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Site Investigation and Remedial Alternatives Report 858 East Ferry Street Site Buffalo, New York Volume I

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Site Investigation and Remedial Alternatives Report 858 East Ferry Street Site Buffalo, New York Volume I

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Prepared for:

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Executive Summary

Ecology and Environment, P.C. (E & E) conducted a site investigation (SI) of the 858 East Ferry Street property to characterize its environmental status, including the nature and extent of contamination potentially present in various site media. Based on the data obtained during the SI, several remedial alternatives for the site were investigated to determine their cost and feasibility. This project was performed under the Brownfields Program of the New York State Clean Water/Clean Air Bond Act. The primary objective of this effort was to determine the nature and extent of contamination at the site and review remedial alternatives that are protective of human health and the environment, cost effective, and compliant with applicable statutes.

The 3.32-acre site is bordered by a heavily traveled road, a frequently used railroad, and a junkyard. The property has never been occupied by buildings or other structures. This is due in part to the presence of the Scajaquada Creek drain that bisects the property underground. The presence of the drain precludes construction of buildings and movement of heavy vehicles on much of the property.

The site has been illegally used as a dumping ground for many years. As observed during the SI activity, two types of ash had historically been dumped at the site: a white, lead-rich ash is present in several areas of the central and western portions of the site, and a gray-mottled ash containing numerous glass bottles is present throughout much of the northern portion of the site. More recently, other types of debris, including rubber automobile tires, televisions, and construction/demolition waste, also were dumped illegally on the site.

SI activities were conducted during two field efforts. During the first field effort conducted in October and November 1997, samples of potential asbestos-containing materials (ACMs) were collected from debris piles; surface soil samples were collected from open areas of the site and from beneath debris piles; subsurface soil samples were collected from trenches excavated to facilitate visual inspection of subsurface conditions; and groundwater monitoring wells were installed to collect groundwater

samples and hydrogeologic data. Debris pile samples were submitted for asbestos analysis. Soil and groundwater samples were submitted for Target Compound List (TCL) and Target Analyte List (TAL) analyses. Data collected from this initial field effort indicated a need to further explore surface and subsurface soils. During the second field effort conducted in June 1998, subsurface soil samples were collected by a truck-mounted drill rig using direct-push technology; surface soil samples were collected in a grid pattern at selected television debris pile areas.

Visual inspection of the debris piles indicated the presence of three suspected ACMs comprising roofing shingles and two types of ceiling tiles. Analysis of samples collected from the piles showed that none of these materials were ACMs. However, a fourth debris pile containing approximately three cubic yards of transite siding, an assumed ACM, was identified on site.

Analysis of surface soil samples indicated the presence of three volatile organic compounds (VOCs) and pesticides at concentrations below regulatory guideline values. Several semivolatile organic compounds (SVOCs), primarily polycyclic aromatic hydrocarbons (PAHs) and phthalates were detected throughout site surface soils. Polychlorinated biphenyls (PCBs) were detected in one composite sample collected from beneath television debris piles. Though 20 of the 23 TAL metals were present in most of the samples, cyanide was detected in only two samples. Toxicity Characteristic Leaching Procedure (TCLP) lead analysis of one surface soil sample containing a high total lead concentration indicated that the soil did not meet the definition of a hazardous waste.

To define the extent of PCB presence beneath the television debris piles, a sample grid was established at each of three television debris piles during the second field effort. Samples were collected from soil depth intervals and analyzed using an immunoassay analytical system. The concentration of PCBs exceeded the 1 part per million (ppm) regulatory threshold at only one television debris pile. PCB concentrations ranged up to 590 ppm in the 0- to-2-inch soil depth interval and 52 ppm in the 6-to-12-inch soil depth interval in the southern part of the grid area.

Analysis of subsurface soil samples collected from test trenches indicated VOCs present at concentrations below regulatory guideline values, and SVOCs, primarily PAHs, present in all but one sample. Though low concentrations of pesticides were detected in subsurface soil samples, no PCBs were detected. Most of the 23 TAL metals were detected in each sample, but cyanide was detected in only one sample.

Due to site PAH concentrations, including those compounds identified as carcinogenic PAHs (c-PAHs), remedial actions for this site were in part determined by applying New York State Department of Health's remedial action guidance values for carcinogenic PAHs (c-PAHs) to site soils as stated by O'Connor (1997). To further define the concentration and extent of c-PAHs at the site, soil core samples were collected from several previous surface and subsurface sample locations and submitted for c-PAH analysis using an immunoassay system during the second phase of SI activities. C-PAHs were detected primarily in samples collected from the 18-to-24-inch depth interval. C-PAHs also were present in one sample collected from the 42- to- 48-inch depth interval next to the fence at approximately the midpoint of the western site border. This sample contained a grease-like substance that may be associated with activities at the junkyard operated on the adjacent property.

Two subsurface soil samples were submitted for TCLP-lead analysis because of their high total lead concentrations. Analysis of one sample consisting entirely of soil indicated that it did not meet the classification of a hazardous waste. The other sample consisted almost entirely of white ash and had a lead extract concentration of 14 ppm, classifying the materials as hazardous waste under New York State regulations. Because the ash is a hazardous waste, the extent of its presence had to be delineated. Delineation was achieved by collecting core samples in a grid pattern over most of the site, then geologically logging samples during the second phase of SI activities.

Few organic analytes were detected in the groundwater samples. A sample collected from well MWEF-03RK contained 260 micrograms per liter (µg/L) of benzene (an unusually high concentration) and a second groundwater sample collected from this well contained benzene at a concentration of 180 µg/L. Organic analysis also detected two other VOCs and two SVOCs at concentrations below regulatory levels, but no PCBs or pesticides in site groundwater. Though 17 of the 23 TAL metals were detected in most of the groundwater samples, cyanide was detected only in the sample collected from MWEF-03RK.

Due to the unusually high concentrations of benzene detected in groundwater samples collected from well MWEF-03RK, four soil borings were installed during the second phase of SI activities to investigate a possible benzene source in the vicinity of the well. Benzene was not detected in any of these soil samples.

Historical background information was reviewed to determine possible origins of site contaminants. The lead-rich ash is possibly

associated with a former lead and zinc foundry that operated on an adjacent property to the west of this site. Though on-site sources of the benzene detected in groundwater samples collected from well MWEF-03RK were not identified, two gasoline spills are reported to have occurred on neighboring properties located upgradient of the well. The elevated concentrations of PAHs in site soils can be attributed, in part, to train and vehicular traffic adjacent to the site. Historical information was not useful in indicating a PCB source. Based on the type and areal extent of PCBs detected at the site, the presence of PCBs is possibly due to a spill(s) of PCB-containing oil.

A human health risk evaluation consisting of a screening-level assessment was conducted on the site sample data to determine whether any contaminants pose a significant threat to human health. The concentrations of several PAHs, including some c-PAHs, in soils exceeded the New York State Technical Assistance and Guidance Memorandum (TAGM) 4046, Recommended Soil Cleanup Objectives, and the concentrations of PCBs exceeded the 1 ppm regulatory threshold in one area of television debris piles. Of the contaminants detected in surface soils, PCBs and c-PAHs were determined to pose the greatest threat to human health, and lead in site surface soils may also pose a substantial health risk.

Based on the maximum concentrations of the PCBs (specifically, Aroclor 1260) and the c-PAHs, the total uppermost cancer risk for future commercial or industrial workers at the site would exceed the risk range considered acceptable (10^{-4} to 10^{-6}) by the United States Environmental Protection Agency (EPA). PCBs accounted for the bulk of the estimated risk.

The presence of the Scajaquada Creek drain restricts options for future site use. In addition, because the surrounding land use to the north and west is industrial, residential use of this property would require a change in zoning status from industrial to residential.

Remedial action objectives were developed for pre-disposal and urban conditions. Remedial alternatives considered include containment, excavation and removal, installation of institutional controls to limit site access, and no action. Installation of a cap over the entire site would cost approximately $195,900, while complete excavation and off-site disposal of site soil (to achieve pre-disposal conditions) would cost an estimated $1,966,300. Limiting site vehicular access would cost approximately $19,500, while installing a fence around the entire site would cost approximately $29,500. If the site is not remediated to pre-disposal conditions but is left alone, installation of institutional controls to restrict site access is recommended as an inexpensive method of reducing

potential future access and illegal dumping at the site. ACM identified in one debris pile will require design and implementation of an asbestos abatement plan. The estimated costs presented above do not include long-term groundwater monitoring or removal of existing site debris.

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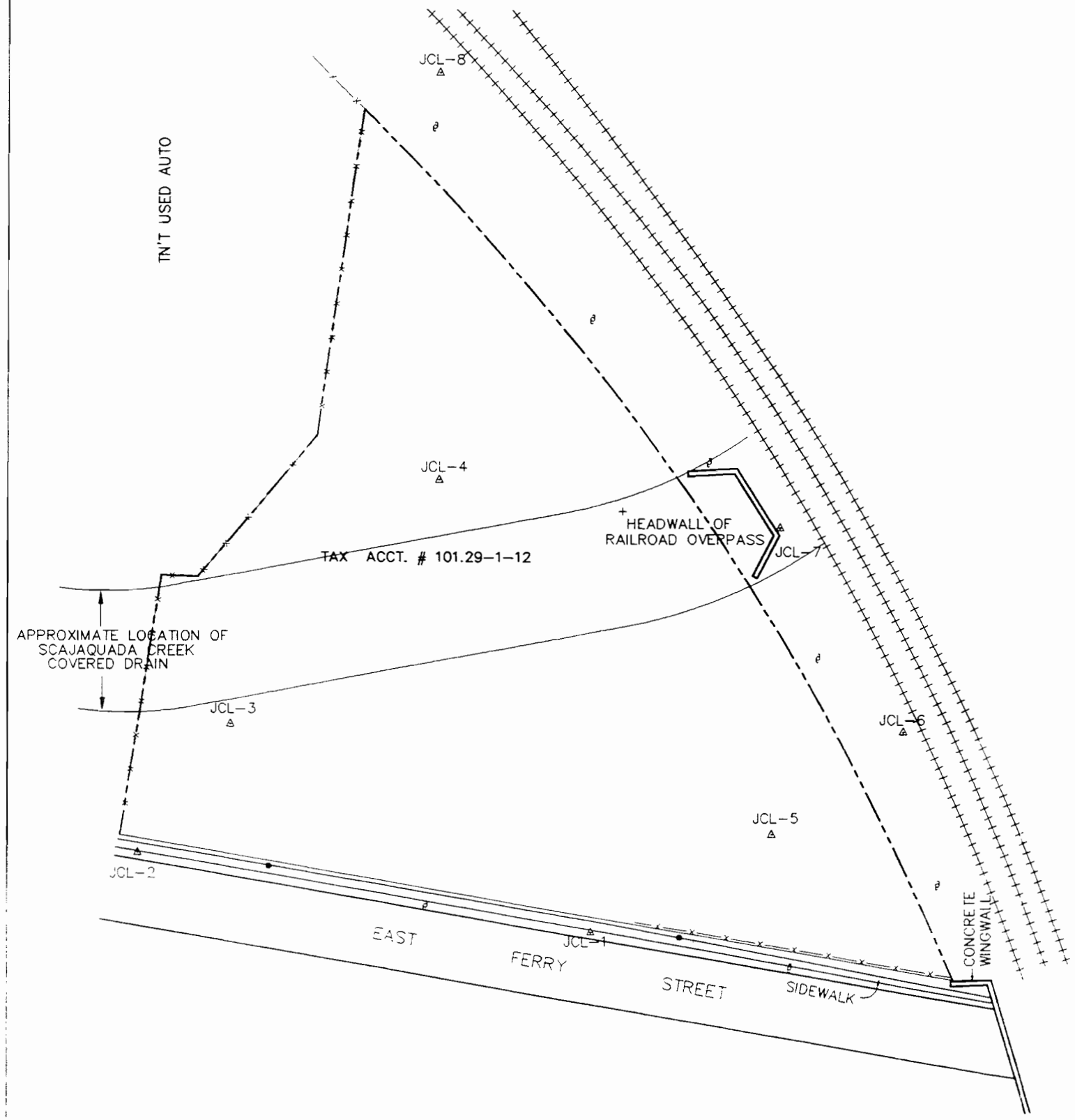

LEGEND

- JCL CONTROL POINT
- UTILITY POLE
- MANHOLE
- PROPERTY LINE
- RAILROAD TRACKS
- CHAIN-LINK FENCE

N

SCALE IN FEET

0 80 160 240

NOTES:

1. HORIZONTAL DATUM IS LOCAL WITH ASSUMED COORDINATES AND MAGNETIC NORTH.
2. VERTICAL DATUM IS LOCAL WITH THE TOP OF JCL-1 REBAR/CAP ELEVATION = 100.00. NO EXISTING MONUMENTATION WITHIN A 2-MILE RADIUS.
3. ALL PROPERTY LINES SHOWN ON THIS MAP ARE APPROXIMATELY POSITIONED PER CURRENT TAX MAPS OR EXISTING OCCUPATION.
4. SCAJAQUADA CREEK DRAIN LOCATION IS APPROXIMATE FIELD VERIFICATION IS REQUIRED.

