910 J	2,870 J	NA	6,330 J	8,400 J
Chromium	61.8	NA	NA	NA	NA	11.9	7.4	NA	9.5	24.8
Cobalt	10.8 B	NA	NA	NA	NA	ND	ND	NA	3.6 B	8.5 B
Copper	119 J	NA	NA	NA	NA	13.7 J	10.1 J	NA	17.2 J	49.4 J
Iron	32,100	NA	NA	NA	NA	9,740	7,880	NA	8,240	17,200
Lead	850	NA	NA	NA	NA	34.0	45.7	NA	43.0	117
Magnesium	1,810	NA	NA	NA	NA	2,080	2,080	NA	3,800	6,760
Manganese	252 J	NA	NA	NA	NA	180 J	108 J	NA	121 J	233 J
Mercury	ND	NA	NA	NA	NA	ND	ND	NA	ND	0.20 J
Nickel	44.0	NA	NA	NA	NA	ND	ND	NA	ND	14.3
Potassium	530 B	NA	NA	NA	NA	ND	324 B	NA	484 B	1,460 B
Sodium	2.6	NA	NA	NA	NA	ND	3.9	NA	6.1	4.6
Vanadium	18.5	NA	NA	NA	NA	10 B	9.6 B	NA	9.0 B	30.0
Zinc	386 J	NA	NA	NA	NA	45.2 J	95.5 J	NA	69.4 J	141 J

NOTES:
TIC: Tentatively Identified Compounds
J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.
B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.
B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.
ND: the compound was analyzed for but not detected.
NA: the compound was not analyzed for.
D: result is from secondary dilution analysis.
**** SED-10 is a field duplicate of SED-6***

Table 1-13 ***Summary of Total Organic Carbon Results for Bronx River Sediment***
Former Red Devil Facility
Mount Vernon, New York

Sample Number	Total Organic Carbon, mg/kg
SED-1	1,777.8
SED-6	2,178.2
SED-8	2,775
SED-9	31,102
SED-9 Duplicate	11,595
Mean SED-9 Concentration	21,349
SED-10 (1)	1,225
Mean TOC Concentration (2)	5,860.9

(1) Duplicate of SED-6.
(2) Mean SED-9 concentration used to determine the mean TOC concentration.

Sampling Locations:
SED 1: Upstream Sample
SED 6: Adjacent to the Site
SED 9: Downstream of the Site

Table 1-14 ***Summary of Air Sampling Results***
Former Red Devil Facility
Mount Vernon, New York

concentrations in parts per billion

Sample Locations	Air-1	Air-2	Air-3	Air-4	Air-5	Air-6	Air-7	Air-8	Air-9	OSHA Levels (2)
Acetone	300	110	110	57	19	14	ND	5.75 (1)	ND	1,000,000
Methylene Chloride	ND	ND	9.7	9.5	11	2.9	5.5	ND	ND	500,000
Tri-chloro, tri-flouroethane	ND	4.9	ND	ND	ND	ND	ND	ND	ND	1,000,000
1,1,1 Trichloroethane	1.2	2.7	2.5	2.4	2.3	3.3	1.4	ND	ND	350,000
Benzene	2.2	3.8	13	14	14	9.4	40	1.2 (1)	ND	1,000
Toluene	7.8 B	40 B	210	210	240	230	320	4.45 B (1)	4.6 B (1)	200,000
Tetrachloroethene	1.4	1.1	0.9	1	0.89	ND	0.9	1.4 (1)	1.4 (1)	100,000
Ethylbenzene	ND	1.7	5.1	5.4	5.7	5.4	20	ND	ND	100,000
Meta and Para-Xylene	3.3	9.5	23	23	23	28	82	1.95 (1)	1.55 (1)	100,000
Ortho Xylene	1.1	4.5	10	10	10	16	31	0.675 (1)	ND	100,000

Notes:
ND: the compound was analyzed for but not detected.
B: result considered suspect and estimated due to potential blank contamination.
(1): results are an average of duplicate laboratory samples.
(2): Permissible Exposure Levels.

Table 1-15

Summary of Previous Tank Removal/Closure Activities
Former Red Devil Facility, Mount Vernon, New York

Area	Tank No.	Tank Type	Former Tank Contents[1]	Condition of Tank[2]	Action Taken
A	1A	UST	alcohol	good (V)	All tanks in Area A were emptied, cleaned and removed. Soil was excavated to a depth of 6 feet where a concrete slab (tank foundation) was encountered.
	2A	UST	excess storage	good (V)	
	3A	UST	mineral spirits	poor (V)	
	4A	UST	methanol	good (V)	
	5A	UST	methylene chloride/isopropanol	good (V)	
	6A	UST	methylene chloride/isopropanol	good (V)	
B	1	Vaulted	temporary storage for materials stored in Area A USTs; medium oil alkyd	good (V)	Tank Nos. 1 through 8 in Area B were emptied and removed.
	2	Vaulted	long oil alkyd/polyurethane blend	good (V)	
	3	Vaulted	hydrocarbon resin	good (V)	
	4	Vaulted	long oil alkyd/polyurethane blend	good (V)	
	5	Vaulted	long oil alkyd/polyurethane blend	good (V)	
	6	Vaulted	methyl carbitol	good (V)	
	7	Vaulted	raw linseed oil	good (V)	
	8	Vaulted	long oil alkyd/polyurethane blend	good (V)	Tank Nos. 1 through 8 in Area B were emptied and removed.

Table 1-15

Summary of Previous Tank Removal/Closure Activities
Former Red Devil Facility, Mount Vernon, New York

Area	Tank No.	Tank Type	Former Tank Contents[1]	Condition of Tank[2]	Action Taken
B	9	Vaulted	fuel oil	good (V)	Tank No. 9 was removed by the Site operator, Metro Self Storage, Inc., after the May 1991 tank closure activities.
	E	UST	mineral spirits; methanol	good (S)	All USTs were emptied, cleaned and permanently closed in-place by filling with sand. USTs were not removed since they were located below load bearing walls.
	F	UST	acetone	good (S)	
	G	UST	medium oil alkyd	good (S)	
	H	UST	no. 6 fuel oil	good (S)	
C	D	UST	polyurethane varnish	good (S)	Emptied, cleaned and permanently closed in-place by filling with sand.
	I	UST	paint sludge	good (S)	Emptied, cleaned and permanently closed in-place by filling with sand.
	13	Vaulted	long oil	good (V)	All vaulted tanks in Area C were emptied and removed.
	15	Vaulted	medium oil	good (V)	
	16	Vaulted	filtered alkyds	good (V)	
	19	Vaulted	medium oil	good (V)	
D	A	UST	stormwater	NA	No action.
	B	UST	stormwater	NA	No action.

Table 1-15

Summary of Previous Tank Removal/Closure Activities
Former Red Devil Facility, Mount Vernon, New York

Area	Tank No.	Tank Type	Former Tank Contents[1]	Condition of Tank[2]	Action Taken
D	C	UST	waste oil; linseed oil	good (V)	Emptied, cleaned and removed.
	10	UST	waste acetone/toluene; acetone/toluene	good (S)	Permanently closed with amino acid foam.
	34	UST	polyurethane varnish; mineral spirits	poor (V)	Emptied, cleaned and removed.
	35	UST	mineral spirits; medium oil	poor (V & S)	Emptied, cleaned and removed.
	36	UST	mineral spirits	good (V)	Emptied, cleaned and removed.

Notes:

[1] Unless otherwise noted, tank contents information was obtained from the "Summary of Preliminary Investigation and Proposed Phase II Site Investigation, Former Red Devil Facility, Mount Vernon, New York", ERM, July 1991 (ERM, 1991).
[2] Tank condition determined via visual inspection of the tank (V) and/or sampling in the area of the tank (S).

Table 1-16 Volume of On-Site NAPL Recovered
Former Red Devil Facility, Mount Vernon, New York

Activity	Volume of On-Site NAPL Recovered, gallons	
	Area C	Area D
Pilot Study - Automated Recovery		
19 January 1993 - 1 February 1993	415	
4 February 1993 - 30 April 1993	1,285	
January 1993 - April 1993 total	1,700	
February 1993 - April 1993[1]		155
IRM - Automated Recovery		
July 1994 - 31 December 1994	1,565	100[2]
IRM - Manual Recovery		
December 1994	0	10
Total Volume of On-Site NAPL Recovered, gallons	3,265	265

Notes:

1 Significant downtime was experienced in this area. As a result, the system did not operate continuously during these months, but rather operated sporadically.

2 Volume also includes some NAPL removed via hand bailing.

Table 1-17 Product Disposal Anaylsis for Area C NAPL
Former Red Devil Facility, Mount Vernon, New York

Parameter	*Concentration, mg/kg*
Benzene	19
Bromobenzene	<9
Bromochloromethane	<9
Bromodichloromethane	<9
Bromoform	<9
n-Butylbenzene	<9
tert-Butylbenzene	44
sec-Buylbenzene	400
Carbon Tetrachloride	<9
Chlorobenzene	<9
Chloroform	<9
4-Chlorotoluene	<9
2-Chlorotoluene	<9
Chlorodibromomethane	<9
1,2-Dibromomethane	<9
Dibromomethane	<9
1,3-Dichlorobenzene	<9
1,2-Dichlorobenzene	<9
1,4-Dichlorobenzene	<9
1,1-Dichloroethane	<9
1,2-Dichloroethane	<9
cis-1,2-Dichloroethene	<9
trans-1,2-Dichloroethene	<9
1,1-Dichloroethene	<9
1,3-Dichloropropane	<9
1,2-Dichloropropane	<9
2,2-Dichloropropane	<9
1,1-Dichloropropene	<9
1,3-Dichloropropene	<9
Ethylbenzene	500
Hexachlorobutadiene	<9
Isopopylbenzene	470
p-Isopropyltoluene	790
Methylene Chloride	<9

Parameter	*Concentration, mg/kg*
Naphthalene	440
n-Propylbenzene	910
Styrene	<9
1,1,1,2-Tetrachloroethane	<9
1,1,2,2-Tetrachloroethane	<9
Tetrachlorothene	<9
Toluene	9,800
1,2,3-Trichlorobenzene	<9
1,2,4-Trichlorobenzene	<9
1,1,1-Trichloroethane	<9
1,1,2-Trichloroethane	<9
Trichloroethylene	<9
1,2,3-Trichloropropane	<9
1,2,4-Trimethylbenzene	4,300
Dibromochloropropane	<9
1,3,5-Trimethylbenzene	3,800
o-Xylene	890
m & p-Xylene	1,700
Xylene	2,600
Bromomethane	<9
Chloroethane	<9
Chloromethane	<9
Dichlorodifluoromethane	<9
Vinyl Chloride	<9
tert-Butyl Alcohol	<900
n-Butyl Alcohol	<900
sec-Butyl Alcohol	<900
Isopropyl Alcohol	<900
n-Propyl Alcohol	<900
Isobutyl Alcohol	<900
Ethyl Alcohol	<900
Acetone	<90
Methyl Ethyl Ketone	<90
Methyl Isobutyl Ketone	<90

	Regulatory Level	*Sample Result*
Ignitability		
Flash Point, F	<140 (1)	**95**

Notes:
(1) Regulatory level applies to liquid, non-aqueous wastes.
ND: not detected
Sample collected on 7/26/94; Analysis performed by GC/MS EPA Method 8260.

[shaded box] *exceeds the Regulatory Level*

Table 2-1 Potential New York State Standards, Criteria and Guidelines

Citation	Description	Type	Reason for Listing
SCGs[1]			
6 NYCRR Part 364	Waste Transporter Permits	Action	May relate to management of recovered product
6 NYCRR Part 370 through 373	Hazardous Waste Management Regulations	Action, Chemical	May relate to management of recovered product
6 NYCRR Part 376	Land Disposal Restrictions	Action, Chemical	May relate to disposal of recovered product
6 NYCRR Part 375	Inactive Hazardous Waste Disposal Site Remedial Program	Action	May relate to all activities
TAGM HWR-90-4030	Selection of Remedial Actions at Inactive Hazardous Waste Sites	Action	May relate to all activities
10 NYCRR Part 5	Drinking Water Supplies	Location, Action	May relate to certain activies at the Site
6 NYCRR Parts 700 through 705	NYSDEC Water Quality Regulations for Surface Waters	Chemical, Location	May relate to Bronx River water quality and remedial activities at the Site
TOGS 1.1.1	Ambient Water Quality Standards and Guidance Values	Chemical, Location	May relate to Bronx River water quality and remedial activities at the Site
6 NYCRR Part 200 through 201	Air Pollution Regulations General Provision and Permits and Certificates	Chemical	May relate to soil remediation in Area A
6 NYCRR Part 211 through 212	Air Pollution Regulations General Prohibitions and Process Emission Sources	Chemical	May relate to soil remediation in Area A
6 NYCRR Part 257	Air Quality Standards	Chemical	May relate to soil remediation in Area A
Air Guide I	Guidelines for the Control of Toxic Ambient Air Contaminants	Chemical	May relate to soil remediation in Area A
TBCs[2]			
6NYCRR Part 595	Chemical Bulk Storage Regulations	Action	May relate to NAPL layer present above ground water beneath the Site

Table 2-1 Potential New York State Standards, Criteria and Guidelines

Citation	Description	Type	Reason for Listing
OSHA; 29 CFR 1910	Guidelines and Requirements for Workers at Hazardous Waste Sites (Subpart 120) and Standards for Air Contaminants (Subpart 1)	Action	May relate to certain activities in areas of potential concern
OSHA; 29 CFR 1926	Safety and Health Regulations for Construction	Action	May relate to certain activities in areas of potential concern
ACGIH Threshold Limit Values	1992-1993 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices	Chemical	May relate to indoor air quality at the Site
Chapter 267, Code of the City of Mount Vernon	Zoning, Code of the City of Mount Vernon	Location	May relate to certain activities (i.e., usages) of the Site
	Technical Guidance for Screening Contaminated Sediments	Chemical	May relate to Bronx River sediment quality

GLOSSARY OF ACRONYMS

CAA	Clean Air Act
NYCRR	New York Code of Rules and Regulations
OSHA	Occupational Safety and Health
ACGIH	American Conference of Governmental Industrial Hygienists
SCG	Standards, Criteria and Guidance
TBC	To Be Considered
CFR	Code of Federal Regulations

[1] SCGs were obtained from the Index, Volumes I, II and III, New York State Standards, Criteria and Guidelines, revised 12/93 (see Appendix A of this document).
[2] TBCs are relevant and appropriate regulations and guidance documents that were not identified in the Index, Volumes I, II and III, New York State Standards, Criteria and Guidelines, revised 12/93.

Table 2-2 ***Comparison of Surface Water Sampling Results and the New York State Surface Water Quality Standards Former Red Devil Facility, Mount Vernon, New York***

Sample Location Relative to the Site		Upstream of Site			Adjacent to the Site	Downstream of the Site	Within the Boom
Sample No. Date Collected	NYS SWQS (1)	SW-1 6/10/93	SW-2 6/10/93	SW-10* 6/10/93	SW-3 6/10/93	SW-4 6/10/93	SW-5 6/10/93
VOLATILES in ug/l							
Toluene	NS	ND	ND	ND	ND	ND	5 J
Xylene	NS	ND	ND	ND	ND	ND	4 J
Total TICs	NS	24 J	17 J	19 J	27 J	33 J	93 J
SEMIVOLATILES in ug/l							
2,6-Dinitrotoluene	NS	ND	8 J	ND	ND	ND	NA
Total TICs	NS	10 J	4 J	4 J		14 J	NA
INORGANICS in ug/l							
Aluminum	100	ND	105 B	44.0 B	115 B	95.1 B	NA
Barium	NS	68.0 B	63.6 B	69.4 B	69.4 B	69.4 B	NA
Calcium	NS	44,600	45,400	47,300	46,300	46,400	NA
Copper	19.1 (2)	ND	10.9 B	9.1 B	9.1 B	7.3 B	NA
Iron	300	296	318	335	334	494	NA
Lead	6.6 (2)	ND	ND	ND	ND	4.8	NA
Magnesium	NS	14,300	14,500	15,100	14,800	14,800	NA
Manganese	NS	178	178	189	187	225	NA
Potassium	NS	3,270 B	4,880 B	4,410 B	4,740 B	4,220 B	NA
Silver	0.1	ND	ND	ND	ND	ND	NA
Sodium	NS	46,300	46,300	47,000	45,600	45,800	NA
Vanadium	14	ND	7.7 B	ND	ND	ND	NA
Zinc	133.4 (2)	16.1 B	14.0 B	15.4 B	12.0 B	16.8 B	NA

NOTES:

(1) New York State Surface Water Quality Standards for protection of aquatic life in Class C waters.

(2) Standard is hardness dependant. Standard provided in this table is based on a calculated average water hardness of 145.5 mg/l CaCO3. (See Appendix D for calculations)

NS: No NYS surface water quality standard promulgated for protection of aquatic life in Class C waters.

TIC: Tentatively Identified Compounds

J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.

B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.

B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.

ND: the compound was analyzed for but not detected.

NA: the compound was not analyzed for.

D: result is from secondary dilution analysis.

** SW-10 is a field duplicate of SW-2*

[shaded box] *exceeds the NYS surface water quality standard*

Table 2-3 ***Comparison of Sediment Sampling Results and the New York State Sediment Screening Criteria***
Former Red Devil Facility, Mount Vernon, New York

Sample Location Relative to the Site	NYS Sediment Screening Criteria (1)	Upstream of the Site		Adjacent to the Site					Downstream of the Site		
Sample No. Date Collected		SED-1 6/10/93	SED-2 6/10/93	SED-3 6/10/93	SED-4 6/10/93	SED-5 6/10/93	SED-6 6/10/93	SED-10* 6/10/93	SED-7 6/10/93	SED-8 6/10/93	SED-9 6/10/93
VOLATILES in mg/kg (2)											
Acetone	NS	ND	ND	ND	ND	ND	ND	ND	0.006 J	ND	ND
1,2-Dichloroethene (total)	NS	ND	ND	ND	0.004 J	0.015	ND	ND	ND	ND	ND
Trichloroethene	0.012	ND	ND	ND	ND	0.004 J	ND	ND	ND	ND	ND
Tetrachloroethene	0.005	ND	ND	ND	ND	0.008 J	ND	ND	ND	ND	ND
SEMIVOLATILES in mg/kg (2)											
Fluorene	NS	ND	NA	NA	NA	NA	ND	ND	NA	0.130 J	ND
Phenanthrene	0.704	ND	NA	NA	NA	NA	0.053 J	ND	NA	0.7	0.170 J
Anthracene	NS	ND	NA	NA	NA	NA	ND	ND	NA	0.180 J	ND
Carbazole	NS	ND	NA	NA	NA	NA	ND	ND	NA	0.061 J	ND
Fluoranthene	5.984	ND	NA	NA	NA	NA	0.078 J	ND	NA	0.560 J	0.310 J
Pyrene	NS	ND	NA	NA	NA	NA	0.060 J	ND	NA	0.380 J	0.310 J
Benzo(a)anthracene	NS	ND	NA	NA	NA	NA	ND	ND	NA	0.280 J	0.280 J
Chrysene	NS	ND	NA	NA	NA	NA	0.064 J	ND	NA	0.320 J	0.280 J
Bis(2-ethylhexyl)phthalate	1.170	0.130 J	NA	NA	NA	NA	0.220 J	0.100 J	NA	0.250 J	0.095 J
Benzo(b)fluoranthene	NS	ND	NA	NA	NA	NA	ND	ND	NA	0.160 J	0.240 J
Benzo(k)fluoranthene	NS	ND	NA	NA	NA	NA	0.063 J	ND	NA	0.240 J	0.130 J
Benzo(a)pyrene	NS	ND	NA	NA	NA	NA	ND	ND	NA	0.150 J	0.200 J
2-Methylnaphthalene	NS	ND	NA	NA	NA	NA	ND	ND	NA	0.055 J	ND
Acenaphthene	0.821	ND	NA	NA	NA	NA	ND	ND	NA	0.170 J	ND
Total TICs	NS	0.940 J	NA	NA	NA	NA	1.814 J	0.530 J	NA	1.276 J	2.260 J

Table 2-3 ***Comparison of Sediment Sampling Results and the New York State Sediment Screening Criteria***
Former Red Devil Facility, Mount Vernon, New York

Sample Location Relative to the Site	NYS Sediment Screening Criteria (1)	Upstream of the Site		Adjacent to the Site					Downstream of the Site		
Sample No. Date Collected		SED-1 6/10/93	SED-2 6/10/93	SED-3 6/10/93	SED-4 6/10/93	SED-5 6/10/93	SED-6 6/10/93	SED-10* 6/10/93	SED-7 6/10/93	SED-8 6/10/93	SED-9 6/10/93
INORGANICS in mg/kg (3)											
Aluminum	NS	3,240	NA	NA	NA	NA	2,290	1,820	NA	2,680	9,010
Antimony	2-25	ND	NA	NA	NA	NA	ND	ND	NA	20.1	46.1
Arsenic	6-33	2.1 BJ	NA	NA	NA	NA	1.3 BJ	ND	NA	1.3 BJ	3.4 J
Barium	NS	39.0 B	NA	NA	NA	NA	29.1 B	21.5 B	NA	21.6 B	78.0
Beryllium	NS	2.0 J	NA	NA	NA	NA	ND	ND	NA	0.39 BJ	0.44 BJ
Calcium	NS	2,170	NA	NA	NA	NA	2,910 J	2,870 J	NA	6,330 J	8,400 J
Chromium	26-110	61.8	NA	NA	NA	NA	11.9	7.4	NA	9.5	24.8
Cobalt	NS	10.8 B	NA	NA	NA	NA	ND	ND	NA	3.6 B	8.5 B
Copper	16-110	119 J	NA	NA	NA	NA	13.7 J	10.1 J	NA	17.2 J	49.4 J
Iron	20,000-40,000	32,100	NA	NA	NA	NA	9,740	7,880	NA	8,240	17,200
Lead	31-110	850	NA	NA	NA	NA	34.0	45.7	NA	43.0	117
Magnesium	NS	1,810	NA	NA	NA	NA	2,080	2,080	NA	3,800	6,760
Manganese	460-1,100	252 J	NA	NA	NA	NA	180 J	108 J	NA	121 J	233 J
Mercury	0.15-1.3	ND	NA	NA	NA	NA	ND	ND	NA	ND	0.20 J
Nickel	16-50	44.0	NA	NA	NA	NA	ND	ND	NA	ND	14.3
Potassium	NS	530 B	NA	NA	NA	NA	ND	324 B	NA	484 B	1,460 B
Sodium	NS	2.6	NA	NA	NA	NA	ND	3.9	NA	6.1	4.6
Vanadium	NS	18.5	NA	NA	NA	NA	10 B	9.6 B	NA	9.0 B	30.0
Zinc	120-270	386 J	NA	NA	NA	NA	45.2 J	95.5 J	NA	69.4 J	141 J

NOTES:

(1) New York State Sediment Criteria as provided in the "Technical Guidance for Screening Contaminated Sediments", NYSDEC, November 1993.

(2) Criteria for volatile and semivolatiles are based on grams of organic carbon for site-specific sediment samples (ug/gOC). Criteria were calculated using the mean total organic carbon concentration , 5,867 mg/kg, for sediment samples.

(3) Criteria for organics are provided as a range. The lower criteria is identified as the "lowest effect level" and the higher criteria is identified as the "severe effect level".

TIC: Tentatively Identified Compounds

J: an estimated value, value estimated due to data validation requirements, concentration below CRQL or compound is a TIC.

B (organics): compound detected in sample at a concentration greater than ten times the amount in the associated method blank.

B (inorganics): result is less than contract lab required detection limit, but greater than the instrument detection limit.

ND: the compound was analyzed for but not detected.

NA: the compound was not analyzed for.

D: result is from secondary dilution analysis.