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Figure 1-2 SITE BASE MAP
EAST FERRY STREET
BUFFALO, NEW YORK

1 Introduction

This Site Investigation/Remedial Alternatives Report (SI/RAR) describes activities performed by Ecology and Environment Engineering, P.C. (E & E), in the site investigation, characterization, and remedial alternatives review program conducted at the 858 East Ferry Street site located in Buffalo, New York.

1.1 Purpose of Report

The purpose of this report is to present a concise summary of the site investigation activities and findings, as well as the results of contaminant risk and remedial alternative evaluations for the East Ferry Street site.

1.2 Site Background

1.2.1 Site Description

The 858 East Ferry Street site is a 3.32-acre parcel of land currently owned by the City of Buffalo. The site is located approximately ½ block west of the intersections of East Ferry and Grider Streets (see Figures 1-1 and 1-2). The property is roughly triangular shaped and is bordered on the south by East Ferry Street, on the west by TNT Used Cars, and on the northeast by the Conrail railroad line, which is an active, elevated, multiple-rail right-of-way (ROW).

There are currently no buildings on site. The property border along East Ferry Street is defined by a chain link fence for approximately one-third of the boundary distance, and a cable fence for the remaining two-thirds boundary distance. The entire western property boundary is defined by a continuous chain link fence. The railroad ROW, built atop a man-made berm approximately 25 feet high, defines the boundary along the northeastern side of the property.

At approximately the midpoint of the northeastern site border, the railroad bed traverses a concrete overpass. This overpass was constructed in 1909 to enable the railroad to bridge the Scajaquada Creek. At some point in approximately the 1920s or 1930s, the

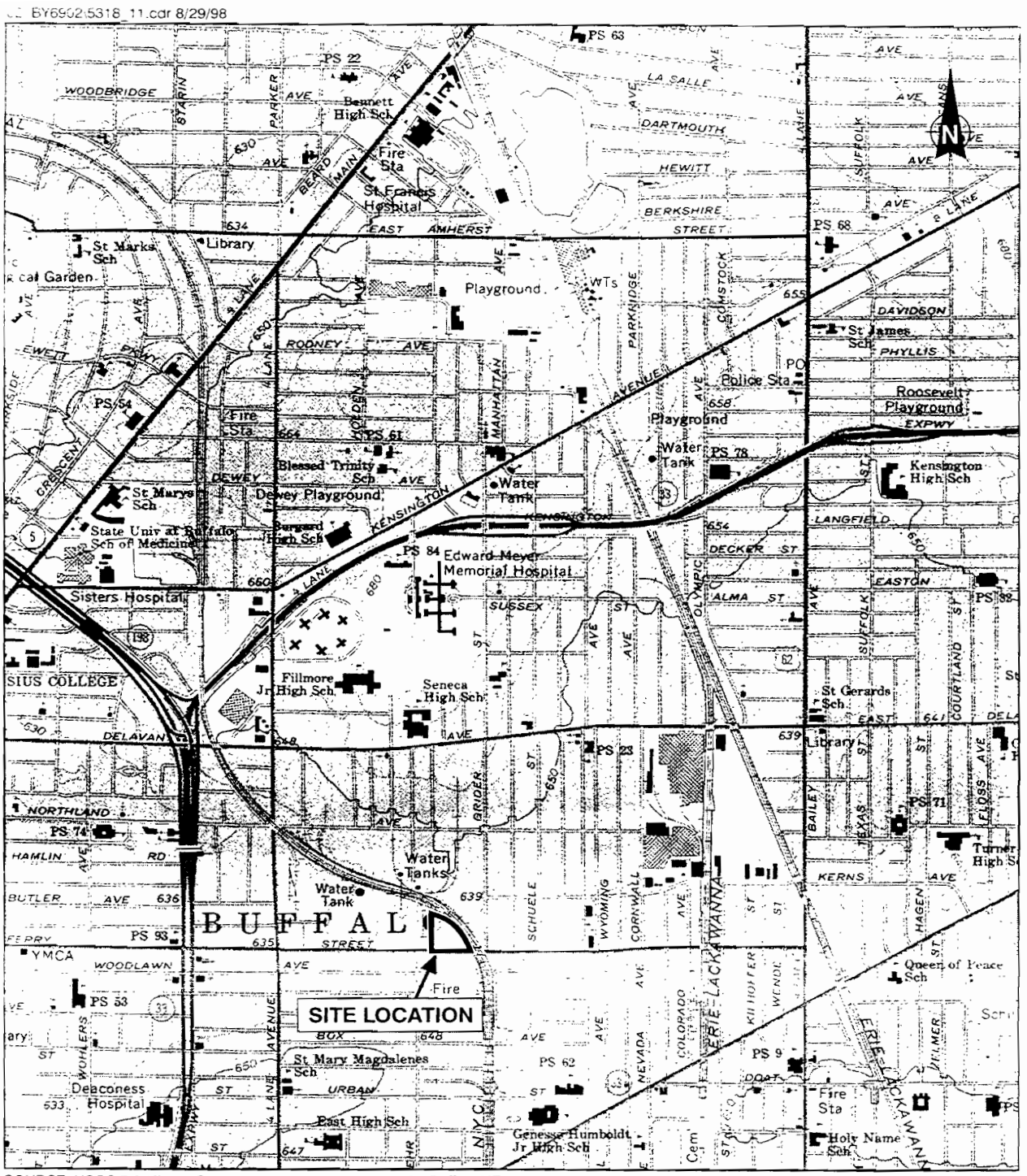

Figure 1-1 SITE LOCATION MAP
858 EAST FERRY STREET
BUFFALO, NEW YORK

City of Buffalo constructed an underground drainageway known as Scajaquada Creek. The drainageway traverses a distance of several miles, starting slightly east of the City's east-side border, and extending to the Delaware Park area in the northern part of the city. Construction drawings of the drainageway dating from approximately the mid-1930s show the location of the drainageway path, including the path segment beneath the 858 East Ferry Street site. These drawings indicate that the top of the drain is located at an elevation of 640.10 to 639.88 feet above mean sea level as one travels from east to west across the site. Drainage flow is to the west. The drain is 33.5 feet wide and measures 15 feet from top to bottom. Each drain wall is constructed of concrete of varying thicknesses, tapering from a maximum of 5 feet thick at its base to 12 inches thick at the extreme top (Buffalo Sewer Authority 1935).

Inquiries made to the Buffalo Sewer Authority as to any ROWs or easements on the property revealed that no such restrictions exist with the authority (Cefalo 1997). However, Sewer Authority personnel are confident that such restrictions exist and may be on file with a different City department. Further inquiry with the City of Buffalo Tax Assessor's Office and Department of Public Works did not reveal any easements for the Scajaquada Creek on the 858 East Ferry Street property.

Pedestrians may access the site along two-thirds of the East Ferry Street frontage or by walking down the embankment along the railroad ROW. Vehicular access to the site is restricted to a segment in the east-central portion of the East Ferry Street frontage, at the west end of a chain-link fence. In this area, the cable fence is slack and lies flat on the ground, and the area is easily crossed by vehicle.

Approximately 10% to 15% of the site's surface is covered by debris piles of various types, including used automobile tires, television sets, lumber, and construction and demolition (C & D) debris. In addition, much of the northern portion of the site is covered by a 1- to 7-foot-thick gray ash layer. Most of the site is vegetated with sage, sumac, goldenrod, and grass.

1.2.2 Site History

Historic Sanborn maps and aerial photographs indicate that the site has never been occupied by any type of building. Surface and subsurface sampling shows that the property was used for the disposal of ash as evidenced by the presence of two distinct ash beds. The first is a white layer that occupies much of the central and western portions of the site and is covered by a soil layer. The second ash is a gray ash layer with some rust stain mottling. Based on the presence of numerous bottles, this gray ash is likely an

incinerated ash. The gray ash was disposed of in the northern and some central portions of the site. Because the gray ash overlies the white ash layer in the central portion of the site, it must have been deposited more recently.

In addition to historical use as an ash-dumping location, much of the site has been used illegally as a dumping ground for C & D debris over the past 20 years. Dumping continues to occur, as observed during field activities. Freshly deposited refuse on the southern and central portions of the site was occasionally noted by the field team. Besides being used as an illegal dumping ground, the site currently serves as open space in a highly developed area. Some local residents regularly use the area to walk their dogs, and an abandoned vegetable garden was found during the initial site walkover. In addition, bottle collectors were witnessed on the site during the second event of field investigation activities.

1.2.3 Surrounding Land Uses

The site is located in an area of varied land uses. Industrial use dominates the areas north and west of the site. As previously noted, the railroad ROW along the northeast side of the site is active. It was formerly operated by the New York Central Railroad, but is currently operated by Conrail as of the writing of this report. Residential use dominates the areas east of Grider Street and south of the site. Light commercial land use (including neighborhood grocery stores, a barber shop, and a bakery) is interspersed with the industrial and residential uses along East Ferry Street within ½ mile east and west of the site.

TNT Used Autos, located adjacent to the west side of the site, is both a used car lot and a junkyard. Automobiles and automobile parts cover much of the northern and eastern portions of the TNT property adjacent to the 858 East Ferry Street property.

On the southern side of East Ferry Street, directly south of the site, is a former Twin Fair retail store. This large, single-story building and parking lot are now operated as the True Bethel Baptist Church. The primary land use south of this church is residential.

Until approximately the 1970s, industrial land uses dominated areas west, north, and northeast of the site. At the adjacent property to the west, where TNT Used Autos now operates, the 1939 Sanborn map shows that the Michael Heyman Company operated a zinc and lead smelting and refining operation. Sanborn maps show two buildings on the Heyman site; the west building was the foundry and blast furnace site, and the east building housed the metal casting facility. A 1958 aerial photo shows a path leading from the Heyman property east of the central part of the 858 East

[illegible] The path runs east [illegible] vegetation. Although the photographic quality is poor, it does indicate other path segments leading from the Heyman property along the northern embankment area of 858 East Ferry Street. The photograph does not show disposal in progress; however, a footpath extending from the southwest corner to the railroad overpass is shown. The location of the Heyman entity adjacent to the site and the path from the Heyman property to the East Ferry Street site appear to be relevant to analytical findings that indicate the past disposal of lead-rich ash. These findings are discussed in Section 8.

The 1939 Sanborn map shows that other heavy industries operated in the area. Otis Elevator was located at the corner of Grider and Northland streets, northeast of the site; Buffalo Foundry and Machine Company was located at the end of Winchester Avenue, north of the site; and Curtiss-Wright operated a metal processing plant on Northland Avenue, also located north of the site.

The 1951, 1966, and 1968 aerial photos show the Heyman Company Buildings and other industrial buildings. Also, 1951 and 1958 aerial photos show a footpath from the southwest corner of the property directly to the Scajaquada Creek railroad overpass. This path is not visible in the 1966, 1968, 1975, or 1989 aerial photographs.

1.2.4 Previous Investigations

Only one previous environmental investigation conducted on this property was identified. A Phase I investigation of this property was conducted in January 1997 by the Sear-Brown Group, a local environmental consulting firm under contract with the City of Buffalo. This investigation identified several debris pile types and several pits to the rear of the site. The study recommended that additional site investigation activities be conducted (The Sear-Brown Group 1997).

The Sear-Brown Group's *Phase I Assessment* (1997) reports three underground storage tank (UST)-related fuel releases in the site area. Two spills occurred at 966 East Ferry Street, located approximately 900 feet east of the site. The first spill (DEC Spill I.D. Number 8904784) occurred in August 1989 and involved the release of approximately 40 gallons of gasoline. The second spill (DEC Spill I.D. Number 9203990) was recognized in June 1992 when a UST failed a leak test. Both spills were reportedly remediated, and the files were closed in November 1990 and December 1994, respectively.

A third spill (DEC Spill I.D. Number 8804436) occurred in August 1988 at a gas station located at the intersection of East Ferry Street

and Fillmore Avenue. The spill was recognized in August 1988 when a UST failed a leak test. This spill is considered less significant to the study site, as it occurred hydraulically downgradient of the 858 East Ferry Street site.