** SED-10 is a field duplicate of SED-6*

[shaded box] *exceeds the NYS sediment criteria*

Table 2-4 Manual On-Site Product Recovery Methods
Red Devil Facility, Mount Vernon, New York

Date (1)	Days of Operation	Well	Recovery			Product Thickness, ft	Amount Recovered	
			Method	DTP, ft	DTW, ft		Per Well, qts	Total, gals
12/6/94	NA	DW-8D	Soakease	10.76	12.70	1.94	NA	
12/12/94	6	DW-8D	Soakease	11.14	11.71	0.57	1	
12/19/94	7	DW-8D	Soakease	10.84	11.65	0.81	0.75	
12/27/94	8	DW-8D	Soakease	NR	NR	NR	1 (2)	
1/4/95	8	DW-8D	Soakease	10.85	11.44	0.59	1	0.7
12/6/94	NA	DW-11D	Keck Canister	10.88	11.38	0.50	NA	
12/12/94	6	DW-11D	Keck Canister	10.89	11.34	0.45	2	
12/19/94	7	DW-11D	Keck Canister	10.99	11.70	0.71	2	
12/27/94	8	DW-11D	Keck Canister	NR	NR	NR	1 (2)	
1/4/95	8	DW-11D	Keck Canister	10.88	11.59	0.71	2	1.5
								2.2

DTP: Depth to Product
DTW: Depth to Water
Product Thickness = DTW- DTP
NR: No Reading
NA: Not Applicable - Date of Unit Deployment
(1) Date device is deployed into the recovery well. Device is recovered from the well on the following deployment date.
(2) Amount of product recovered measured by volume of product in the passive recovery unit.

Table 2-5 ***Apparent Thickness Measurements After Commencement of the On-Site Product Recovery IRM (1)***
Former Red Devil Facility, Mount Vernon, New York

Well ID #	Date	DTW, ft (2)	DTP, ft (3)	Product Thickness, ft
DW-1C	6/17/94	15.64	14.43	1.21
DW-1C	6/23/94	15.53	14.55	0.98
DW-1C	7/26/94	15.40	14.14	1.26
DW-1C	8/29/94	15.68	14.87	0.81
DW-1C	10/26/94	15.63	14.71	0.92
DW-1C	11/1/94	15.20	0.00	0.00
DW-1C	11/22/94	15.52	14.75	0.77
DW-1C	12/6/94	16.60	14.79	1.81
DW-1C	12/19/94	15.99	15.01	0.98
DW-2C	6/17/94	15.59	14.30	1.29
DW-2C	6/23/94	15.65	14.40	1.25
DW-2C	7/26/94	15.35	14.26	1.09
DW-2C	9/1/94	14.25	14.20	0.05
DW-2C	9/7/94	15.20	14.25	0.95
DW-2C	9/29/94	14.40	0.00	0.00
DW-2C	10/26/94	16.39	15.41	0.98
DW-2C	11/1/94	16.16	15.15	1.01
DW-2C	11/22/94	15.59	15.15	0.44
DW-6C	6/17/94	15.09	14.42	0.67
DW-6C	8/29/94	15.85	15.01	0.84
DW-6C	9//1/94	15.15	14.40	0.75
DW-6C	9/7/94	15.20	14.25	0.95
DW-6C	11/22/94	15.35	15.03	0.32
DW-1D	6/23/94	14.08	12.77	1.31
DW-1D	7/26/94	14.07	12.67	1.40
DW-1D	8/17/94	14.17	12.94	1.23
DW-1D	9/15/94	14.38	12.88	1.50
DW-1D	11/22/94	13.15	12.70	0.45
DW-2D	6/23/94	12.35	0.00	0.00
DW-2D	7/26/94	13.10	12.45	0.65
DW-2D	8/17/94	0.00	12.57	3.50
DW-2D	11/22/94	12.85	12.25	0.60
DW-4D	6/23/94	15.60	14.67	0.93
DW-4D	7/26/94	15.60	14.55	1.05
DW-4D	8/17/94	15.65	14.80	0.85
DW-4D	9/15/94	15.73	14.87	0.86

Table 2-5 ***Apparent Thickness Measurements After Commencement of the On-Site Product Recovery IRM (1)***
Former Red Devil Facility, Mount Vernon, New York

Well ID #	Date	DTW, ft (2)	DTP, ft (3)	Product Thickness, ft
DW-4D	7/8/94	14.54	11.12	3.42
DW-4D	11/22/94	14.85	14.82	0.03
DW-6D	7/8/94	14.54	11.12	3.42
DW-6D	11/22/94	0.00	0.00	0.00
DW-8D	6/17/94	14.20	10.40	3.80
DW-8D	7/26/94	13.63	10.77	2.86
DW-8D	11/22/94	12.92	10.94	1.98
DW-8D	12/6/94	12.70	10.76	1.94
DW-8D	12/12/94	11.71	11.14	0.57
DW-8D	12/19/94	11.65	10.84	0.81
DW-8D	1/4/95	11.44	10.85	0.59
DW-10D	6/23/94	17.07	14.25	2.82
DW-10D	7/11/94	17.00	14.27	2.73
DW-10D	7/20/94	16.85	14.52	2.33
DW-10D	8/1/94	16.65	15.79	0.86
DW-10D	9/15/94	15.73	14.87	0.86
DW-10D	11/22/94	15.53	14.60	0.93
DW-11D	6/23/94	12.02	11.13	0.89
DW-11D	11/22/94	11.15	11.07	0.08
DW-11D	12/6/94	11.38	10.88	0.50
DW-11D	12/12/94	11.34	10.89	0.45
DW-11D	12/19/94	11.70	10.99	0.71
DW-11D	1/4/95	11.59	10.88	0.71
DW-13D	6/17/94	15.93	11.90	4.03
DW-13D	6/23/94	14.95	12.20	2.75
DW-13D	7/26/94	14.85	12.03	2.82
DW-13D	10/26/94	14.15	12.40	1.75
DW-13D	11/22/94	13.41	12.60	0.81

(1) On-Site product recovery commenced in July 1994. June 1994 measurements are provided for comparative purposes.
(2) DTW: Depth to Water
(3) DTP: Depth to Product

Table 2-6 ***Physical Characteristics of NAPL***
Former Red Devil Facility, Mount Vernon, New York

Area C			
Well ID:	Date:	Product Appearance & Odor:	Estimated Product Viscosity:
DW-1C	6/17/94	Light Brown	Low
	6/23/94	Light Brown	Low
	7/26/94	Light Brown	Low
	9/1/94	Amber - Light Turpentine Odor	Low
	9/7/94	Amber - Light Turpentine Odor	Low
	9/29/94	Amber - Light Turpentine Odor	Low
	10/26/94	Amber - Light Turpentine Odor	Low
	11/1/94	Amber - Light Turpentine Odor	Low
	11/22/94	Amber - Light Turpentine Odor	Low
	12/6/94	Amber - Light Turpentine Odor	Low
	12/19/94	Amber - Light Turpentine Odor	Low
DW-2C	6/17/94	Light Brown	Low
	6/23/94	Light Brown	Low
	7/26/94	Light Brown	Low
	9/1/94	Amber - Light Turpentine Odor	Low
	9/7/94	Amber - Light Turpentine Odor	Low
	9/29/94	Amber - Light Turpentine Odor	Low
	10/26/94	Amber - Light Turpentine Odor	Low
	11/1/94	Amber - Light Turpentine Odor	Low
	11/22/94	Amber - Light Turpentine Odor	Low
	12/6/94	Amber - Light Turpentine Odor	Low
	12/19/94	Amber - Light Turpentine Odor	Low
DW-6C	6/23/94	Light Brown	Low
	7/26/94	Light Brown	Low
	9/1/94	Milky White	Med
	9/7/94	Amber - Light Turpentine Odor	Low
	9/29/94	Amber - Light Turpentine Odor	Low
	10/26/94	Amber - Light Turpentine Odor	Low
	11/1/94	Amber - Light Turpentine Odor	Low
	11/22/94	Amber - Light Turpentine Odor	Low
	12/6/94	Amber - Light Turpentine Odor	Low
	12/19/94	Amber - Light Turpentine Odor	Low

Table 2-6 ***Physical Characteristics of NAPL***
Former Red Devil Facility, Mount Vernon, New York

Area D			
Well ID:	Date:	Product Appearance & Odor:	Estimated Product Viscosity:
DW-1D	6/23/94	Light Brown	Low
	7/26/94	Light Brown	Low
	9/1/94	Light Brown	Low
	9/7/94	Light Brown	Low
layer 1	9/23/94	Black/Grey Suspended Matter - Septic	Low
layer 2	9/23/94	Amber - Light Turpentine Odor	Med
	10/26/94	Black/Grey Suspended Matter - Septic	Low
	11/1/94	Black/Grey Suspended Matter - Septic	Low
layer 1	11/29/94	Amber - Light Turpentine Odor	Low
layer 2	11/29/94	Amber - Light Turpentine Odor	Med
DW-2D	6/23/94	Brown Gel	Med
	7/26/94	Brown Gel	Med
	9/1/94	Brown Gel	Med
	9/7/94	Grey Gel	Hi
	9/23/94	Grey Gel	Hi
	10/26/94	Grey Gel	Hi
	11/1/94	Grey Gel	Hi
	11/29/94	Amber - Light Turpentine Odor	Med
DW-4D	6/23/94	Light Brown	Med
	7/26/94	Light Brown	Med
	9/1/94	Light Brown	Med
	9/7/94	Light Brown	Med
	9/19/94	Light Brown	Med
	9/23/94	Light Brown	Med
	10/26/94	Light Brown	Med
	11/1/94	Amber - Light Turpentine Odor	Low
	11/29/94	Amber - Light Turpentine Odor	Low

Table 2-6 *Physical Characteristics of NAPL*
Former Red Devil Facility, Mount Vernon, New York

Area D			
Well ID:	Date:	Product Appearance & Odor:	Estimated Product Viscosity:
DW-6D	6/23/94	Brown Gel	Hi
	7/26/94	Brown Gel	Hi
	9/1/94	Brown Gel	Hi
	9/7/94	Brown Gel	Hi
	9/19/94	Brown Gel	Hi
	9/23/94	Brown Gel	Hi
	10/26/94	Brown Gel	Hi
	11/1/94	Green/Tan Paste Strong Turpentine Odor	Paste
	11/29/94	Green/Tan Paste Strong Turpentine Odor	Paste
DW-8D	6/23/94	Brown Gel	Hi
	7/26/94	Brown Gel	Hi
	9/1/94	Brown Gel	Hi
	9/7/94	Brown Gel	Hi
	9/19/94	Brown Gel	Hi
	9/23/94	Brown Gel	Hi
	10/26/94	Brown Gel	Hi
	11/1/94	Amber - Chemical Odor	Hi
	11/29/94	Amber - Chemical Odor	Hi
	12/6/94	Amber - Chemical Odor	Hi
DW-10D	6/23/94	Brown Gel	Hi
	7/26/94	Brown Gel	Hi
	9/1/94	Brown Gel	Hi
	9/7/94	Brown Gel	Hi
	9/19/94	Brown Gel	Hi
	9/23/94	Brown Gel	Hi
	10/26/94	Brown Gel	Hi
	11/1/94	Brown Gel	Hi
	11/29/94	Brown Gel	Hi
DW-11D	6/23/94	Light Brown	Low
	7/26/94	Light Brown	Low
	9/1/94	Light Brown	Low

Table 2-6 ***Physical Characteristics of NAPL***
Former Red Devil Facility, Mount Vernon, New York

Area D			
Well ID:	Date:	Product Appearance & Odor:	Estimated Product Viscosity:
DW-11D			
Layer 1	9/7/94	Light Brown	Low
Layer 2		Dissolved Black Metal - Chemical Odor	Low
	9/19/94	Milky White	Hi
	9/23/94	Light Brown	Low
	10/26/94	Light Brown	Low
	11/1/94	Light Brown	Low
Layer 1	11/29/94	Light Brown	Low
Layer 2		Dissolved Black Metal - Chemical Odor	
DW-13D	6/23/94	Brown Liquid	Med
	7/26/94	Brown Liquid	Med
	9/1/94	Brown Liquid	Med
	9/7/94	Brown Liquid	Med
	9/19/94	Brown Liquid	Med
	9/23/94	Brown Gel	Hi
	10/26/94	Amber - Chemical Odor	Hi
	11/1/94	Amber - Chemical Odor	Hi
	11/29/94	Amber - Chemical Odor	Hi

Table 5-1 ***Summary of Scores for Detailed Analysis of the OU-I FS Remedial Alternatives (1)***
Former Red Devil Facility, Mount Vernon, New York

Criteria	Maximum Potential Score	Alternative I: No Action	Alternative II: Access and Use Restrictions	Alternative III: Active On-Site Product Recovery and Passive Off-Site Surface Water Product Recovery
Threshold Criteria				
Compliance with Applicable or Relevant and Appropriate NYS SCGs	20	6	6	10
Protection of Human Health and the Environment	10	11	11	20
Subtotal for Threshold Criteria	30	17	17	30
Balancing Criteria				
Short-Term Effectiveness	10	10	9	7
Long-Term Effectiveness and Permanence	15	6	6	13
Reduction of Toxicity, Mobility or Volume	15	0	0	15
Implementability	15	12	14	13
Cost (2)	15	15	14.7	0
Subtotal for Balancing Criteria	70	43	43.7	48
Total Score	100	60	60.7	78

Notes:

(1) Scoring sheets for each Alternative by criteria are presented in Appendix F.
(2) As per section of 5.2.3 of (NYSDEC, 1990), the lowest cost was given a score of 15; the highest cost was given a score of zero; and the middle cost was proportionately scored with reference to the other two scores.

APPENDIX A

NYSDEC'S LIST OF
STANDARDS, CRITERIA AND GUIDELINES, REVISED 12/93

To: Carla Weinponi
Fr: Ajay Shroff (518)485-8792
5 pages total

WILL BE UPDATED IN
~2 MONTHS

INDEX
VOLUME I
NEW YORK STATE Standards, Criteria and Guidelines (equivalent to ARAR's)

Revised 12/93

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

- **Division of Solid Waste**

  - *6 NYCRR Part 360 - Solid Waste Management Facilities (effective October 9, 1993)

- **Division of Hazardous Substances Regulation**

  - Description of Difference - EPA/State Regulations
  - 6 NYCRR Part 364 - Waste Transporter Permits (revised January 12, 1990)
  - 6 NYCRR Part 370 - Hazardous Waste Management System: General (revised January 31, 1992)
    - Part 371 - Identification and Listing of Hazardous Wastes (revised January 31, 1992)
    - Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (revised January 31, 1992)
  - 6 NYCRR Subpart 373-1 - Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements (revised January 31, 1992)
    - 373-2 - Final Status Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities (revised January 31, 1992)
    - 373-3 - Interim Status Standards for Owners and Operators of Hazardous Waste Facilities (revised January 31, 1992)
  - 6 NYCRR Part 374 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (revised January 31, 1992)
  - 6 NYCRR Part 376 - Land Disposal Restrictions (January 31, 1992)

- **Division of Hazardous Waste Remediation**

  - 6 NYCRR Part 375 - Inactive Hazardous Waste Disposal Site Remedial Program (May 1992)
  - Technical and Administrative Guidance Memorandum (TAGM)

    HWR-92-4046 Determination of Soil Cleanup Objectives and Cleanup Levels. (November, 1992)

    ** HWR-92-4030 Selection of Remedial Actions at Inactive Hazardous Waste Sites. (May 1990).

* revised ** newly added

INDEX
VOLUME II
NEW YORK STATE SCGs

Revised 12/93

- **Division of Water**

  - 6 NYCRR Part 700-705 - NYSDEC Water Quality Regulations for Surface Waters and Groundwater

  - 6 NYCRR Part 750-757 - Implementation of NPDES Program in NYS

  - 6 NYCRR Part 702.15(a),(b),(c),(d) and (e) Empowers DEC to Apply and Enforce Guidance where there is no Promulgated Standard

  - Technical and Operations Guidance Series (TOGS)

* 1.1.1; October, 1993 -	Ambient Water Quality Standards and Guidance Values
1.2.1; April, 1990 -	Industrial SPDES Permit Drafting Strategy for Surface Waters
1.3.1; May, 1990 -	Waste Assimilative Capacity Analysis and Allocation for Setting Water Quality Based Effluent Limits
1.3.1 C; August 1991 -	Development of Water Quality Based Effluent Limits for Metals Amendment
1.3.2; May, 1990 -	Toxicity Testing in the SPDES Permit Program
1.3.4; April 1, 1987 -	BPJ Methodologies
1.3.4.a; November 3, 1988 -	BPJ Methodologies/Amendments
1.3.7; July, 1990 -	Analytical Detectability and Quantitation Guidelines for Selected Environmental Parameters
2.1.2; July, 1990 -	Underground Injection/Recirculation (UIR) at Groundwater Remediation Sites
2.1.3; October, 1990 -	Primary and Principal Aquifer Determinations

- **Division of Air**

  - *6 NYCRR Part 200 (200.6) - General Provisions (Revised January 29, 1993)
  - *6 NYCRR Part 201 - Permits and Certificates (Revised March 31, 1993)
  - 6 NYCRR Part 211 (211.1) - General Prohibitions
  - 6 NYCRR Part 212 - General Process Emission Sources
  - 6 NYCRR Part 257 - Air Quality Standards
  - Air Guide 1 - Guidelines for the Control of Toxic Ambient Air Contaminants

- **Division of Spills Management**

  - Spill Technology and Remediation Series (STARS)

    ** Memo #1, August, 1992 - Petroleum-Contaminated Soil Guidance Policy

* revised ** newly added

Revised 12/93

INDEX
VOLUME II
NEW YORK STATE SCGs (cont'd)

* revised   ** newly added

Revised 12/93

INDEX
VOLUME III
NEW YORK STATE SCGs

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (cont'd)

- **Division of Fish and Wildlife**

  - 6 NYCRR Part 608 - Use and Protection of Waters
  - 6 NYCRR Part 662 - Freshwater Wetlands - Interim Permits
    - 663 - Freshwater Wetlands Permit Requirements
    - 664 - Freshwater Wetlands Maps and Classifications
    - 665 - Local Government Implementation of the Freshwater Wetlands Act and Statewide Minimum Land - Use Regulations for Freshwater Wetlands
  - 6 NYCRR Part 182 - Endangered and Threatened Species of Fish and Wildlife
  - ECL Article 24 and Article 71, Title 23 - Freshwater Wetlands Act

- **Division of Regulatory Affairs**

  - 6 NYCRR Part 361 - Siting of Industrial Hazardous Waste Facilities
  - Article 27, Title II of the ECL - Industrial Siting Hazardous Waste Facilities
  - 6 NYCRR Part 621 - Uniform Procedures
  - 6 NYCRR Part 624 - Permit Hearing Procedures

- **Division of Marine Resource, Bureau of Marine Habitat Protection**

  - Chapter 10 of 6 NYCRR Part 661 Tidal Wetlands - Land Use Regulations

- **Division of Mineral Resources**

  - 6 NYCRR Part 420 - General
    - 421 - Permits
    - 422 - Mined Land - Use Plan
    - 423 - Reclamation Bond
    - 424 - Enforcement
    - 425 - Civil Penalties
    - 426 - Hearings
  - Title 27 - NYS Mined Land Reclamation Law

NEW YORK STATE DEPARTMENT OF LABOR

- 12 NYCRR 50 - Lasers
- 12 NYCRR 38 - Ionizing Radiation Protection

NEW YORK STATE DEPARTMENT OF AGRICULTURE AND MARKETS

- 1 NYCRR Part 371 - Notice of Intent

COASTAL MANAGEMENT

Revised 12/93

- Part 600 - Department of State, Waterfront Revitalization and Coastal Resources Act
- State Coastal Policies
- State Consistency Process
- Federal Consistency Process
- NYS Coastal Policies
- NYS Coastal Management Program
- Federal Register, June 25, 1979 - Part V - Department of Commerce - Federal Consistency Regulation

APPENDIX B

ON-SITE NAPL VOLUME CALCULATIONS

Appendix B
On-Site NAPL Volume Calculation
Former Red Devil Facility, Mount Vernon, New York

The volume of product underlying the former Red Devil Facility located in Mount Vernon, New York ("the Site") was calculated using the following procedure:

- Product baildown tests were first performed. These tests entailed bailing NAPL from monitoring wells at the Site and monitoring the recharge of NAPL using an interface probe. The results of these tests were then graphed as depth to water and depth to NAPL versus time. These graphs were presented in the Appendix to the IRM Work Plan.

- The inflection points in the NAPL recovery curves were then identified since the NAPL thickness at the inflection point approximates the actual thickness of NAPL on the water table. Fourteen baildown tests were performed at the Site; the average thickness was found to be 0.3 times the apparent thickness.

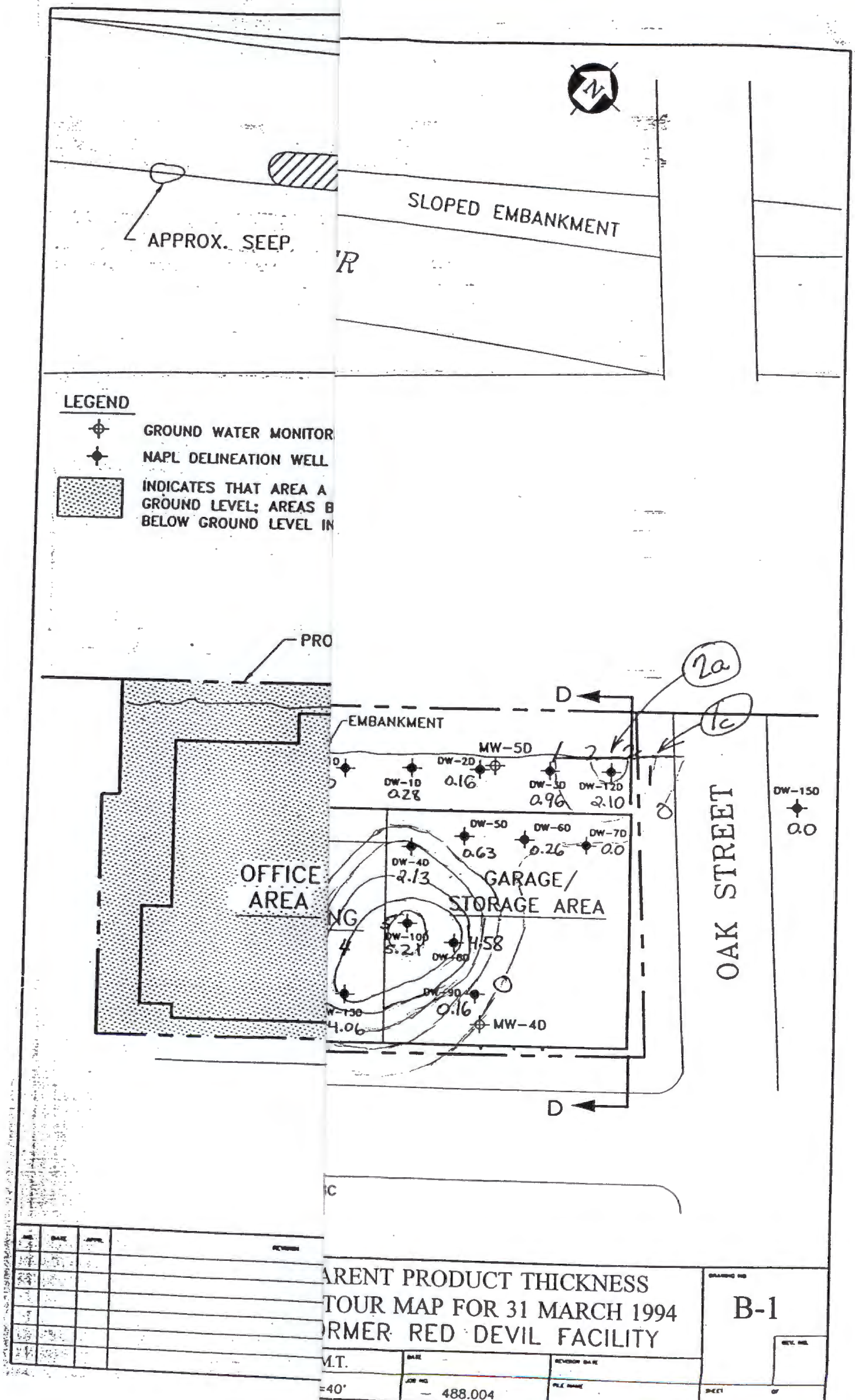
- The volume of on-Site NAPL was then calculated using the apparent thickness isopleth map (Figure B-1) and assuming a porosity of 30%.