1.3 Report Organization

The remainder of this report is divided into seven sections. The site investigation field activities are discussed in Section 2, followed by a presentation of analytical findings in Section 3. Section 4 presents the physical characteristics of the site, and Section 5 provides an evaluation, based on analytical data, of human health risks posed by the site. An engineering study presenting remedial goals and the feasibility of implementing various remedial alternatives follows in Sections 6 and 7, respectively. A project summary is presented in Section 8.

2 Site Investigation Field Activities

2.1 Introduction

Field investigation activities at the 858 East Ferry Street site consisted of tasks and subtasks conducted during two field investigation efforts. The first field investigation effort included debris pile inventorying and sampling; discreet surface soil sampling; composite surface soil sampling; installing test trenches; soil boring; and conducting a groundwater investigation consisting of monitoring well installation and development, groundwater sampling, and permeability testing. Following these efforts, the surveying task was conducted by Lu Engineers, a subcontractor to E & E. All field activities were conducted according to the Project Work Plan (E & E 1997). This document included a Field Sampling Plan (FSP), a Quality Assurance Project Plan (QAPjP), a Health and Safety Plan (HASP), and a Community Participation Plan (CPP).

A second field effort was conducted to further investigate areas of contamination identified during the first field effort. The second field effort involved using a hand auger to collect surface soils at three grids located in television debris pile areas; collecting soil cores from nodes on a grid to investigate a lead-rich ash layer; collecting other soil cores to further investigate carcinogenic polycyclic aromatic hydrocarbon (c-PAH) concentrations in subsurface soils at locations identified during the first field effort; and collecting soil cores to check for the presence of a benzene source upgradient of groundwater monitoring well MWEF-03RK. In addition, further analysis was performed on three soil samples to check for the ability to leach lead from them via the Toxicity Characteristic Leachate Procedure (TCLP).

In order to achieve accurate site representation and distribute unbiased surface soil sample and test trench locations around the site, it was partitioned into 12 approximately equal cells (see Figure 2-1). The cells' dimensions were delineated using a Brunton compass and survey tape. Cell intersections were flagged in the field. Note that test trenches and unbiased surface soil samples are named for the cell from which they were installed or

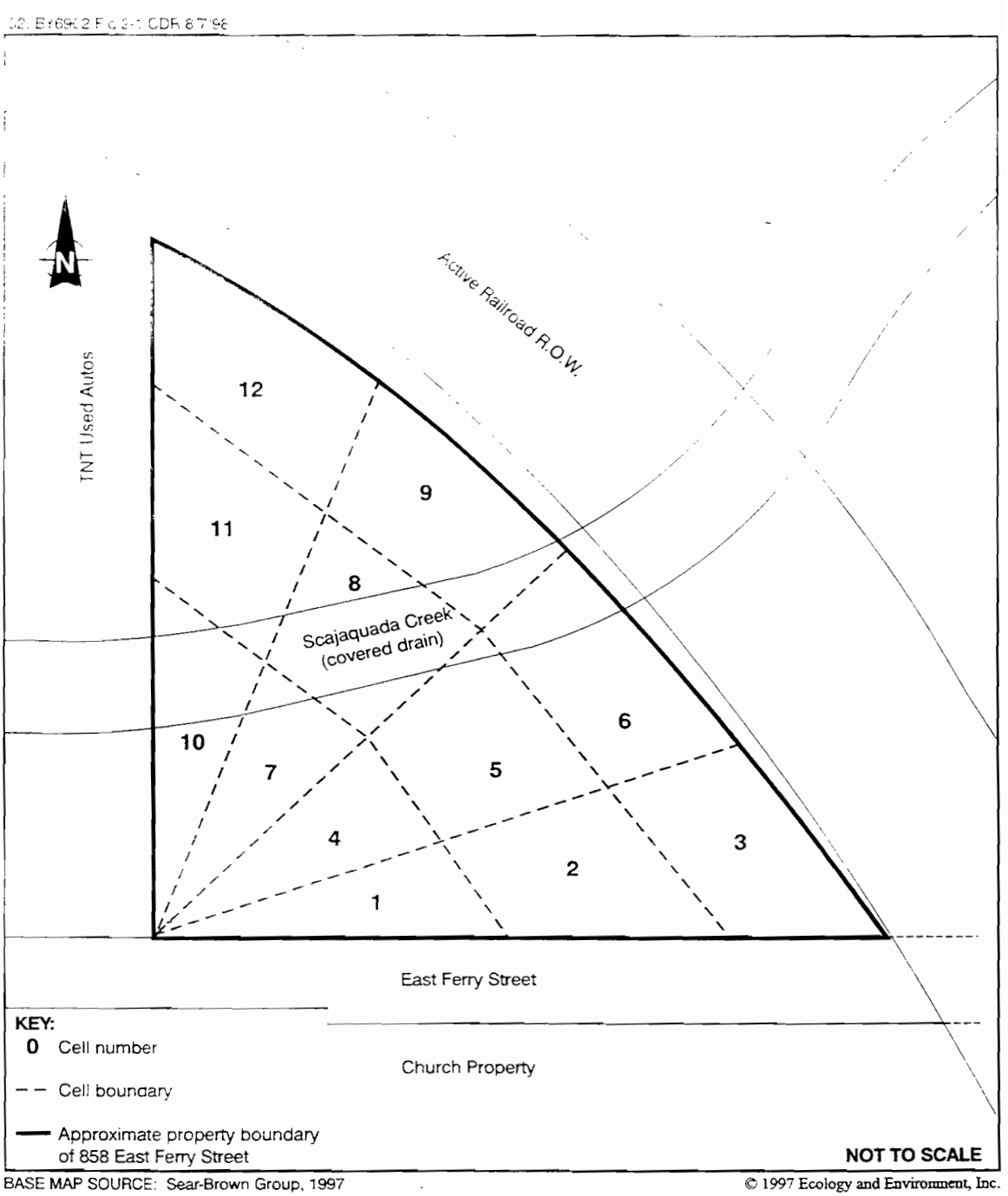

Figure 2-1 SITE SAMPLE CELL LOCATIONS, 858 EAST FERRY STREET BUFFALO, NEW YORK

collected. All sample locations were approved by New York State Department of Environmental Conservation (NYSDEC) oversight personnel prior to sample collection.

2.2 Debris Pile Inventory and Sampling

The purpose of this activity was to characterize the type and determine the volume of debris present to assist in the selection of the most appropriate remedial action. Each debris pile was visually inspected, and the material comprising each pile was inventoried. In addition, the height and diameter of each pile was measured to determine the approximate volume of waste present. Table 2-1 presents the results of the debris pile inventory. For the purposes of this SI, debris pile samples were collected and submitted for asbestos analysis. A New York State Department of Labor Certified Asbestos Inspector analyzed the piles and selected three materials as potential asbestos-containing materials (ACMs). A sample of each was collected and submitted for analysis. Analytical results are discussed in Section 3.2.

2.3 Surface Soil Sampling

Two types of surface soil sampling were conducted: discreet and composite. Sample collection procedures described in the FSP were followed. During the first field investigation effort, 20 surface soil samples were collected from the site: 14 discreet surface soil samples from open areas (SSEF-01 through SSEF-14), and six composite surface soil samples from beneath debris piles (SSEF-15 through SSEF-20). During the second field investigation effort, three sets of soil sampling grids were installed at television debris pile areas. Both surface and subsurface soils were collected from these grid locations, as discussed in Section 2.3.3. Figure 2-2 depicts Phase I surface soil sample locations, and Figure 2-3 depicts sample grid locations. Chemical analytical results of surface soil samples are presented in Section 3.3.

2.3.1 Discreet Surface Soil Sampling

Discreet samples were collected from 12 cells at locations other than the existing debris piles or potential test trench locations. The locations of discreet soil samples were selected based on visual observations and unusual surface conditions, including lack of vegetation or an oil stain. For example, in Cell 5, a television debris pile was found. The surface soil sample from this cell (SSEF-05) was collected at the debris pile. If no unusual circumstances were present, sample locations were selected randomly to achieve an adequate distribution of locations around the site. Due to discolored soils found in Cell 12, two surface soil samples (SSEF-12 and SSEF-13) were collected from this cell. For comparative purposes, a discreet background surface soil sample (SSEF-14) was also collected. A location in the southwest corner

Table 2-1 Debris Pile Inventory, October 2 - October 14, 1997
858 East Ferry Street Site

Debris Type	Occupying Cells	Approximate Dimensions	Approximate Cubic Yards
Metal siding and gravel	3	8' x 4' x 2'	2.4
Televisions	5	6' x 2' x 1'	.5
Televisions	6	26' x 18' x 2'	34.7
Lumber, wood, and vinyl siding	6	46' x 10' x 4'	68.1
Televisions	6	7' x 3' x 2'	1.6
Televisions	6	18' x 3' x 1'	2.0
Gravel, tires, concrete chunks, rocks	5	3' x 4' x 2'	0.9
Two concrete slabs	12	12' x 6' x 3.8'	10.2
Concrete pillar	12	10' x 10' x 8'	29.6
Wood, siding, iron flashing, gutters	6	29' x 10' x 4'	43.0
Asbestos shingles	6	7' x 7' x 3'	5.4
Tires	9	11' x 12' x 4'	19.6
Wood, construction and demolition debris	9	17' x 10' x 4'	25.2
Wood	8	8' x 4'x 6'	7.1
Televisions	8	32' x 6' x 3'	21.3
Wood, construction and demolition debris	8	10' x 8' x 3'	8.9
Tires	9,6	80' x 65' x 4'	770.4
Automobile gasoline tanks	12	15' x 10' x 3'	16.7
Approximate Total Debris Volume			**1,068**

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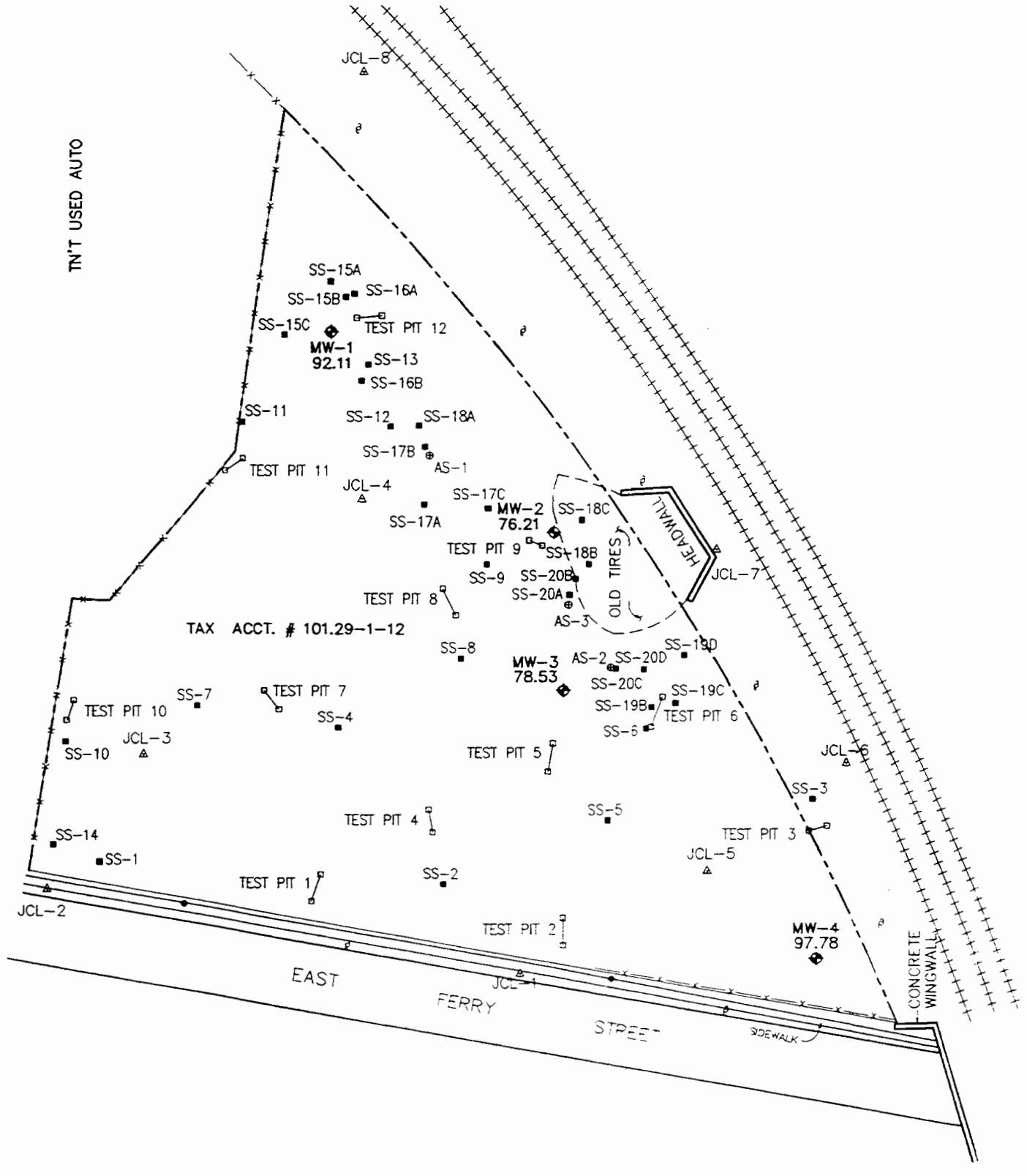

MONITORING WELL CONSTRUCTION DATA:

MONITORING WELL	CASING ELEVATION	PVC RISER ELEVATION	GROUND ELEVATION
MW-1	100.70	100.68	98.19
MW-2	100.72	100.69	98.74
MW-3	101.94	101.86	100.35
MW-4	104.81	104.78	102.77

LEGEND

- ⊕ ASBESTOS SAMPLE
- ▫ TEST PIT
- ◆ MONITORING WELL
- ▪ SOIL SAMPLE
- △ JCL CONTROL POINT
- UTILITY POLE
- MANHOLE
- PROPERTY LINE
- RAILROAD TRACKS
- CHAIN-LINK FENCE

N

SCALE IN FEET

0 80 160 240

NOTE:

HORIZONTAL DATUM IS LOCAL WITH ASSUMED COORDINATES AND MAGNETIC NORTH.