Apparent Thickness Range, ft	Area Between Isopleth Lines, sf [1]	Average Apparent NAPL Thickness, ft	Apparent Thickness Correction Factor [2]	Porosity	Conversion Factor, gal/cf	Volume of On-Site NAPL, gallons
0 - 1 =	x 7,712	x 0.5	x 0.3	x 0.3	x 7.48	= 2,596
1 - 2 =	x 4,192	x 1.5	x 0.3	x 0.3	x 7.48	= 4,234
2 - 3 =	x 816	x 2.5	x 0.3	x 0.3	x 7.48	= 1,374
3 - 4 =	x 560	x 3.5	x 0.3	x 0.3	x 7.48	= 1,320
4 - 5 =	x 608	x 4.5	x 0.3	x 0.3	x 7.48	= 1,842
> 5 =	x 112	x 5.5	x 0.3	x 0.3	x 7.48	= 392
						11,758
					approximately	12,000

Notes:

(1) Area between isopleth lines obtained from Figure B-1 which depicts apparent thickness isopleth for the 31 March 1994 product measurement round.

(2) Apparent Thickness Correction Factor determined, as described above, via baildown tests.



N
SLOPED EMBANKMENT
APPROX. SEEP
LEGEND
GROUND WATER MONITOR
NAPL DELINEATION WELL
INDICATES THAT AREA A
GROUND LEVEL; AREAS B
BELOW GROUND LEVEL IN
PRO
EMBANKMENT
D
MW-5D
DW-1D
0.28
DW-2D
0.16
DW-3D
0.96
DW-12D
2.10
DW-15D
0.0
DW-5D
0.63
DW-6D
0.26
DW-7D
0.0
DW-4D
2.13
OFFICE
AREA
GARAGE/
STORAGE AREA
OAK STREET
DW-10D
5.21
DW-8D
4.58
DW-9D
0.16
DW-13D
4.06
MW-4D
2a
1c
ARENT PRODUCT THICKNESS
TOUR MAP FOR 31 MARCH 1994
RMER RED DEVIL FACILITY
B-1
M.T.
=40'
488.004

APPENDIX C

SOIL VOLUME CALCULATIONS FOR AREA A

Appendix C
Soil Volume Calculations for Area A
Former Red Devil Facility, Mount Vernon, New York

Extent of Potentially Affected Media, Worst-Case Estimates

Area A

The volume of potentially affected media in Area A was calculated assuming that the area immediately adjacent to soil boring, HP-6 was affected. The volume calculation was therefore based on the following information:

Diameter around HP-6 of potentially affected soil: 12 feet
Area of impacted soil (worst-case): $\pi r^2 = (\pi)(6 \text{ feet})^2 = 113$ feet
Average Area A Depth to Water [(1)]: 27.5 feet
Depth of impacted soil (worst-case): Depth to water - depth to concrete slab (i.e., depth of previous soil excavation for tank removal) = 27.5 feet - 6 feet = 21.5 feet

Volume of potentially affected soil: $(113 \text{ ft}^2 \times 21.5 \text{ ft})/(27 \text{ ft}^3/\text{yd}^3) = 90 \text{ yd}^3$

[(1)] Average depth to water based on an area average of the ground water measurements collected during the October 1993 measurement round (Table 2-14 of the RI). This measurement round was used since it had the highest depths to water and therefore resulted in the most conservative soil volumes.

APPENDIX D

DETAILED COST ESTIMATE TABLES

TABLE D - 1
COST ESTIMATE
ALTERNATIVE II
ACCESS AND USE RESTRICTIONS

Item Description	Unit	Unit Cost	Quantity	Total Cost	Reference
CAPITAL COSTS					
Non-Construction Items					
Use Restrictions					
Notice to Future Occupants	l.s..	9,000	1	9,000	(1)
		Subtotal, Use Restrictions		9,000	
		Contingency (25%)		2,250	
		Total Capital Costs for Non-Construction Items		$11,250	
		Total Remedial Action Capital Cost		$11,250	(2)
ANNUAL COSTS					
Access Restrictions					
Pavement and Foundation Maintenance	l.s..	1,500	1	1,500	(3)
Site Inspections	quarterly	260	2	520	(4)
		Subtotal Annual Costs		$2,020	
		Present Worth (5 yrs, 7%, PWF=4.10)		$8,282	(5)
		Contingency (25%)		$2,071	
		Total Present Worth of Remedial Action Annual Costs		$10,353	
TOTAL PRESENT WORTH OF ALTERNATIVE II REMEDIAL ACTION COSTS				$21,603	(6)

References

(1) Cost assumes 40 hrs of attorney work at $225 per hour.
(2) Total Remedial Action Capital Cost = Total Capital Costs for Non-Construction Items
(3) Includes 2 persondays of labor plus equipment and materials.
(4) Based on 3 hours of engineering time at $80 per hour plus $20 for travelling expenses.
(5) EPA recommends a discount rate of 7 percent (EPA, 1993f).
(6) Total Present Worth of Alternative II Remedial Action Costs = Total Remedial Action Capital Cost + Total Present Worth of Remedial Action Annual Costs

TABLE D -2
COST ESTIMATE
ALTERNATIVE III
ON-SITE ACTIVE PRODUCT RECOVERY AND OFF-SITE PASSIVE SURFACE WATER PRODUCT RECOVERY

Item Description	Unit	Unit Cost	Quantity	Total Cost	Reference
CAPITAL COSTS					
Non-Construction Items					
Use Restrictions					
Notice to Future Occupants	l.s..	9,000	1	9,000	(1)
Passive Soil Venting of Area A Soils					
Emissions Analysis	l.s.	570	1	$570	(1a)
Total Capital Costs for Non-Construction Items				$9,570	
Construction Items					
Passive Soil Venting of Area A Soils					
Drilling	l.s..	5,000	1	5,000	(2)
Aboveground Piping	l.s..	1,600	1	1,600	(3)
Subtotal, Passive Soil Venting of Area A Soils				$6,600	
Mobilization, Engineering, Contingencies (65%)				$4,290	(4)
Passive Soil Venting of Area A Soils				$10,890	
Active On-Site Product Recovery					
Project Managment	l.s..	29,400	1	29,400	(5)(6)
Design	l.s..	23,900	1	23,900	(5)(7)
System Construction	l.s..	192,000	1	192,000	(5)(8)
Construction Management	l.s..	16,850	1	16,850	(5)(9)
System Start-Up	l.s..	8,100	1	8,100	(5)(10)
Subtotal, On-Site Product Recovery				$270,250	
Total Capital Costs for Construction Items				$281,140	(11)
Total Remedial Action Capital Cost				$290,710	(12)
ANNUAL COSTS					
Access Restrictions					
Pavement and Foundation Maintenance	l.s..	1,500	1	1,500	(13)
Site Inspections	quarterly	260	2	520	(14)
Subtotal, Access Restrictions				2,020	

TABLE D-2
COST ESTIMATE
ALTERNATIVE III
ON-SITE ACTIVE PRODUCT RECOVERY AND OFF-SITE PASSIVE SURFACE WATER PRODUCT RECOVERY

Item Description	Unit	Unit Cost	Quantity	Total Cost	Reference
Active On-Site Product Recovery					
Area C					
O&M Labor	month	2,500	12	30,000	(15)
O&M Materials	month	1,500	12	18,000	(16)
Disposal	month	210	12	2,520	(17)
Area D					
O&M Labor	month	2,500	12	30,000	(18)
O&M Materials	month	1,500	12	18,000	(18)
Disposal	month	210	12	2,520	(18)
Areas C & D					
Engineering Oversight & Expenses	month	1,550	12	18,600	(19)
	Subtotal, On-Site Active Product Recovery			119,640	
Passive Off-Site Surface Water Product Recovery					
O&M Labor	month	4,000	12	48,000	(20)
O&M Materials	month	1,000	12	12,000	(21)
Disposal	quarterly	6,300	4	25,200	(22)
	Subtotal, Off-Site Passive Surface Water Product Recovery			85,200	
Passive Soil Venting of Area A Soils					
Vapor Phase Controls, if needed	year	1,000	1	1,000	(23)
	Subtotal, Passive Soil Venting			1,000	
	Subtotal, Annual Costs			207,860	
	Present Worth (3 yrs, 7%, PWF=2.62)			$544,593	(24)
	Contingency (25%)			$136,148	
	Total Present Worth of Remedial Action Annual Costs			$680,742	
TOTAL PRESENT WORTH OF ALTERNATIVE III REMEDIAL ACTION COSTS				$971,452	(25)

TABLE D-2
COST ESTIMATE
ALTERNATIVE III
ON-SITE ACTIVE PRODUCT RECOVERY AND OFF-SITE PASSIVE SURFACE WATER PRODUCT RECOVERY

References

(1) Cost assumes 40 hrs of attorney work at $225 per hour.
(1a) Cost assumes collection of one sample (labor cost: 4 hours at $80/hr); analysis of two samples (one air sample and one blank) for toluene at $100 per sample; and $50 in expenses.
(2) Includes labor and expenses for installation of a passive vent well.
(3) Costs for installation of aboveground vent piping, including trenching, and repavement.
(4) A factor 65% was applied to construction items. This factor includes mobilization, engineering design and construction oversight and contingencies.
(5) Based on actual costs incurred for the IRM on-Site product recovery system.
(6) Includes: administrative, permitting, tank registration and bidding process labor and expense costs.
(7) Includes design labor and expenses.
(8) Includes costs for supply and installation of the IRM product recovery and storage system.
(9) Includes labor and expense costs for construction management.
(10) Includes labor and expenses for system start-up.
(11) Construction adjustment factors (i.e., engineering, mobilization and contingencies) were not applied to this cost since these were actual costs.
(12) Total Remedial Action Capital Cost = Total Capital Costs for Non-Construction Items + Total Capital Costs for Construction Items
(13) Includes 2 persondays of labor plus equipment and materials.
(14) Based on 3 hours of engineering time at $80 per hour plus $20 for travelling expenses.
(15) Based on average monthly labor costs for O&M of the on-Site IRM product recovery system in Area C.
(16) Based on average monthly O&M materials costs for the IRM on-Site product recovery system in Area C.
(17) Based on product disposal costs for the Area C on-Site IRM product recovery system. Assumes a total recovery rate of 7 gpd and a disposal via combustion in a cement kiln a cost of $1 per gallon.
(18) Future Area D O&M costs assumed to be equal to costs incurred in Area C for the IRM. Area D IRM O&M costs were not used since the current system is not operating effectively.
(19) Based on engineering oversight costs incurred for the IRM on-Site product recovery systems. Includes review and analysis of system data and tracking of Site conditions, investigating system modifications, and steering IRM activities.
(20) Based on average ERM and EnviroClean monthly labor costs for O&M of the off-Site IRM product recovery system. Includes labor costs for two persondays per week plus administrative costs.
(21) Based on average monthly O&M materials costs for the IRM off-Site product recovery system. Includes costs for drums and boom materials.
(22) Based on product disposal costs for the off-Site IRM product recovery system. Assumes disposal of thirteen drums per quarter via combustion in a cement kiln at a cost of $285 per drum plus $2,600 for shipping.
(23) Assumes a 200 lb unit of carbon is used annually. Includes supply and disposal of a 200 lb carbon unit.
(24) EPA recommends a discount rate of 7 percent (EPA, 1993f).
(25) Total Present Worth of Alternative III Remedial Action Costs = Total Remedial Action Capital Cost +

APPENDIX E

PASSIVE VENTING AIR EMISSION CALCULATIONS

MEMORANDUM

To: File
From: Carla Weinpahl
Subject: Former Red Devil Facility, Mount Vernon, New York
Estimation of Passive Venting System Emissions
Date: 28 April 1994, *Revised 24 January 1995*

At NYSDEC's request, installation of a passive venting system was evaluated for Area A of the Site. As documented in ERM's 22 April 1994 letter to NYSDEC, soils having a toluene concentration greater than 2,000 mg/kg would be identified for passive venting. Review of the RI data indicated that the only sample exceeding this level was HP-6. This sample, which collected in May 1991 from a depth of 16-18 feet, exhibited a toluene concentration of 2,200 mg/kg. Installation of one passive vent in the vicinity of this soil boring was therefore evaluated. This analysis included estimation of air emission for the proposed system and evaluation of vapor control requirements.

Emissions from this passive venting system were estimated via the USEPA Closed Landfill Model, as documented in the Hazardous Waste Treatment Storage, and Disposal Facilities (TSDF) - Air Emission Models (Review Draft), November 1989, EPA-450/3-87-026. Equations presented in this model for "barometric pumping" were used to estimate passive air emissions from the system. Surface diffusion of compounds was not evaluated since the "hot spot" of toluene is located 16' to 18' below grade. The following steps were followed to determine air emissions from the proposed system:

Step 1: Determine whether the predominant compound, toluene, is present in a dilute solution or as a free liquid. [Conservatively assume: (1) the concentration of toluene in the entire area under the influence of the passive vent is 2,200 mg/kg, and (2) all pore spaces are completely filled with water (i.e., saturated).]

Step 2: Estimate the partial pressure, P_i, of the compounds detected in HP-6 through use of Raoult's Law. Raoult's Law is used since the predominant compound, toluene, is present as a free liquid. Had the predominant compound been present as a dilute solution (i.e., fully dissolved), Henry's Law would have been used to estimates air emissions.

Step 3: Estimate the soil gas concentration of each of the compounds, C_{si}, through use of the Ideal Gas Law.

Step 4: Estimate the average flow rate of gas, Q, from the passive vent due to changes in barometric pressure.

a. Estimate the total volume of void space within the waste, V_C, using the area under the influence of the passive vent, A, and the soil porosity. {Conservatively assume the entire pore space is filled with air.]

b. Estimate the total volume of gas exiting the passive vent, V_B, using the V_C, daily change in barometric pressure, and the assumption that there will be no significant subsurface temperature changes.

c. Calculate the average flow rate, Q, using V_B, the calculated soil area and the time interval of barometric pressure change.

Step 5: Estimate the initial emission rate of each compound, E_i, in g/cm^3, using Q, C_{si} and A.

Step 6: Convert the estimated emission rates into lbs/hr.

Step 7: Calculate the maximum potential annual impact, C_p, and the maximum short-term impact, C_{ST}, of these compounds in accordance with NYS Draft Air Guide-1. [Conservatively assume that a stack height of 15' will be used].

Step 8: Compare the maximum annual impact and the maximum short-term impact for each compound to the annual guideline concentration (AGC) and the short-term guideline concentration (SGC), respectively.

Step 9: Evaluate the annual consumption of carbon by conservatively assumption a 10% carbon consumption rate (i.e., 10 lbs of carbon used per lb of VOCs).

A table summarizing the passive venting air emissions calculation is attached. In addition, air emissions calculations as outlined above are also attached. Based on this estimate, approximately 0.002 lbs/hr of VOCs would initially be passively vented from Area A and all emissions would be below both the applicable AGCs and SGCs.

It should be noted that the estimated emission rates are initial worst-case emission rates. As such, these rates are expected to decrease in time as the small toluene source is diminished. [These rates are considered to be worst-case since they are based on a number of conservative assumptions (i.e., entire area under influence of well has a toluene concentration of 2,200 mg/kg, all pore spaces are completely filled with air, etc.).]

Although these numbers indicate that vapor controls would not be needed, annual carbon usage was calculated in the event that NYSDEC requires vapor controls. Assuming a 10% carbon usage rate, approximately 203 lbs of carbon would be used per year.

cc: John Iannone
Laura Truettner

Table E-1
Estimation of Passive Venting System Emissions (1)
Former Red Devil Facility, Mount Vernon, New York

	<------------------STEP 1------------------				<-----STEP 2----->		STEP 3	STEP 4	STEP 5	STEP 6	<----------------------STEPS 7 & 8----------------------->					
	HP-6 (16-18') mg/kg	MW, g/gmole	gmoles	mole fraction	VP, atm	Pi, atm	Csi, g/cm3	Q, cm/sec	E, g/sec	E, lbs/hr	Cp, g/cm3	AGC, ug/m3	% of AGC	Cst, g/cm3	SGC, ug/m3	% of SGC
Toluene	2200	92.4	2.38E-02	0.9719	0.029	2.82E-02	1.10E-04	8.99E-06	2.88E-04	2.29E-03	2.71E-01	2000	0.0136%	17.62	45,000	0.0392%
Benzene	0.73	78.1	9.35E-06	0.0004	0.1	3.82E-05	1.26E-07	8.99E-06	3.30E-07	2.62E-06	3.18E-05	0.12	0.0265%	0.00	30	0.0069%
1,1,1-TCA	0.28	133.4	2.10E-06	0.0001	0.162	1.39E-05	7.81E-08	8.99E-06	2.05E-07	1.63E-06	1.98E-05	1000	0.0000%	0.00	450,000	0.0000%
Xylene (2)	60	106.2	5.65E-04	0.0231	0.008	1.84E-04	8.26E-07	8.99E-06	2.17E-06	1.72E-05	2.09E-04	300	0.0001%	0.01	100,000	0.0000%
Ethylbenzene	12	106.2	1.13E-04	0.0046	0.0092	4.24E-05	1.90E-07	8.99E-06	4.99E-07	3.96E-06	4.81E-05	1400	0.0000%	0.00	100,000	0.0000%
			0.024499	1.0000												
										0.00231						
									lb/day	0.0555						
									lb/year	20.25						
								STEP 9	lb C/yr	202.54						

Notes:

(1) A detailed description of the calculations is presented in Attachment E-1.
(2) Most conservative xylene isomer AGC (i.e., p-xylene) used.

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Project INSILCO | W.O. No. | Sheet 1 of 3
Subject ESTIMATION OF PASSIVE VENTING SYSTEM EMISSIONS | By [illegible] | Date 4/21/94 REVISED 1/24/95
Chkd. by | Date

STEP 1: ARE THE CHEMICALS IN DILUTE SOLUTION OR PRESENT AS FREE PRODUCT?

CALCULATE CONC. OF TOLUENE IN SOLUTION

- ASSUME 100 lb/ft³ SOIL → 1 kg SOIL = 0.02 ft³
- USING AN AVERAGE POROSITY OF 0.3 (RI STATES 0.2 - 0.4 RANGE), CALCULATE PORE VOLUME

$$\left(\frac{0.02\ ft^3\ soil}{kg\ soil}\right)\left(\frac{0.3\ ft^3\ air}{ft^3\ soil}\right) = 0.006\ ft^3\ air/kg\ soil$$

- ASSUME THE PORE VOLUME IS FILLED w/ H_2O → 0.006 ft³ H_2O/kg soil
- $0.006\ \frac{ft^3\ H_2O}{kg\ soil}\left(\frac{28.317\ l}{ft^3}\right) = \frac{0.17\ l\ H_2O}{kg\ soil}$
- $2{,}200\ \frac{mg\ toluene}{kg\ soil}\left(\frac{kg\ soil}{0.17\ l\ H_2O}\right) = 12{,}950\ \frac{mg}{l}$ toluene

BECAUSE THIS VALUE IS > THE SOLUBILITY OF TOLUENE
12,950 ppm > 542 ppm

∴ TOLUENE IS PRESENT AS A FREE LIQUID.

STEP 2: ESTIMATE THE PARTIAL PRESSURE OF EACH CPD. USING RAOULT'S LAW.

- $P_i = (VP_i)x_i$ — VP_i = VAPOR PRESSURE, x_i = LIQUID MOLE FRACTION
- $x_i = \frac{moles_i}{total\ moles}$, $moles = \frac{mass_i}{MW_i}$

ASSUME 1 kg SOIL → MASS of cpd.

$$x_i = \frac{([LHP\text{-}6]_i,\ \frac{mg}{kg}[\frac{g}{1000\ mg}][1\ kg]/MW_i,\ \frac{g}{gmole})}{\sum_i([LHP\text{-}6]_i,\ \frac{mg}{kg}[\frac{g}{1000\ mg}][1\ kg]/MW_i,\ \frac{g}{gmole})}$$

$$e.g.\quad x_{toluene} = \frac{[2{,}200\ \frac{mg}{kg}][\frac{g}{1000\ mg}][1\ kg]/92.4\ g/gmole}{0.0245} = 0.9719$$

CALCULATIONS FOR OTHER MOLE FRACTIONS AND THE TOTAL # OF MOLES (i.e., 0.0245) ARE PRESENTED IN TABLE 1.

- $P_i = x_i VP_i$ (SEE TABLE 1)

e.g. $P_T = 0.9719\ (0.029\ atm) = 0.0282\ atm$

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STEP 3: ESTIMATE THE SOIL GAS CONCENTRATION, C_{si}

$$C_{si} = \frac{P_i MW_i}{RT} = \frac{P_i MW_i}{82.05 \frac{cm^3 atm}{kg\,mole} (289 \text{°K})}$$ ← ASSUME

e.g., $C_{TOLUENE} = \frac{0.0282 \text{ atm } (92.4 \text{ g/gmole})}{(82.05)(289)} = 1.10 \times 10^{-4} \text{ g/cm}^3$

STEP 4: ESTIMATE Q

a. $V_C = D A \varepsilon_{fw}$

D = DEPTH TO H_2O TABLE − DEPTH OF PREVIOUSLY EXCAVATED SOIL

D = 27.5 FT − 6 = 21.5 FT

$V_C = (21.5')(\pi(10)^2)(0.3)(30.48 \frac{cm}{ft})^3$ ← ASSUME EFFECTIVE RADIUS OF 10'

A = 291,864 cm²

$V_C = 57.4 \times 10^6 \text{ cm}^3$

b. $V_B = 57.4 \times 10^6 \left(\frac{1016.6 \text{ mbar}}{1012.6 \text{ mbar}} - 1\right) = 226,661 \text{ cm}^3$

$V_B = V_C \left[\left(\frac{P_{ref}}{P_1}\right)\left(\frac{T_1 + 273}{T_{ref} + 273}\right) - 1\right]$ ASSUME NO SIGNIFICANT SUBSURFACE TEMPERATURE CHANGE

P_{ref} = 1016.6 (source: LaGuardia Airport 1992 Average Barometric Pressure) - see Attachment

P_1 = 1016.6 − daily ΔP = 1016.6 − 4 = 1012.6

daily ΔP = 4.0 mbar (source: avg. US ΔP for 1986 as documented in EPA-450/3-87-026) cursory evaluation of 1992 LaGuardia Airport data appears to support this.

c. $Q = \frac{V_B}{\Delta t A} = \frac{226,661 \text{ cm}^3}{1 \text{ day} \left(\frac{24 h}{d}\right)\left(\frac{3600 \text{ sec}}{hr}\right)(291,864 \text{ cm}^2)}$

$= 8.99 \times 10^{-6} \text{ cm/sec}$

STEP 5: ESTIMATE E_i, g/sec

$E_{Toluene} = Q C_{si} A = (8.99 \times 10^{-6} \frac{cm}{sec})(1.10 \times 10^{-4} \text{ g/cm}^3)(291,864 \text{ cm}^2)$

$= 2.89 \times 10^{-4}$ g/sec

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Project ______ W.O. No. ______ Sheet 3 of 3
Subject ______ By GW Date 4/21/94 revised 11/14/95
Chkd. by ______ Date ______

STEP 6: CONVERT $E_i \rightarrow$ lb/hr

$$2.89\times10^{-4}\ g/sec\left(\frac{3600\ sec}{hr}\right)\left(\frac{lb}{453.59\ g}\right) = 2.29\times10^{-3}\ lb/hr$$

STEP 7: COMPARE TO NYS AGC (SOURCE OF EQNS. NYS AIR GUIDE - 1)
ESTIMATE DISPERSED CONCENTRATION

~~$C_p = \frac{4218\ E_i}{he^{2.16}}$~~ ~~$C_{ST} = 420\,C_p$~~

$\frac{\mu g}{m^3}$ $C_p = \frac{52,500\ E_i}{he^{2.25}}$ $C_{ST} = 65\,C_p$ REVISED APPENDIX B, AIR GUIDE-1 ~~[illegible]~~ FORMULAS

he = effective stack ht ≅ 15'
$h_s / h_b < 1.5$ ∴ no plume rise reduction factor applied

e.g. $C_{p,\ toluene} = \frac{52,500\ (\sout{4218})\ (2.29\times10^{-3}\ lb/hr)}{(15)^{2.25}\ (\sout{2.16})} = 2.71\times10^{-1}$ ~~2.78×10^{-2}~~ $\frac{\mu g}{m^3}$

e.g. $C_{ST,\ toluene} = 2.71\times10^{-1}$ ~~2.78×10^{-2}~~ (65) ~~(420)~~ $= 17.62$ ~~11.69~~ $\mu g/m^3$