VERTICAL DATUM IS LOCAL WITH THE TOP OF JCL-1 REBAR/CAP ELEVATION = 100.00. NO EXISTING MONUMENTATION WITHIN A 2-MILE RADIUS.

ALL PROPERTY LINES SHOWN ON THIS MAP ARE APPROXIMATELY POSITIONED PER CURRENT TAX MAPS OR EXISTING OCCUPATION.

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FIGURE 2-2 FIRST FIELD EFFORT
SAMPLE LOCATION MAP
858 EAST FERRY STREET
BUFFALO, NEW YORK

BUFF Plotted: 08/07/98 MEH

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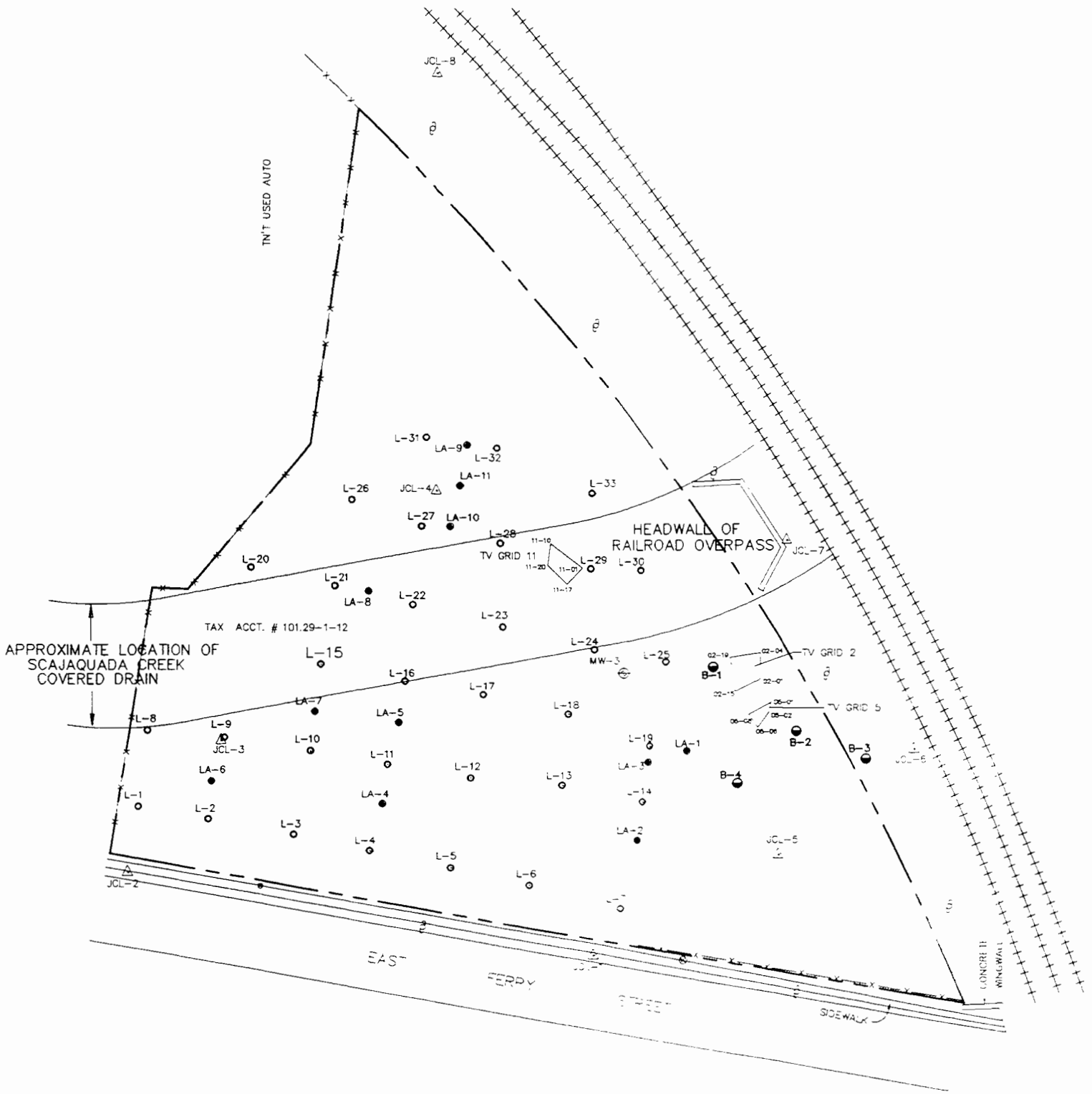

LEGEND

- MONITORING WELL SOIL SAMPLE
- JCL CONTROL POINT
- UTILITY POLE
- MANHOLE
- B-4 BOREHOLE
- L-19 PRIMARY LEAD SAMPLING POINTS
- LA-2 SECONDARY LEAD SAMPLING POINTS
- 11-17 PCB GRID CORNER NODE
- PROPERTY LINE
- RAILROAD TRACKS
- CHAIN-LINK FENCE

N

SCALE IN FEET

0 80 160 240

NOTES:

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4. SCAJAQUADA CREEK DRAIN LOCATION IS APPROXIMATE; FIELD VERIFICATION IS REQUIRED.

Figure 2-3 DIRECT-PUSH SOIL CORE SAMPLE LOCATION MAP
858 EAST FERRY STREET
BUFFALO, NEW YORK

of the site was selected for background sampling based on its distance from potential on-site contaminants, including the ash piles, the railroad ROW, and the junkyard.

2.3.2 Composite Surface Soil Sampling

Composite sampling was conducted on soils collected from beneath debris piles to determine whether debris pile contents may have contributed to surface soil contamination. E & E used a backhoe to bisect debris piles and access the underlying surface soils, as described in the FSP. Several debris pile types were found on site, including used automobile tires, television sets, lumber, and C & D debris. Each composite sample consisted of up to five aliquots; one aliquot was collected from beneath each pile in a group of the same pile type. Sample locations were selected based on the prevalence of material and the ability to access surface soils underlying the debris piles. In addition to the surficial debris, an ash bed ranging up to seven feet in thickness covers most of the northern portion of the site. A composite material of this sample was also collected. Table 2-2 summarizes the composite surface soil sampling locations.

Table 2-2 Composite Surface Soil Summary, 858 East Ferry Street Site

Sample Number	Debris Pile Type	Number of Aliquots	Cell Locations Sampled
SSEF-15-SO100697	Gray ash	3	12
SSEF-16-SO100697	Automobile gasoline tanks	2	12
SSEF-17-SO100697	Wood, roofing debris	2 1	9 8
SSEF-18-SO100697	Automobile tires	2 2	9 6
SSEF-19-SO100697	Televisions	1 3	8 6
SSEF-20-SO100697	Construction and demolition waste	2 2	6 9

2.3.3 Soil Sample Grids in Selected Debris Pile Areas

Polychlorinated biphenyls (PCBs) were detected in composite surface soil sample SSEF-19 (see Section 3.2 for analytical results). Consequently, it was necessary to characterize the soil beneath each of the piles to determine the location of PCBs. Four soil aliquots collected from beneath the piles of televisions comprised this sample and included three aliquots from two piles in Cell 6, and one from a pile in Cell 8. (Note that of the original three piles in Cell 6, two piles had been merged by the backhoe during the initial surface soil sampling beneath debris piles, resulting in a total of two piles in that cell.) Thus, E & E installed one sampling grid at each of these three former television pile locations (see Figure 2-3). Grids were constructed by establishing transects along the length of each pile's footprint. Nodes were installed at 5-foot intervals along each transect, and transects were located five feet from one another. Due to physical obstructions and waste pile dimensions, not all transects were of equal length. Table 2-3 lists the television debris pile numbers and the approximate number of transects and nodes installed.

Table 2-3 Summary of Sample Node Quantities at Debris Pile Grids, 858 East Ferry Street Site

Cell Number	Debris Pile Number	Quantity of Transects	Quantity of Nodes
C-6	TV-2	4	19
C-6	TV-5	3	9
C-8	TV-11	4	20

Immunoassay analytical systems are used as a screening tool to quickly evaluate large quantities of samples. The Ohmicron Rapidassay system was used for this part of the field investigation. Operating the Ohmicron system involves analyzing groups of samples and comparing the resulting data to calibration curves. Accuracy of the data is extremely limited if analyte concentrations exceed the values of the calibration curve endpoints. For the purposes of this investigation, the endpoints were set at 0.5 parts per million (ppm) and 10 ppm. As a quality assurance check, 10% of all field samples were submitted to E & E's Analytical Services Center (ASC) for conventional PCB analysis using Method CLP 95-3.

At each node of each of the three sampling grids, one surface soil sample was collected from the 0- to 2-inch depth interval and analyzed using an immunoassay analysis system. At nodes indicat-

ing that PCBs were present at concentrations greater than 1 ppm, soil was collected from the 6- to 12-inch depth interval and submitted for immunoassay analysis. Results of these analyses are discussed in Section 3.3.3.

2.4 Subsurface Soil Investigation

Subsurface soils were investigated using two methods during the first field effort: test trench installation, and sampling during soil boring installation. Direct-push soil core collection was conducted during the second event of field activities.

Prior to performing the subsurface soil investigation, all excavation, drilling, and direct-push locations were screened for the presence of near-subsurface ferrous obstructions using a magnetic locator wand. In addition, the Underground Facilities Protection Organization marked locations of subsurface utilities present at or near the site. Utilities were determined not to be present in any of the proposed subsurface exploration areas.

2.4.1 Test Trench Installation

E & E installed 12 trenches at the site. Trench locations were selected based on several factors, such as surface observations including areas of visible potential surface contamination, adequate distribution of trench locations about the site, neighboring land uses, and site physical obstructions.

Trenches were installed and sampled as per the methodology presented in the FSP (E & E 1997). Each trench was installed to a depth at least two feet below the depth at which native soil was encountered. Trench depths ranged from 5.8 to 9.8 feet and extended 8 to 12 feet linearly. Based on visual soil observations, one discreet subsurface soil sample was collected from 11 of the 12 trenches. A sample was not collected from trench TTEF-02, as it appeared to contain native soil similar to that present in trenches TTEF-01 and TTEF-03. Table 2-4 lists the test trench installation and sample depth data. Results of subsurface soil sample chemical analyses are presented in Section 3.

2.4.2 Split-Spoon Sampling

For the purposes of installing groundwater monitoring wells, boreholes were installed at four locations during the first phase of field activities. Overburden soils were continuously sampled from grade to bedrock using a split-spoon sampler. Soil samples were scanned with an organic vapor analyzer (OVA) to check for volatile organic contaminant (VOC) presence, and the subsurface geology was logged in the field by the site geologist. Borehole logs are presented in Appendix A.