STEP 8: COMPARE TO AGCs + SGCs (SEE TABLE 1)

C_p		AGC	
e.g. ~~2.78×10^{-2}~~ 2.71×10^{-1}	<<	2,000	TOLUENE
C_{ST}		SGC	
~~11.69~~ 17.62	<<	45,000 ~~89,000~~	∴ CONTROLS NOT NEEDED

STEP 9: CALCULATE CARBON USAGE

~~[illegible]~~

e.g. $2.29\times10^{-3}\ lb/hr\left(\frac{24\ hr}{day}\right)\left(\frac{365\ d}{yr}\right) = 20.1\ \frac{lbs\ VOCs}{yr}$

$20.1\ \frac{lb\ VOC}{yr}\left|\frac{10\ lb\ C}{lb\ VOC}\right. \cong 200\ \frac{lb\ C}{yr}$ consumed

METEOROLOGICAL DATA FOR 1992

NEW YORK, LA GUARDIA FIELD, NEW YORK

LATITUDE: 40°46' N LONGITUDE: 73°54' W ELEVATION: FT. GRND 11 BARO 39 TIME ZONE: EASTERN WBAN: 14732

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:													
Averages													
-Daily Maximum	42.1	42.9	47.5	57.7	70.2	79.6	82.9	81.5	75.4	63.0	51.5	43.6	61.5
-Daily Minimum	29.7	30.1	33.1	43.0	52.2	62.8	67.8	66.3	61.3	48.2	41.4	32.3	47.4
-Monthly	35.9	36.5	40.3	50.4	61.2	71.2	75.4	73.9	68.4	55.6	46.5	38.0	54.4
-Monthly Dewpt.	23.1	24.1	25.3	35.2	45.4	55.9	61.6	60.9	57.2	42.1	35.7	28.2	41.2
Extremes													
-Highest	60	61	63	81	94	87	97	93	82	79	70	62	97
-Date	14	23	9	24	22	13	14	11	18	3	23	31	JUL 14
-Lowest	12	15	19	33	43	53	59	58	45	36	31	18	12
-Date	19	12	16	13	6	22	24	21	30	20	20	24	JAN 19
DEGREE DAYS BASE 65 °F:													
Heating	894	819	756	431	156	10	0	1	47	293	546	831	4784
Cooling	0	0	0	1	45	202	327	284	153	10	0	0	1022
% OF POSSIBLE SUNSHINE													
AVG. SKY COVER (tenths)													
Sunrise - Sunset	6.1	6.3	6.0	6.5	5.9	5.3	6.5	5.2	5.8	5.1	6.8	6.9	6.0
Midnight - Midnight	5.9	5.9	6.0	6.7	5.8	5.3	6.5	5.1	5.7	5.0	7.2	7.0	6.0
NUMBER OF DAYS:													
Sunrise to Sunset													
-Clear	8	8	12	7	9	13	5	10	10	12	8	8	110
-Partly Cloudy	8	6	4	10	9	6	13	12	8	8	7	7	98
-Cloudy	15	15	15	13	13	11	13	9	12	11	15	16	158
Precipitation .01 inches or more	8	9	11	12	8	7	15	12	8	7	10	13	120
Snow, Ice pellets, hail 1.0 inches or more	0	0	2	0	0	0	0	0	0	0	0	0	2
Thunderstorms	1	0	0	3	1	5	5	4	3	1	1	1	25
Heavy Fog, visibility 1/4 mile or less	2	0	2	1	0	0	0	1	0	0	1	2	9
Temperature °F													
-Maximum													
90° and above	0	0	0	0	2	0	5	2	0	0	0	0	9
32° and below	5	3	0	0	0	0	0	0	0	0	0	1	9
-Minimum													
32° and below	17	15	14	0	0	0	0	0	0	0	4	13	63
0° and below	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG. STATION PRESS. (mb)	1014.6	1015.2	1013.5	1015.9	1018.6	1012.5	1013.2	1017.6	1020.7	1017.3	1020.7	1019.3	1016.6
RELATIVE HUMIDITY (%)													
Hour 01	65	69	65	70	71	72	73	76	77	69	73	72	71
Hour 07 (Local Time)	68	68	68	69	67	71	71	75	76	73	74	74	71
Hour 13	59	57	51	51	51	50	55	54	58	51	64	66	56
Hour 19	59	61	54	61	59	59	62	63	68	60	66	65	61
PRECIPITATION (inches):													
Water Equivalent													
-Total	1.39	1.43	4.07	1.52	2.87	3.25	4.38	4.12	2.58	1.05	5.27	5.47	37.40
-Greatest (24 hrs)	0.52	0.75	1.30	0.39	1.53	1.82	1.08	2.02	0.87	0.51	2.32	3.07	3.07
-Date	23-24	15-16	18-19	24-25	31	5- 6	8- 9	17-18	10-11	9-10	2- 3	10-11	DEC 10-11
Snow, Ice pellets, hail													
-Total	1.3	1.3	10.2	T	0.0	0.0	0.0	0.0	0.0	T	1	0.5	13.3
-Greatest (24 hrs)	1.0	0.9	6.6	T	0.0	0.0	0.0	0.0	0.0	T	T	0.5	6.6
-Date	25-26	8	18-19	16						19	2	12-13	MAR 18-19
WIND:													
Resultant													
-Direction (!!!)	304	318	303	008	063	204	227	244	085	306	330	328	316
-Speed (mph)	7.3	6.6	4.7	2.0	4.0	3.0	1.0	1.3	0.9	4.3	3.0	4.8	2.4
Average Speed (mph)	14.3	14.0	14.6	11.9	11.2	11.2	10.7	10.6	11.5	11.1	11.5	14.2	12.2
Fastest Obs. 1 Min.													
-Direction (!!!)	06	34	11	29	05	18	17	16	06	31	18	05	05
-Speed (mph)	39	36	38	30	26	29	29	29	31	29	39	52	52
-Date	4	29	25	24	8	18	9	28	25	16	13	11	DEC 11
Peak Gust													
-Direction (!!!)	W	NW	SE	W	N	S	SW	S	NE	NW	S	NE	NE
-Speed (mph)	58	51	61	43	44	37	41	48	39	46	61	77	77
-Date	14	5	26	24	2	18	14	28	25	16	13	11	DEC 11

(!!!) See Reference Notes on Page 68

APPENDIX F

NYSDEC REMEDIAL ALTERNATIVE SCORING SHEETS

NO ACTION ALTERNATIVE

Table 5.2

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. Compliance with chemical-specific SCGs	Meets chemical specific SCGs such as groundwater standards	**Yes** ___ **No** _✓_	4 0
2. Compliance with action-specific SCGs	Meets SCGs such as technology standards for incineration or landfill	**Yes** _✓_ **No** ___	3 0
3. Compliance with location-specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	**Yes** _✓_ **No** ___	3 0
TOTAL (Maximum = 10)			6

Table 5.3

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. **(If answer is yes, go to the end of the Table.)**	**Yes**		20
		No	✓	0
TOTAL (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	**Yes**	✓	3
		No		0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	**Yes**		4
		No	✓	0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	**Yes**	✓	3
		No		0
Subtotal (maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	**≤ 1 in 1,000,000**	✓	5
	ii) Health risk	**≤ 1 in 100,000**		2
Subtotal (maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable			5
	ii) Slightly greater than acceptable			3
	iii) Significant risk still exists		✓	0
Subtotal (maximum = 5)				
TOTAL (maximum = 20)			11	

Table 5.4

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	° Are there significant short-term risks to the community that must be addressed? **(If answer is no, go to Factor 2.)**	**Yes**	___	0
		No	✓	4
	° Can the risk be easily controlled?	**Yes**	___	1
		No	___	0
	° Does the mitigative effort to control risk impact the community life-style?	**Yes**	___	0
		No	___	2
Subtotal (maximum = 4)				
2. Environmental Impacts	° Are there significant short-term risks to the environment that must be addressed? **(If answer is no, go to Factor 3.)**	**Yes**	___	0
		No	✓	4
	° Are the available mitigative measures reliable to minimize potential impacts?	**Yes**	___	3
		No	___	0
Subtotal (maximum = 4)				
3. Time to implement the remedy.	° What is the required time to implement the remedy?	**≤ 2yr.**	✓	1
		> 2yr.	___	0
	° Required duration of the mitigative effort to control short-term risk.	**≤ 2yr.**	✓	1
		> 2yr.	___	0
Subtotal (maximum = 2)				
TOTAL (maximum = 10)			10	

Table 5.5

LONG-TERM EFFECTIVENESS AND PERMANENCE

(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. On-site or off-site treatment or land disposal	° On-site treatment*		3
	° Off-site treatment*		1
	° On-site or off-site land disposal		0
Subtotal (maximum = 3)			
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes			
2. Permanence of the remedial alternative.	° Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). **(If answer is yes, go to Factor 4.)**	**Yes** ____	3
		No ____	0
Subtotal (maximum = 3)			
3. Lifetime of remedial actions.	° Expected lifetime or duration of of effectiveness of the remedy.	**25-30yr.** ____	3
		20-25yr. ____	2
		15-20yr. ____	1
		< 15yr. ____	0
Subtotal (maximum = 3)			
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None** ____	3
		≤ 25% ____	2
		25-50% ____	1
		≥ 50% ____	0
	ii) Is there treated residual left at the site? **(If answer is no, go to Factor 5.)**	**Yes** ____	0
		No ____	2
	iii) Is the treated residual toxic?	**Yes** ____	0
		No ____	1
	iv) Is the treated residual mobile?	**Yes** ____	0
		No ____	1
Subtotal (maximum = 5)			

Table 5.5 (cont'd)

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**< 5yr.** ✓	1
		> 5yr. ___	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? **(If answer is no, go to "iv")**	**Yes** ___	0
		No ✓	1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident** ___	1
		Somewhat to not confident ___	0
	iv) Relative degree of long-term monitoring required **(compare with other remedial alternatives)**	**Minimum** ✓	2
		Moderate ___	1
		Extensive ___	0
Subtotal (maximum = 4)			
TOTAL (maximum = 15)			6

Table 5.6
REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). **If Factor 1 is not applicable, go to Factor 2.**	i) Quantity of hazardous waste destroyed or treated. **Immobilization technologies do not score under Factor 1.** N.A.	99-100% ____	8
		90-99% ____	7
		80-90% ____	6
		60-80% ____	4
		40-60% ____	2
		20-40% ____	1
		< 20% ____	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i)? **If answer is no, go to Factor 2**	Yes ____	0
		No ____	2
Subtotal (maximum = 10) If subtotal = 10, go to Factor 3	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal ____	0
		On-site land disposal ____	1
		Off-site destruction or treatment ____	2
2. Reduction in mobility of hazardous waste. **If Factor 2 is not applicable, go to Factor 3**	i) Quality of Available Wastes Immobilized After Destruction/Treatment N.A.	90-100% ____	2
		60-90% ____	1
		< 60% ____	0
	ii) Method of Immobilization		
	- Reduced mobility by containment	____	0
	- Reduced mobility by alternative treatment technologies	____	3
Subtotal (maximum = 5)			
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste	Completely irreversible	____	5
	Irreversible for most of the hazardous waste constituents.	____	3
	Irreversible for only some of the hazardous waste constituents	____	2
	Reversible for most of the hazardous waste constituents.	____	0
Subtotal (maximum = 5)			
TOTAL (maximum = 15)			0

Table 5.7

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. Technical Feasibility			
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.	✓	3
	ii) Somewhat difficult to construct. No uncertainties in construction.	___	2
	iii) Very difficult to construct and/or significant uncertainties in construction.	___	1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.	✓	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.	___	2
c. Schedule of delays due to technical problems.	i) Unlikely	✓	2
	ii) Somewhat likely	___	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.	___	2
	ii) Some future remedial actions may be necessary.	✓	1
Subtotal (maximum = 10)			
2. Administrative Feasibility			
a. Coordination with other agencies.	i) Minimal coordination is required.	✓	2
	ii) Required coordination is normal.	___	1
	iii) Extensive coordination is required.	___	0
Subtotal (maximum = 2)			
3. Availability of Services and Materials			
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes** ✓	1
		No ___	0
	ii) Will more than one vendor be available to provide a competitive bid? N.A.	**Yes** ___	1
		No ___	0