Table 2-4 Test Trench Summary, 858 East Ferry Street Site

Test Pit Number	Sample Number	Sample Depth (ft BGS)	Approximate Depth of Test Trench (ft BGS)	Observations
TTEF-01	TTEF-01-ASO	0.4 - 0.5	5.8	0' - 0.4': Black silty loam with gravel cobbles to 18 cm. 0.5' - 5.5': Tight, red/tan clay, damp, low plasticity, moderately low cohesion.
TTEF-02	N/A	N/A	7.6	0' - 0.5': Black organic loam. 0.5' - 7.6': Red/tan clay, tight, moderate to low plasticity, dry to damp.
TTEF-03	TTEF-03-ASO	0 - 1	6	0' - 1': Black loam. 1' - 6': Tan/red silty clay, organic.
TTEF-04	TTEF-04-BSO	2.6 - 3.1	6.6	0' - 1.7': Black silty loam, organic. 1.7' - 2.6': Light red silty clay, dry. 2.6' - 3.1': White ash with brick and glass fragments and cinders. 3.1' - 6.6': Tan clay with rounded pebbles, gray mottling, tight.
TTEF-05	TTEF-05-ASO	1 - 2	6.8	0' - 2': Black silty loam, organic, with brick fragments and white clay around bricks. 2' - 6.8': Yellow/tan clay.
TTEF-06	TTEF-06-ASO	0.8 - 1.4	6.5	0' - 0.8': Black silty loam. 0.8' - 1.4': Tan silt with pebbles. 1.4' - 6.5': Red clay with rounded gravel, gray mottling, large rounded boulders (0.4 m long) at 4.1', damp at 5'.
TTEF-07	TTEF-07-ASO	1.8 - 2.1	7	0' - 1.8': Black silty sand, organic. 1.8' - 2.1': Ash, white with limonite staining, vesicular inclusions. 2.1' - 2.6': Tan clay, low plasticity, dry. 2.6' - 7': Yellow/tan clay with rounded inclusions.
TTEF-08	TTEF-08-ASO	0 - 0.6	9.8	0' - 0.6': Black silty loam, organic. 0.6' - 4.4': Tan clay and silt. 4.4' - 9.8': Tan clay, tight, moderately plastic, damp.
TTEF-09	TTEF-09-ASO	1 - 1.4	5.9	0' - 1.4': Black loam, organic, concrete chunks at base. 1.4' - 5.9': Tan/red clay, mottled with gray, rounded pebbles (up to 1.2 cm diameter), damp.
TTEF-10	TTEF-10-ASO	0 - 0.8	8	0' - 0.8': Black loam with gravel, stained. 0.8' - 8': Red/tan clay, dry, crumbly.

Table 2-4 (Cont.)

Test Pit Number	Sample Number	Sample Depth (ft BGS)	Approximate Depth of Test Trench (ft BGS)	Observations
TTEF-11	TTEF-11-DSO	6 - 6.4	7	0' - 1.3': Topsoil. 1.3' - 6.4': Gray incinerator ash containing bottles and ceramic fragments. 6.4' - 7.0': Black clay, highly plastic, cohesive.
TTEF-12	TTEF-11-DSO	6.5 - 7.0	7.5	0' - 1': Brown silty loam. 1' - 4.5': Gray incinerator ash, rust color in places. 4.5' - 7.5': Brown and black silty clay, extremely ductile, plastic. Water enters hole at 6'. (Note: Two concrete slabs were covering pit area.)

Key:

BGS = Below ground surface.
N/A = Not applicable.

A sample portion from the split-spoon sample collected from the 2-to 4-foot depth interval of MWEF-01 was submitted for a suite of geotechnical analyses consisting of grain size analysis, moisture content, and Atterburg limits. A Shelby tube sample was also collected from this same depth interval in soil adjacent to borehole MWEF-02. The Shelby tube soil was submitted for bulk density analysis. Geotechnical analysis results are presented in Section 4.2.

2.4.3 Borehole Coring

Two boreholes, those of MWEF-02 and MWEF-03, were drilled into bedrock. Rock cores from these boreholes were extracted and evaluated by the site geologist. All cores consisted of Onondaga limestone. The upper five feet were found to be more fractured than the lower core sections. Rock quality designations (RQDs) were assigned based on RQD criteria. (As defined by the United States Army Corps of Engineers, RQD is a modified core recovery percentage based on the number of core segments exceeding four inches. It is an indication of core quality and provides an estimate of the valuation of in-situ rock. RQD is reported as a percentage value—the higher the value, the fewer fractures contained in the rock). RQDs of cores ranged from 40 to 69 in the upper 10 feet of rock, and 71 to 82 at depths of 10 to 12 feet below the uppermost rock surface. RQDs below 50 are poor, from 50 to 75 are fair, and RQDs greater than 75 are good. The upper 10-foot RQD values are considered poor to fair, indicating the presence of numerous natural fractures. The 10- to 12-foot depth RQD values are considered fair to good due to the presence of fewer natural fractures.

2.4.4 Direct-push Soil Sampling

Analysis of some surface and subsurface soils collected during the first field effort revealed the presence of lead and total c-PAH concentrations exceeding New York State regulatory criteria. During the second phase of field investigation activities, locations containing contaminants at concentrations of concern were further explored using a truck-mounted soil-coring system with direct-push technology. The system involved pushing a 1¼-inch-diameter steel tube lined with an acetate sleeve into the soil of interest. Once the soil tube had been pushed to the desired depth, the acetate sleeve full of soil was removed and cut open, exposing a soil core. During field activities, each core was scanned with an OVA to measure the presence, if any, of VOCs emitted by the core. Each core was logged by the field geologist, and soil samples were collected from the core at desired depth intervals and submitted for analysis.

Exploration of Lead Areas

Elevated lead concentrations were found in soil samples from several locations. An ash layer present in some parts of the site was believed to be the source of these high lead concentrations. Ash comprises the majority of soil sample TTEF-07-ASO, the sample containing the highest lead concentration. A similar white ash was also present in test trench TTEF-11, while a gray ash was found in TTEF-12. Samples from these trenches contained lead concentrations exceeding 2,500 ppm.

This ash layer was further investigated during the second phase of field activities. To determine the areal and vertical extent of the ash layer, a grid with an internodal spacing of 50 feet was placed over most of the site (see Figure 2-3). (The northern portion of the site had become inaccessible by motor vehicle due to excavations by bottle collectors.) At each location, soil cores were collected by direct-push methods until the depth of native soil was encountered. Each soil core was logged by the project geologist, with close attention given to the depth and thickness of the white ash layers. At each location where ash was encountered, the ash was sampled and archived, and the location was noted on the site map as nodes l-1 through l-34 of Figure 2-3.

To further delineate the extent of the ash layer, core holes were installed halfway between locations where ash was found and locations where it was not found. These locations are labeled LA-1 through LA-10 on Figure 2-3. Once the areal extent of white ash had been determined, ash samples from those cores collected at the perimeter of the ash layer were submitted for total lead analysis. Results of this analysis are discussed in Section 3.

Exploration of PAH Areas

Cleanup guidance criteria set by the New York State Department of Health (NYSDOH) recommend the remediation of soil that contains total PAH concentrations exceeding 10 ppm and/or total c-PAH concentrations exceeding 1 ppm (O'Connor 1997). Data from the first field sampling event indicated the existence of 18 sampling locations throughout the site where PAH concentrations exceeded these NYSDOH criteria. Table 2-5 lists these surface and subsurface soil sampling locations. Note that sample SSEF-14 (the background sample) is included on this list.

In order to establish the vertical distribution of PAH concentrations exceeding the regulatory criteria, soil cores were installed at each of these locations with the exception of SSEF-15, which was inaccessible by vehicle. The second sampling at node SSEF-15 was collected by hand.

At each surface soil sampling location listed in Table 2-5, one soil sample from the 1.5- to 2-foot depth interval was collected and analyzed. Soil samples from the lower six inches of each successive 2-foot depth interval were collected until native soil was encountered. These deeper soil samples were temporarily archived for analysis at a later date if the preceding sample contained a c-PAH concentration that exceeded the regulatory criteria. At each of the four subsurface soil sampling locations listed in Table 2-5, a sample from the lower six inches of the 2- to 4-foot depth interval was collected and submitted for analysis. Native soil was encountered below the four-foot depth in each of these four subsurface soil sample locations.

Table 2-5 Soil Samples Containing Total Carcinogenic PAH Concentrations of 1 ppm or Greater, 858 East Ferry Street Site

Surface Soil Samples	Subsurface Soil Samples
SSEF-01	TTEF-01
SSEF-02	TTEF-05
SSEF-03	TTEF-06
SSEF-04	TTEF-10
SSEF-05	
SSEF-06	
SSEF-07	
SSEF-09	
SSEF-10	
SSEF-11	
SSEF-13	
SSEF-14	
SSEF-15	
SSEF-20	

The analytical approach used for c-PAH analysis of these soil samples was similar to that proposed for PCB analysis of soil samples. An immunoassay system set by the manufacturer to detect total c-PAH concentration in the range of 1 to 10 ppm was used. In addition to the field analysis of samples, 10% of the

samples were submitted to E & E's ASC for conventional PAH analysis using NYSDEC-ASP Method 95-2. Data from these analyses are discussed in Section 3.

Exploration For Benzene Sources

On two separate sampling events, groundwater monitoring well MWEF-03RK yielded groundwater samples containing benzene at concentrations exceeding the New York State regulatory criteria (see Section 3.5 for a complete discussion of analytical findings). The benzene was believed to be from an off-site source, most likely the gasoline spills that occurred in the 900 block of East Ferry Street. To confirm the absence of a benzene source on site, four hydrologically upgradient locations were selected around well MWEF-03RK. Borehole locations are shown on Figure 2-3 and are labeled B-1 through B-4. Cores were extracted from grade to depths of 12 to 14 feet, the lowest depth the direct-push core rig could penetrate. Although it was hoped that bedrock could be reached using the direct-push method, this deeper penetration was not possible due to the tightness of the overburden soils. Extracted cores were scanned with an OVA; however, evidence of a benzene source was not detected. A soil sample from the lowest soil core segment was collected and submitted for benzene analysis.

2.5 Groundwater Investigation

2.5.1 Monitoring Well Installation and Development

During the first event of field investigation activities, one groundwater monitoring well was installed in each of four boreholes to provide groundwater sampling points, and to provide groundwater depth data that was later used to determine the groundwater flow pattern and hydraulic gradient at the site. Subsurface borehole data are discussed below. A cross-section and overall site geology discussion are presented in Section 4.1.

The overburden was penetrated using 4¼-inch hollow-stem augers and was continuously split-spooned, as per the methodology prescribed in the FSP. Once bedrock was encountered in boreholes MWEF-02RK and MWEF-03RK, the drill rig was equipped with coring equipment and the borehole was extended by coring to the desired depth. These two wells were constructed as bedrock groundwater monitoring wells. Groundwater was encountered in the overburden in boreholes MWEF-01OB and MWEF-04OB; thus, these two wells were constructed as overburden wells. All wells were constructed as described in the FSP. Table 2-6 summarizes the groundwater monitoring well construction data.

During installation of MWEF-02OB, concrete was encountered from a depth of 14.3 to 15.8 feet below ground surface (BGS). Continuous rock was subsequently encountered. Judging from the

Table 2-6 Groundwater Monitoring Well Construction Summary, 858 East Ferry Street Site

Well Number	Well Type	Total Depth (feet BGS)	Depth to Bedrock (feet BGS)	Screen Interval (feet BGS)	Ground Elevation[a] (feet)	Well Elevation[a] (feet TOIC)
MWEF-01OB	Overburden	11.5	11.5	3.5 - 11.5	98.19	100.68
MWEF-02RK	Bedrock	26.0	13.1	15.5 - 25.25	98.74	100.69
MWEF-03RK	Bedrock	28.0	15.8	16.5 - 26.5	100.35	101.86
MWEF-04OB	Overburden	19.4	19.4	9.1 - 19.1	102.77	104.78

[a] Based on a site-specific 100-foot datum.

Key:

BGS = Below ground surface.
TOIC = Top of inner casing.

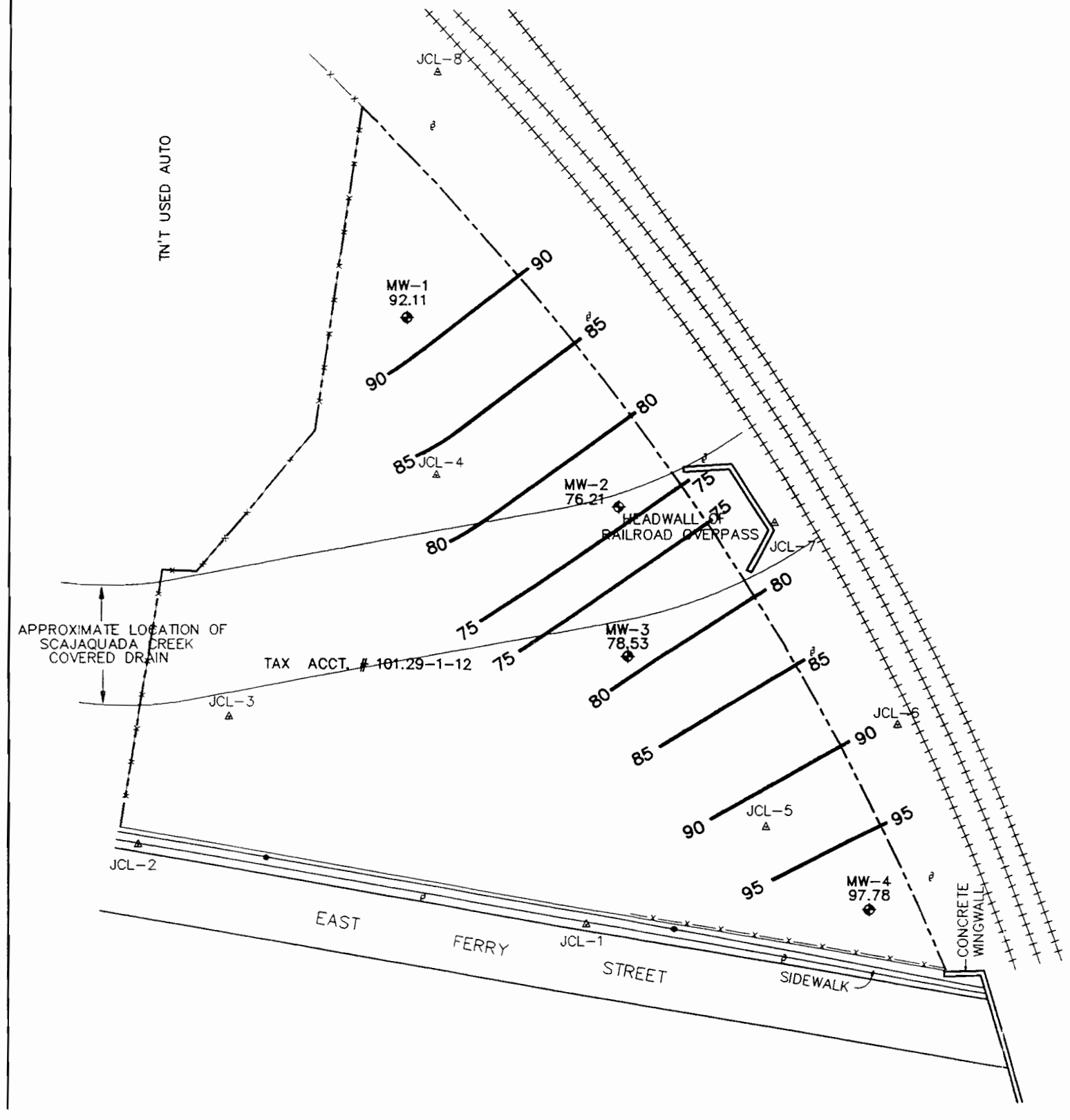
Scajaquada Creek Drain construction drawings, it appears that the northern lip of the culvert support was penetrated. However, this does not affect the integrity of either the well or the drain. Each well was developed after a minimum 24-hour respite period after well installation. Development was performed according to the procedures detailed in the FSP.

The first saturated zone encountered in boreholes MWEF-02RK and MWEF-03RK was found at depths of 21 to 24 feet, and was contained entirely within the Onondaga limestone, a rock unit classified as an unconfined aquifer. This varies from the situation at borehole MWEF-04OB, where water was first encountered at a depth of 17 feet BGS. However, following construction of the well, the water level in the borehole rose to a depth of approximately 3.5 feet BGS before settling to approximately 4.5 feet BGS; thus, the overburden acts as a confining layer in this well. This is the opposite of the situation in the northern part of the site, where water was encountered in the overburden in MWEF-01OB, with no overlying confining layer. Thus, the overburden is classified as an unconfined aquifer.

2.5.2 Groundwater Sampling

After a minimum seven-day respite period following well development, the wells were purged and sampled as per the methodology described in the FSP and QAPjP (E & E 1997).

BY6S017B



MONITORING WELL CONSTRUCTION DATA:

MONITORING WELL	CASING ELEVATION	PVC RISER ELEVATION	GROUND ELEVATION
MW-1	100.70	100.68	98.19
MW-2	100.72	100.69	98.74
MW-3	101.94	101.86	100.35
MW-4	104.81	104.78	102.77

LEGEND

40 ———	GROUNDWATER CONTOUR
78.53	GRADE ELEVATION AT AT MONITORING WELL
△	JCL CONTROL POINT
	UTILITY POLE
•	MANHOLE
◆	MONITORING WELL
— — —	PROPERTY LINE
++++++++++	RAILROAD TRACKS
x—x—x	CHAIN-LINK FENCE

N

SCALE IN FEET

0 80 160 240

NOTES:

1. HORIZONTAL DATUM IS LOCAL WITH ASSUMED COORDINATES AND MAGNETIC NORTH.
2. VERTICAL DATUM IS LOCAL WITH THE TOP OF JCL-1 REBAR/CAP ELEVATION = 100.00. NO EXISTING MONUMENTATION WITHIN A 2-MILE RADIUS.
3. ALL PROPERTY LINES SHOWN ON THIS MAP ARE APPROXIMATELY POSITIONED PER CURRENT TAX MAPS OR EXISTING OCCUPATION.
4. SCAJAQUADA CREEK DRAIN LOCATION IS APPROXIMATE; FIELD VERIFICATION IS REQUIRED.

ecology and environment

Figure 2-4 GROUNDWATER CONTOUR MAP
858 EAST FERRY STREET
BUFFALO, NEW YORK

12/1/98 REB

BUFF PI

Table 2-7 Groundwater Level Data, 858 East Ferry Street Site

Well Number	Ground Elevation[a] (feet)	Groundwater Elevation (feet)[a] (as measured on 10-22-97)	Top of PVC Riser Elevation[a] (feet)
MWEF-01OB	98.19	92.11	100.68
MWEF-02RK	98.74	76.21	100.69
MWEF-03RK	100.35	78.53	101.86
MWEF-04OB	102.77	97.78	104.78

a Based on a site-specific 100-foot datum.

Prior to purging, groundwater level readings were obtained at each well. Table 2-7 presents the groundwater elevation data. Figure 2-4 presents a groundwater contour map of the site based on this groundwater elevation data. This figure indicates that groundwater flows toward the buried Scajaquada drain traversing the middle of the site. Regionally, the drain flows west, then north, resurfacing at Forest Lawn Cemetery before passing through Delaware Park.

Following the purging process, field measurements of temperature, pH, specific conductance, and turbidity were recorded. Table 2-8 presents this field chemistry data. Following purging, groundwater was collected from each monitoring well in accordance with the FSP and QAPjP. In addition to the field samples, quality assurance/quality control (QA/QC) samples including trip blanks, duplicate samples, and a rinsate sample were also collected and submitted for the same analyses as the field samples.

Water from a fire hydrant located approximately 1.5 miles north-northeast of the site (at the corner of Liberty Avenue and Shawnee Street) was used for decontamination of drilling equipment and coring. This water source was used because permission to use this hydrant had already been obtained for concurrent investigations. For comparative purposes, a sample from this water source was also obtained and analyzed for the same parameters as those for which groundwater well samples were analyzed.

Table 2-8 Groundwater Field Chemistry Measurements, 858 East Ferry Street Site

Well Number	pH	Temperature (°F)	Conductivity (µmohs)	Initial Turbidity Following Purging (NTUs)	Turbidity Following Respite Period (NTUs)
MWEF-01OB	6.93	48.8	1,021	>1000	>1000
MWEF-02RK	7.12	52.4	715	132	41
MWEF-03RK	8.62	52.4	805	718	223
MWEF-04OB	7.51	49.2	694	>1000	>1000

Key:

NTU = Nephelometric turbidity units.
µmohs = Micro ohms.

At the time of sampling, all four wells yielded turbidity readings greater than 50 nephelometric turbidity units (NTUs). As a result, a sample to be submitted for metals analysis (according to the FSP and QAPjP) was not collected at that time due to the high turbidity reading. All wells were revisited later, and the turbidity was measured. Three of the four wells (MWEF-01OB, MWEF-03RK, and MWEF-04OB) yielded water exhibiting a turbidity greater than 50 NTUs. Consequently, two volumes for metals analysis were collected from each of these three wells. One volume was submitted for metals analysis as unfiltered, while the second volume was filtered using a 45-micron filter prior to submittal for metals analysis. Groundwater data are presented in Section 3.5.

Due to an elevated benzene concentration found in the sample initially collected from MWEF-03RK (see Section 3.5 for analytical results discussion), this well was resampled approximately five weeks following the first sampling event. Sampling procedures used during the first sample collection effort were again followed. Analytical results of this sample analysis are also discussed in Section 3.5.

2.5.3 Permeability Testing

E & E performed permeability testing on the underlying aquifer by conducting rising head slug tests on all four wells. The purpose of this testing was to determine the hydraulic conductivity of the

bedrock in the immediate vicinity of the well. Permeability test findings are presented in Section 4.3.

2.6 Sample Identification

All samples collected by E & E were identified using a site-specific sample identification number on a label affixed to the sample container. The following sample identification system was used for the project.

Monitoring Well Numbers

MWEF-88XX

where:

MW = Monitoring well designation
EF = East Ferry
88 = Well number
XX = Well type: RK for bedrock well, OB for overburden well.

Groundwater Sample Numbers

MWEF-88XX-WT

where:

MWEF-88XX = Source (well number)
W = Water
T = Sample Type: O = Original
D = Duplicate
F = Filtered
B = Field Blank
T = Trip Blank
R = Rinsate

Surface Soil Sample Number

SSEF-88-ST

where:

SS = Surface soil designation
EF = East Ferry
88 = Surface soil location number
S = Soil
T = Sample type, as above.

Trench Soil Sample Numbers

TTEF-XX-HST

where:

TT = Trench designation
EF = East Ferry
XX = Trench number
H = Depth interval:
- A = 0 - 2 feet
- B = 2 - 4 feet
- C = 4 - 6 feet
- D = 6 - 8 feet

S = Soil
T = Sample type, as above.

Direct-Push Sample Numbers

GPEF-L88-ST

where:

GP = Geoprobe sample
EF = East Ferry Street
L = Lead ash layer survey
88 = Sample number
S = Soil
T = Type, as above.

Grid Sample Numbers

HA-11-99H

where:

HA = Hand auger
11 = Debris pile grid number
99 = Sample number
H = Depth, as above.

2.7 Surveying

In order to produce accurate maps depicting the location of potential contamination as well as for use in developing a site hydrogeologic model, the location of each trench, surface soil sampling point, and well was surveyed. Surveying was conducted according to the specifications stated in the project Work Plan.

3 Field Investigation Results

3.1 Introduction

Each sample matrix was submitted for specific analyses to characterize the site. Debris pile samples were submitted for asbestos analysis. Each of the soil and groundwater samples collected from the East Ferry Street site during the first effort of field activities was submitted for the full Target Compound List (TCL) organic analysis suite, and the Target Analyte List (TAL) inorganic analyte suite. TCL analysis is comprised of three groups of compounds: volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and polychlorinated biphenyl (PCB) and pesticide analysis. TAL analysis consists of analyzing for 23 metals and total cyanide. The results of the analyses for the samples collected at the site are summarized below. Samples collected during the second event of fieldwork were analyzed either by an immunoassay system, or by conventional methods in the laboratory. Laboratory analysis consisted of selected TCL and TAL analyses, as well as the TCLP analysis, which was performed to determine lead leachability. A risk evaluation of the data is presented in Section 5. Much of the risk evaluation is based on c-PAH concentration. Thus some of the immunoassay system analyses investigated c-PAH concentrations in site soils. C-PAHs are discussed further in Section 3.4.3.

Sample analysis in the laboratory was conducted as per New York State Analytical Services Protocol (NYSDEC ASP). All resulting data was reviewed by quality assurance specialists. The laboratory reports utilize the USEPA data qualifiers for data reporting. The data validation uses a different set of qualifiers: the USEPA's National Functional Guidelines for validation. These data validation qualifiers are discussed in other sections of this report. Data review forms and reports are presented in Appendix B.

Analyte concentrations that were not detected are listed as "ND" in the data summary tables in this section. Concentrations listed with no qualifier are accepted as real values; however, much of the reported concentration data is qualified due to conditions associated with the data. Qualifiers are listed along with the reported values in the summary tables presented later in this report. Addi-

tional qualifier details are discussed in the Quality Assurance Project Plan included in the work plan (E & E 1997).

Several samples contained analytes at concentrations greater than what could be accurately quantified without diluting the sample. In order to properly analyze such a sample, the sample is diluted. While this procedure allows for proper analysis of high-concentration analytes, it also has the effect of raising the detection limit.