Table 5.7 (cont'd)

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis	Score		
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay. NA.	**Yes**	___	1
		No	___	0
			(12)	

Subtotal (maximum = 3)

TOTAL (maximum = 15)

ACCESS AND USE RESTRICTIONS

Table 5.2

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)
(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs	Meets chemical specific SCGs such as groundwater standards	**Yes**	✓	4
		No	✓	0
2. Compliance with action-specific SCGs	Meets SCGs such as technology standards for incineration or landfill	**Yes**	✓	3
		No		0
3. Compliance with location-specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	**Yes**	✓	3
		No		0
TOTAL (Maximum = 10)			6	

Table 5.3

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. **(If answer is yes, go to the end of the Table.)**	**Yes**	✓	20
		No	✓	0
TOTAL (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	**Yes**	✓	3
		No	___	0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	**Yes**	✓	4
		No	✓	0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	**Yes**	✓	3
		No	___	0
Subtotal (maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	**≤ 1 in 1,000,000**	✓	5
	ii) Health risk	**≤ 1 in 100,000**	___	2
Subtotal (maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable		___	5
	ii) Slightly greater than acceptable		___	3
	iii) Significant risk still exists		✓	0
Subtotal (maximum = 5)				
TOTAL (maximum = 20)				

Table 5.4

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	° Are there significant short-term risks to the community that must be addressed? **(If answer is no, go to Factor 2.)**	**Yes**		0
		No	✓	4
	° Can the risk be easily controlled?	**Yes**	___	1
		No	___	0
	° Does the mitigative effort to control risk impact the community life-style?	**Yes**	___	0
		No	___	2
Subtotal (maximum = 4)				
2. Environmental Impacts	° Are there significant short-term risks to the environment that must be addressed? **(If answer is no, go to Factor 3.)**	**Yes**		0
		No	✓	4
	° Are the available mitigative measures reliable to minimize potential impacts?	**Yes**	___	3
		No	___	0
Subtotal (maximum = 4)				
3. Time to implement the remedy.	° What is the required time to implement the remedy?	**≤ 2yr.**		1
		> 2yr.	✓	0
	° Required duration of the mitigative effort to control short-term risk.	**≤ 2yr.**	✓	1
		> 2yr.	___	0
Subtotal (maximum = 2)			9	
TOTAL (maximum = 10)				

Table 5.5

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. On-site or off-site treatment or land disposal	° On-site treatment*		3
	° Off-site treatment*		1
	° On-site or off-site land disposal		0
Subtotal (maximum = 3)			
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes			
2. Permanence of the remedial alternative.	° Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). **(If answer is yes, go to Factor 4.)**	**Yes** ✓	3
		No ✓	0
Subtotal (maximum = 3)			
3. Lifetime of remedial actions.	° Expected lifetime or duration of of effectiveness of the remedy.	25-30yr.____	3
		20-25yr.____	2
		15-20yr. ✓	1
		< 15yr. ✓	0
Subtotal (maximum = 3)			
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None** ____	3
		≤ 25% ____	2
		25-50% ✓	1
		≥ 50% ✓	0
	ii) Is there treated residual left at the site? **(If answer is no, go to Factor 5.)**	**Yes** ✓	0
		No ✓	2
	iii) Is the treated residual toxic?	**Yes** ____	0
		No ____	1
	iv) Is the treated residual mobile?	**Yes** ____	0
		No ____	1
Subtotal (maximum = 5)			

Table 5.5 (cont'd)

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**< 5yr.** ✓	1
		> 5yr. ___	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? **(If answer is no, go to "iv")**	**Yes** ✓	0
		No ___	1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident** ✓	1
		Somewhat to not confident ___	0
	iv) Relative degree of long-term monitoring required **(compare with other remedial alternatives)**	**Minimum** ✓	2
		Moderate ___	1
		Extensive ___	0
Subtotal (maximum = 4)			
TOTAL (maximum = 15)			6

Table 5.6
REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Relative Weight = 15)

Analysis Factor		Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). **If Factor 1 is not applicable, go to Factor 2.**	i)	Quantity of hazardous waste destroyed or treated. **Immobilization technologies do not score under Factor 1.**	**99-100%**	___	8
			90-99%	___	7
			80-90%	___	6
			60-80%	___	4
			40-60%	___	2
			20-40%	___	1
			< 20%	___	0
	ii)	Are there untreated or concentrated hazardous waste produced as a result of (i)? **If answer is no, go to Factor 2**	**Yes**	___	0
			No	___	2
Subtotal (maximum = 10) If subtotal = 10, go to Factor 3	iii)	After remediation, how is the untreated, residual hazardous waste material disposed?	**Off-site land disposal**	___	0
			On-site land disposal	___	1
			Off-site destruction or treatment	___	2
2. Reduction in mobility of hazardous waste. **If Factor 2 is not applicable, go to Factor 3**	i)	Quality of Available Wastes Immobilized After Destruction/ Treatment	**90-100%**	___	2
			60-90%	___	1
			< 60%	___	0
	ii)	Method of Immobilization			
		- Reduced mobility by containment		___	0
		- Reduced mobility by alternative treatment technologies		___	3
Subtotal (maximum = 5)					
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste		Completely irreversible		___	5
		Irreversible for most of the hazardous waste constituents.		___	3
		Irreversible for only some of the hazardous waste constituents		___	2
		Reversible for most of the hazardous waste constituents.		___	0
Subtotal (maximum = 5)					
TOTAL (maximum = 15)					

Table 5.7

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		✓	3
	ii) Somewhat difficult to construct. No uncertainties in construction.		___	2
	iii) Very difficult to construct and/or significant uncertainties in construction.		___	1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		✓	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		___	2
c. Schedule of delays due to technical problems.	i) Unlikely		✓	2
	ii) Somewhat likely		___	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		___	2
	ii) Some future remedial actions may be necessary.		✓	1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.		✓	2
	ii) Required coordination is normal.		___	1
	iii) Extensive coordination is required.		___	0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	✓	1
		No	___	0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	✓	1
		No	___	0

Table 5.7 (cont'd)

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes	✓	1
		No	___	0

Subtotal (maximum = 3)

TOTAL (maximum = 15) (14)

ACTIVE ON-SITE PRODUCT RECOVERY AND PASSIVE OFF-SITE SURFACE WATER PRODUCT RECOVERY

Table 5.2

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)
(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs	Meets chemical specific SCGs such as groundwater standards	Yes No	✓ ___	4 0
2. Compliance with action-specific SCGs	Meets SCGs such as technology standards for incineration or landfill	Yes No	✓ ___	3 0
3. Compliance with location-specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	Yes No	✓ ___	3 0
TOTAL (Maximum = 10)			10	

Table 5.3

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

(Relative Weight = 20)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. **(If answer is yes, go to the end of the Table.)**	**Yes**	___	20
		No	✓	0
TOTAL (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	**Yes**	✓	3
		No	___	0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	**Yes**	✓	4
		No	___	0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	**Yes**	✓	3
		No	___	0
Subtotal (maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	**≤ 1 in 1,000,000**	✓	5
	ii) Health risk	**≤ 1 in 100,000**	___	2
Subtotal (maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable		✓	5
	ii) Slightly greater than acceptable		___	3
	iii) Significant risk still exists		___	0
Subtotal (maximum = 5)				
TOTAL (maximum = 20)				(20)

Table 5.4

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	° **Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)**	**Yes**	✓	0
		No		4
	° Can the risk be easily controlled?	**Yes**	✓	1
		No		0
	° Does the mitigative effort to control risk impact the community life-style?	**Yes**		0
		No	✓	2
Subtotal (maximum = 4)				
2. Environmental Impacts	° Are there significant short-term risks to the environment that must be addressed? **(If answer is no, go to Factor 3.)**	**Yes**		0
		No	✓	4
	° Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)				
3. Time to implement the remedy.	° What is the required time to implement the remedy?	**≤ 2yr.**		1
		> 2yr.	✓	0
	° Required duration of the mitigative effort to control short-term risk.	**≤ 2yr.**		1
		> 2yr.	✓	0
Subtotal (maximum = 2)			(7)	
TOTAL (maximum = 10)				

Table 5.5

LONG-TERM EFFECTIVENESS AND PERMANENCE

(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. On-site or off-site treatment or land disposal	° On-site treatment*		3 ✓
	° Off-site treatment*		1 ✓
	° On-site or off-site land disposal		0
Subtotal (maximum = 3)			
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes			
2. Permanence of the remedial alternative.	° Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). **(If answer is yes, go to Factor 4.)**	**Yes** ✓	3 *
		No ___	0
Subtotal (maximum = 3)			
3. Lifetime of remedial actions.	° Expected lifetime or duration of of effectiveness of the remedy.	**25-30yr.** ___	3
		20-25yr. ___	2
		15-20yr. ___	1
		< 15yr. ___	0
Subtotal (maximum = 3)			
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None** ✓	3
		≤ 25% ___	2
		25-50% ___	1
		≥ 50% ___	0
	ii) Is there treated residual left at the site? **(If answer is no, go to Factor 5.)**	**Yes** ✓	0
		No ✓	2
	iii) Is the treated residual toxic?	**Yes** ___	0
		No ___	1
	iv) Is the treated residual mobile?	**Yes** ___	0
		No ___	1
Subtotal (maximum = 5)			

* for on-site and off-site product

Table 5.5 (cont'd)

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	< 5yr.	✓	1
		> 5yr.		0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? **(If answer is no, go to "iv")**	Yes	✓	0
		No		1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident	✓	1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required **(compare with other remedial alternatives)**	Minimum	✓	2
		Moderate		1
		Extensive		0
Subtotal (maximum = 4)				
TOTAL (maximum = 15)				(13)

Table 5.6
REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). **If Factor 1 is not applicable, go to Factor 2.**	i) Quantity of hazardous waste destroyed or treated. **Immobilization technologies do not score under Factor 1.**	**99-100%** ✓	8
		90-99% ___	7
		80-90% ___	6
		60-80% ___	4
		40-60% ___	2
		20-40% ___	1
		< 20% ___	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i)? **If answer is no, go to Factor 2**	**Yes** ✓	0
		No ✓	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3**	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	**Off-site land disposal** ___	0
		On-site land disposal ___	1
		Off-site destruction or treatment ___	2
2. Reduction in mobility of hazardous waste. **If Factor 2 is not applicable, go to Factor 3**	i) <u>Quality of Available Wastes Immobilized After Destruction/ Treatment</u>	**90-100%** ___	2
		60-90% ___	1
		< 60% ___	0
	ii) <u>Method of Immobilization</u>		
	- Reduced mobility by containment	___	0
	- Reduced mobility by alternative treatment technologies	___	3
Subtotal (maximum = 5)			
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste	Completely irreversible	✓	5
	Irreversible for most of the hazardous waste constituents.	___	3
	Irreversible for only some of the hazardous waste constituents	___	2
	Reversible for most of the hazardous waste constituents.	___	0
Subtotal (maximum = 5)			
TOTAL (maximum = 15)			15

Table 5.7

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. <u>Technical Feasibility</u>			
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.	✓	3
	ii) Somewhat difficult to construct. No uncertainties in construction.	___	2
	iii) Very difficult to construct and/or significant uncertainties in construction.	___	1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.	✓	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.	___	2
c. Schedule of delays due to technical problems.	i) Unlikely	___	2
	ii) Somewhat likely	✓	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.	___	2
	ii) Some future remedial actions may be necessary.	✓	1
Subtotal (maximum = 10)			
2. <u>Administrative Feasibility</u>			
a. Coordination with other agencies.	i) Minimal coordination is required.	✓	2
	ii) Required coordination is normal.	___	1
	iii) Extensive coordination is required.	___	0
Subtotal (maximum = 2)			
3. <u>Availability of Services and Materials</u>			
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes** ✓	1
		No ___	0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes** ✓	1
		No ___	0

Table 5.7 (cont'd)

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes**	✓	1
		No	___	0
			(1½)	

Subtotal (maximum = 3)

TOTAL (maximum = 15)