In those cases where an analyte concentration value can only be estimated, it is qualified with a "J." Similarly, when an elevated detection limit results from a dilution, and the detection limit itself is estimated, the value is qualified as "UJ."

Quality control samples including trip blanks and laboratory blanks were included in the analysis of the field samples. Blanks are used to determine whether other sources of an analyte besides the sample matrix exist. Analytes qualified with a "B" were present at a concentration less than ten times the concentration detected in the blank for the common laboratory contaminants (acetone, MEK, methylene chloride, toluene, and phthalate esters). For all other analytes, a factor of five was used in application of the "B" flag. For the purposes of this report, analytes qualified with a "B" are not considered present at significant quantities and thus are not discussed. Trip blanks did not show contamination unless associated with laboratory contamination. The results are flagged "U" and considered not-detect.

3.2 Debris Pile Sampling

Three debris pile samples (numbered DPEF-01 through DPEF-03) suspected of containing asbestos were collected and submitted for polarized light microscopy (PLM) analysis. As shown in Table 3-1, no asbestos was detected in any of the samples as a result of PLM analysis. However, two of the samples (DPEF-02 and DPEF-03) were roofing material containing organic binders that impede the PLM process. New York State regulations require that samples containing organic binders be analyzed by transmission electron microscopy (TEM) analysis in order to definitively be classified as ACM or non-ACM. The results of the TEM analysis performed on these two samples revealed that there was no asbestos present in debris sample DPEF-02, and only a trace amount of chrysotile (an asbestos mineral) in debris sample DPEF-03 (see Table 3-1). The trace amount of chrysotile present is insufficient for the material to be classified as ACM under New York State and EPA regulations. Therefore, asbestos remediation is not necessary for this debris pile.

Table 3-1 Asbestos Sample Analysis Summary, 858 East Ferry Street Site

Sample Number	Sample Matrix	Cell Location	PLM Analysis Results	TEM Analysis Results
DPEF-01-A0101497	Beige ceiling tile	8	No asbestos detected	Not submitted
DPEF-02-A0101497	Black roofing shingles	6	No asbestos detected	No asbestos detected
DPEF-03-A0101497	Black roofing material	9	No asbestos detected	Trace <1% chrysotile

In addition to the debris piles containing potential ACMs, the New York State Certified Asbestos Inspector conducting the sampling identified one debris pile located in Cell 6 as containing approximately three cubic yards of transite siding. New York State Law classifies transite as an "assumed ACM." Therefore, its disposal must be conducted according to New York State procedures prescribed for ACMs.

3.3 Surface Soil Investigation

As discussed in Section 2, both discreet and composite surface soil samples were collected during the first field effort. The results of the organic and inorganic sample analyses are presented in Tables 3-2 and 3-3, respectively.

3.3.1 Discreet Surface Soil Sampling

The VOC acetone was found in 12 of the 14 discreet soil samples collected (SSEF-01 through SSEF-14); however, it was also present in the blank samples associated with all the samples. Thus, its presence is considered insignificant. Three other VOCs were detected: total 1,2-dichloroethene, at an estimated concentration of 3 parts per billion (ppb); trichloroethene, at a concentration of 3 ppb in Sample SSEF-07; and toluene, at an estimated concentration of 2 ppb in Sample SSEF-03. Numerous SVOCs were detected in all of the samples, most of which were PAHs (see Table 3-2). Dibenzofuran, carbazole, and several phthalates were also detected in several samples. Phthalates are plasticizers and present in gloves and bags used in the sampling and analysis processes. Thus, they are regarded as common laboratory and field contaminants and do not pose a concern.

Pesticides were detected in nine of the samples; the most common were heptachlor epoxide, DDE, and endrin ketone. Twenty of the

Table 3-2 Organic Compounds Detected in Surface Soil Samples, October 2, 1997
858 East Ferry Street Site (µg/kg)

Compound	SSEF-01-SO	SSEF-02-SO	SSEF-03-SO	SSEF-04-SO	SSEF-05-SO	SSEF-06-SO	SSEF-06-SD
Volatiles							
Acetone	12 B	12 B	17 B	14 B	12 B	13 B	13 B
Total 1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	17 UJ	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	17 UJ	ND	ND	ND	ND
Vinyl Acetate	ND	ND	17 UJ	ND	ND	ND	ND
Bromodichloromethane	ND	ND	17 UJ	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	17 UJ	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	17 UJ	ND	ND	ND	ND
Trichloroethene	ND	ND	17 UJ	ND	ND	ND	ND
Dibromochloromethane	ND	ND	17 UJ	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	17 UJ	ND	ND	ND	ND
Benzene	ND	ND	17 UJ	ND	ND	ND	ND
Trans-1,3-Dichloropropene	ND	ND	17 UJ	ND	ND	ND	ND
Bromoform	ND	ND	17 UJ	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	17 UJ	ND	ND	ND	ND
2-Hexanone	ND	ND	17 UJ	ND	ND	ND	ND
Tetrachloroethene	ND	ND	17 UJ	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	17 UJ	ND	ND	ND	ND
Toluene	ND	ND	2 J	ND	ND	ND	ND
Chlorobenzene	ND	ND	17 UJ	ND	ND	ND	ND

Key at end of table.

Table 3-2 (Cont.)

Compound	SSEF-01-SO	SSEF-02-SO	SSEF-03-SO	SSEF-04-SO	SSEF-05-SO	SSEF-06-SO	SSEF-06-SD
Ethylbenzene	ND	ND	17 UJ	ND	ND	ND	ND
Styrene	ND	ND	17 UJ	ND	ND	ND	ND
Total xylenes	ND	ND	17 UJ	ND	ND	ND	ND
Semivolatiles							
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	120 J	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	150 J	280 J	ND	ND	ND	ND
Acenaphthylene	120 J	170 J	1,600 J	ND	ND	ND	ND
Acenaphthene	86 J	650 J	430 J	ND	ND	ND	ND
Dibenzofuran	ND	510 J	380 J	ND	ND	ND	ND
Fluorene	110 J	1,200	1,300 J	ND	ND	ND	ND
Phenanthrene	1,800	9,700 DJ	11,000	410 J	330 J	1,200 J	250 J
Anthracene	520 J	1,400	2,800	66 J	51 J	210 J	ND
Carbazole	110 J	970	370 J	49 J	ND	260 J	ND
Di-n-butylphthalate	ND	ND	ND	ND	150 J	800 J	55 J
Fluoranthene	4,800	10,000 DJ	17,000 DJ	680	690	2,200 J	550 J
Pyrene	5,500 DJ	15,000 DJ	20,000 DJ	700	980	3,000 J	890 J
Butylbenzylphthalate	ND	780 UJ	2,700 UJ	ND	57 J	100 J	73 J
3.3'-Dichlorobenzidine	ND	780 UJ	2,700 UJ	ND	ND	ND	ND
Benzo(a)anthracene	4,900	5,900 DJ	18,000 J	360 J	560	1,600 J	550 J

Key at end of table.

Table 3-2 (Cont.)

Compound	SSEF-01-SO	SSEF-02-SO	SSEF-03-SO	SSEF-04-SO	SSEF-05-SO	SSEF-06-SO	SSEF-06-SD
Chrysene	4,500	7,200 DJ	17,000 J	420 J	640	1,800 J	620 J
bis(2-Ethylhexyl)phthalate	ND	780 UJ	2,700 UJ	120 J	280 J	830 J	280 J
Di-n-octylphthalate	820 UJ	780 UJ	2,700 UJ	ND	ND	ND	ND
Benzo(b)fluoranthene	5,100 J	4,500 DJ	17,000 DJ	380 J	560	1,700 J	500 J
Benzo(k)fluroanthene	3,600 J	4,700 J	2,700 UJ	240 J	290 J	1,300 J	250 J
Benzo(a)pyrene	5,100 J	5,100 DJ	19,000 J	330 J	490 J	1,500 J	500 J
Indeno(1,2,3-cd)pyrene	2,700 J	4,900 J	12,000 J	270 J	420 J	920 J	410 J
Dibenz(a,h)anthracene	1,000 J	2,400 J	6,100 J	92 J	230 J	470 J	250 J
Benzo(g,h,i)perylene	3,100 J	5,100 J	11,000 J	280 J	510 J	940	450 J
Pesticides							
alpha-BHC	ND	ND	57 UJ	ND	ND	ND	ND
beta-BHC	ND	ND	57 UJ	ND	ND	ND	ND
delta-BHC	ND	ND	57 UJ	ND	ND	ND	ND
gamma-BHC	ND	ND	57 UJ	ND	ND	ND	ND
Heptachlor	ND	ND	57 UJ	ND	ND	ND	ND
Aldrin	ND	ND	57 UJ	4 J	10 J	ND	ND
Heptachlor Epoxide	ND	ND	57 UJ	ND	ND	24 J	13 J
Endosulfan I	ND	ND	57 UJ	ND	ND	ND	ND
Dieldrin	ND	ND	110 UJ	ND	4 J	ND	ND
4,4'-DDE	38 J	ND	110 UJ	5 J	24	ND	ND

K- nd of table.

Table 3-2 (Cont.)

Compound	SSEF-01-SO	SSEF-02-SO	SSEF-03-SO	SSEF-04-SO	SSEF-05-SO	SSEF-06-SO	SSEF-06-SD
Endrin	13 J	ND	110 UJ	6	4 J	ND	ND
Endosulfan II	ND	ND	110 UJ	ND	ND	ND	ND
4,4'-DDD	ND	ND	110 UJ	ND	5 J	ND	ND
Endosulfan Sulfate	ND	ND	110 UJ	ND	ND	ND	ND
4,4'-DDT	ND	20 J	110 UJ	ND	ND	ND	ND
Methoxychlor	ND	ND	570 UJ	ND	21 J	ND	ND
Endrin Ketone	28 J	38 J	150 DJ	ND	16 J	ND	ND
Endrin Aldehyde	ND	ND	110 UJ	ND	ND	ND	ND
alpha-Chlordane	ND	ND	57 UJ	ND	ND	ND	ND
gamma-Chlordane	ND	ND	57 UJ	ND	ND	ND	ND
Toxaphene	ND	ND	5,700 UJ	ND	ND	ND	ND
Aroclor 1016	ND	ND	1,100 UJ	ND	ND	ND	ND
Aroclor 1221	ND	ND	2,200 UJ	ND	ND	ND	ND
Aroclor 1232	ND	ND	1,100 UJ	ND	ND	ND	ND
Aroclor 1242	ND	ND	1,100 UJ	ND	ND	ND	ND
Aroclor 1248	ND	ND	1,100 UJ	ND	ND	ND	ND
Aroclor 1254	ND	ND	1,100 UJ	ND	ND	ND	ND
Aroclor 1260	ND	ND	1,100 UJ	ND	ND	ND	ND

Key at end of table.

Table 3-2 (Cont.)

Compound	SSEF-07-SO	SSEF-08-SO	SSEF-09-SO	SSEF-10-SO	SSEF-11-SO	SSEF-12-SO	SSEF-13-SO
Volatiles							
Acetone	ND	14 B	13 B	ND	19 B	15 B	13 B
Total 1,2-Dichloroethene	3 J	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	13 UJ	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	13 UJ	ND	ND	ND	ND	ND	ND
Vinyl Acetate	13 UJ	ND	ND	ND	ND	ND	ND
Bromodichloromethane	13 UJ	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	13 UJ	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	13 UJ	ND	ND	ND	ND	ND	ND
Trichloroethene	3	ND	ND	ND	ND	ND	ND
Dibromochloromethane	13 UJ	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	13 UJ	ND	ND	ND	ND	ND	ND
Benzene	13 UJ	ND	ND	ND	ND	ND	ND
Trans-1,3-Dichloropropene	13 UJ	ND	ND	ND	ND	ND	ND
Bromoform	13 UJ	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	13 UJ	ND	ND	ND	ND	ND	ND
2-Hexanone	13 UJ	ND	ND	ND	ND	ND	ND
Tetrachloroethene	13 UJ	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	13 UJ	ND	ND	ND	ND	ND	ND
Toluene	13 UJ	ND	ND	ND	ND	ND	ND
Chlorobenzene	13 UJ	ND	ND	ND	ND	ND	ND

K- ·d of table.

Table 3-2 (Cont.)

Compound	SSEF-07-SO	SSEF-08-SO	SSEF-09-SO	SSEF-10-SO	SSEF-11-SO	SSEF-12-SO	SSEF-13-SO
Ethylbenzene	13 UJ	ND	ND	ND	ND	ND	ND
Styrene	13 UJ	ND	ND	ND	ND	ND	ND
Total xylenes	13 UJ	ND	ND	ND	ND	ND	ND
Semivolatiles							
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	1,200	690	ND	57 J
2-Methylnaphthalene	ND	ND	ND	470	120 J	ND	53 J
Acenaphthylene	ND	ND	ND	69 J	ND	ND	ND
Acenaphthene	ND	ND	ND	1,200	350 J	ND	110 J
Dibenzofuran	ND	ND	ND	970	360 J	ND	78 J
Fluorene	51 J	ND	ND	1,300	420 J	ND	150 J
Phenanthrene	580	320 J	280 J	10,000	6,500	350 J	1,300
Anthracene	110 J	50 J	50 J	1,800	600 J	65 J	ND
Carbazole	72 J	ND	ND	1,300	680	54 J	110 J
Di-n-butylphthalate	64 J	60 J	ND	240 J	200 J	110 J	1,100
Fluoranthene	1,000	490	480	7,800	7,200	530	1,000
Pyrene	1,100	520	560	12,000 J	11,000 J	730	2,200 J
Butylbenzylphthalate	ND	50 J	56 J	180 J	220 J	ND	450 J
3.3'-Dichlorobenzidine	ND	ND	ND	450 UJ	610 UJ	ND	430 UJ
Benzo(a)anthracene	650	290 J	280 J	4,700 J	4,000 J	340 J	1,200 J
Chrysene	690	350 J	310 J	5,100 J	4,400 J	380 J	430 UJ

Key at end of table.

Table 3-2 (Cont.)

Compound	SSEF-07-SO	SSEF-08-SO	SSEF-09-SO	SSEF-10-SO	SSEF-11-SO	SSEF-12-SO	SSEF-13-SO
bis(2-Ethylhexyl)phthalate	200 J	210 J	390 J	13,000 J	530 J	490 B	86,000 J
Di-n-octylphthalate	ND	ND	ND	450 UJ	610 UJ	ND	430 UJ
Benzo(b)fluoranthene	910	290 J	400 J	3,700 J	4,400 J	560	580 J
Benzo(k)fluroanthene	ND	180 J	ND	450 UJ	2,600 J	ND	440 J
Benzo(a)pyrene	490	230 J	240 J	3,600 J	3,100 J	320 J	550 J
Indeno(1,2,3-cd)pyrene	430 J	220 J	220 J	2,300 J	2,200 J	210 J	390 J
Dibenz(a,h)anthracene	250 J	130 J	120 J	1,100 J	890 J	130 J	200 J
Benzo(g,h,i)perylene	490 J	260 J	230 J	2,600 J	2,000 J	270 J	410 J
Pesticides							
alpha-BHC	ND	ND	ND	ND	ND	ND	ND
beta-BHC	ND	ND	ND	ND	ND	ND	ND
delta-BHC	ND	ND	ND	ND	ND	ND	ND
gamma-BHC	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	16	ND	ND	ND	ND	ND	36
Endosulfan I	ND	ND	ND	ND	ND	ND	ND
Dieldrin	ND	ND	ND	ND	ND	ND	26
4,4'-DDE	ND	ND	ND	350	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	ND	ND	ND	ND	ND	ND	ND

Ke· ·nd of table.

Table 3-2 (Cont.)

Compound	SSEF-07-SO	SSEF-08-SO	SSEF-09-SO	SSEF-10-SO	SSEF-11-SO	SSEF-12-SO	SSEF-13-SO
4,4'-DDD	ND	ND	ND	29 J	ND	ND	ND
Endosulfan Sulfate	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	ND	ND	ND	340	ND	ND	ND
Methoxychlor	ND	ND	ND	ND	ND	ND	ND
Endrin Ketone	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	ND	ND	ND	ND	ND	ND	ND
alpha-Chlordane	ND	ND	ND	ND	ND	ND	ND
gamma-Chlordane	ND	ND	ND	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	ND	ND	ND	ND	ND	ND	ND

Key at end of table.

Table 3-2 (Cont.)

Compound	SSEF-14-SO[a]	SSEF-15-SO	SSEF-16-SO	SSEF-17-SO	SSEF-18-SO	SSEF-19-SO	SSEF-20-SO
Volatiles							
Acetone	15 B	12 B	12 B	ND	13 B	12 B	5 BJ
Total 1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND
Vinyl Acetate	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND

Key: nd of table.

Table 3-2 (Cont.)

Compound	SSEF-14-SO[a]	SSEF-15-SO	SSEF-16-SO	SSEF-17-SO	SSEF-18-SO	SSEF-19-SO	SSEF-20-SO
Toluene	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND
Total xylenes	ND	ND	ND	ND	ND	ND	ND
Semivolatiles							
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	42 J	ND
Naphthalene	92 J	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND	51 J
Acenaphthene	180 J	ND	ND	ND	ND	ND	ND
Dibenzofuran	140 J	ND	ND	ND	ND	ND	ND
Fluorene	220 J	46 J	ND	50 J	ND	ND	74 J
Phenanthrene	2,400	500	88 J	510	250 J	220 J	660
Anthracene	720 J	100 J	ND	120 J	58 J	ND	150 J
Carbazole	240 J	150 J	ND	110 J	63 J	ND	160 J
Di-n-butylphthalate	90 J	67 J	47 J	130 J	91 J	ND	58 J
Fluoranthene	3,700	720	110 J	800	450	340 J	750
Pyrene	5,500	710 J	170 J	910 J	420 J	560 J	940 J

Key at end of table.

Table 3-2 (Cont.)

Compound	SSEF-14-SO[a]	SSEF-15-SO	SSEF-16-SO	SSEF-17-SO	SSEF-18-SO	SSEF-19-SO	SSEF-20-SO
Butylbenzylphthalate	600 J	ND	380 UJ	940	ND	ND	ND
3.3'-Dichlorobenzidine	ND	ND	380 UJ	ND	ND	ND	ND
Benzo(a)anthracene	2,400	380 J	96 J	480	230 J	220 J	470
Chrysene	2,500	410	83 J	500	260 J	240 J	490
bis(2-Ethylhexyl)phthalate	1,800	100 J	82 J	230 J	81 J	290 J	100 J
Di-n-octylphthalate	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	3,500	620	130 J	760	380 J	390	730
Benzo(k)fluroanthene	ND	ND	80 J	ND	ND	ND	ND
Benzo(a)pyrene	2,100	74 J	100 J	99 J	230 J	230 J	420
Indeno(1,2,3-cd)pyrene	1,200	290 J	130 J	350 J	200 J	190 J	360 J
Dibenz(a,h)anthracene	640 J	140 J	49 J	180 J	99 J	69 J	170 J
Benzo(g,h,i)perylene	1,200	310 J	140 J	380 J	210 J	210 J	380 J
Pesticides							
alpha-BHC	ND	ND	ND	ND	ND	ND	ND
beta-BHC	ND	ND	ND	ND	ND	ND	ND
delta-BHC	ND	ND	ND	ND	ND	ND	ND
gamma-BHC	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND	ND	ND	ND
Aldrin	11 J	ND	ND	ND	ND	ND	5 J
Heptachlor Epoxide	120	ND	5	22	15	ND	29

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Table 3-2 (Cont.)

Compound	SSEF-14-SO[a]	SSEF-15-SO	SSEF-16-SO	SSEF-17-SO	SSEF-18-SO	SSEF-19-SO	SSEF-20-SO
Endosulfan I	ND	ND	ND	ND	ND	ND	ND
Dieldrin	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	37 J	ND	ND	97	ND	ND	14
Methoxychlor	ND	ND	ND	ND	ND	ND	ND
Endrin Ketone	28 J	ND	ND	ND	ND	ND	9.6
Endrin Aldehyde	ND	ND	ND	ND	ND	ND	ND
alpha-Chlordane	ND	ND	ND	ND	ND	ND	ND
gamma-Chlordane	ND	ND	ND	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	ND	ND	ND	ND	ND	ND	ND

Key at end of table.

Table 3-2 (Cont.)

Compound	SSEF-14-SO[a]	SSEF-15-SO	SSEF-16-SO	SSEF-17-SO	SSEF-18-SO	SSEF-19-SO	SSEF-20-SO
Aroclor 1248	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	ND	ND	ND	ND	ND	43,000 D	ND

[a] Background sample.

Key:

ND = Not detected.
J = Reported value is estimated.
D = Result from dilution analysis.
B = Also present in blank sample.
U = Analyte was not detected; value reported is the quantitation limit.

Table 3-3 Inorganic Analytes Detected in Surface Soil Samples (October 2-6, 1997)
858 East Ferry Street Site (mg/kg)

Analyte	Sample Number						
	SSEF-01-SO	SSEF-02-SO	SSEF-03-SO	SSEF-04-SO	SSEF-05-SO	SSEF-06-SO	SSEF-06-SD
Aluminum	6,820	10100	11,300	9,420	11,500	6,620	9,280
Antimony	5.8 J	4.6 J	13.4 J	6.8 J	11 J	3.9 J	5.7 J
Arsenic	10.3	6	18.3	7.2	9.7	5.5	6.7
Barium	100	114	169	91.6	144	56.2	73.4
Beryllium	0.52 J	0.52 J	0.73 J	0.79 J	0.62 J	0.38 J	0.48 J
Cadmium	0.63	1.1 J	2.8 J	1.1 J	11.5 J	0.46 J	0.63 J
Calcium	92,500	113,000	13,600	50,600	48,700	124,000	99,200
Chromium	14.1	21.1	34.6	21.5	29.6	13.1	17.9
Cobalt	5.1 J	6.1 J	10.8 J	11.7 J	9.3 J	5.5 J	8 J
Copper	46.6	39.9	396	53.0	94.2	26.6	33.2
Iron	13,300	20,400	27,300	20,700	23,100	13,000	17,100
Lead	469	220	718	267	469	159	200
Magnesium	18,600	25,000	5,660	28,300	20,600	46,800	36,800
Manganese	314	340	493	288	487	344	399
Mercury	0.29	0.32	0.45	0.35	0.45	0.25	0.31
Nickel	14.4	16.5	34.7	29.9	29	14.2	19.2
Potassium	1,580	2,290	2,300	2,650	2,790	1,700	2,860
Selenium	1.2 U	1.1 U	6.6	2	2.9	1.2 U	1.2 U
Silver	0.54 U	0.5 U	0.71 U	0.59 U	0.53 U	0.57 U	0.57 U
Sodium	207 U	192 U	270 U	226 U	202 U	217 U	216 U

Key at end of table.

Table 3-3 (Cont.)

Analyte	Sample Number						
	SSEF-01-SO	SSEF-02-SO	SSEF-03-SO	SSEF-04-SO	SSEF-05-SO	SSEF-06-SO	SSEF-06-SD
Thallium	0.91 U	0.85 U	1.2 U	0.99 U	0.89 U	0.96 U	0.95 U
Vanadium	19.2	24.5	32.5	23.6	31.4	17.5	24
Zinc	270	290	475	478	383	172	206
Cyanide	0.62 U	0.59 U	0.83 U	0.68 U	0.61 U	0.66 U	0.66 U

Key at end of table.

Table 3-3 (Cont.)

Analyte	Sample Number						
	SSEF-07-SO	SSEF-08-SO	SSEF-09-SO	SSEF-10-SO	SSEF-11-SO	SSEF-12-SO	SSEF-13-SO
Aluminum	13,800	5,370	8,320	7,550	8,190	7,550	9,520
Antimony	11.7 J	3.2 J	2 J	33 J	52.6 J	20.2 J	35.8 J
Arsenic	7.6	6.3	5.2	13.2	16.5	12.3	12.5
Barium	144	47.2 J	60.8	92.1	436	188	137
Beryllium	0.66 J	0.33 J	0.4 J	0.48 J	0.55 J	0.73 J	0.53 J
Cadmium	0.86 J	0.35 J	0.31 J	2.6	5.9	0.03 U	0.03 J
Calcium	62,000	156,000	46,000	25,400	23,400	19,600	34,500
Chromium	22.4	14.1	12.8	19.6	35	15	17.7
Cobalt	8.5 J	5 J	4.9 J	7.7 J	9 J	9.7 J	7.4 J
Copper	52.8	20.9	19.9	155	213	71.9	73.2
Iron	21,800	13,700	14,100	29,000	25,000	13,200	27,400
Lead	725	149	76.3	1,390 J	5,290 J	2,550 J	2,820 J
Magnesium	30,100	77,300	19,900	8,950 J	3,610 J	7,350 J	11,600 J
Manganese	499	246	345	428	491	314	401
Mercury	0.5	0.21	0.13	0.7	1.4	0.5	0.73
Nickel	20.7	13.9	12.9	29.7	36.9	23.1	21.9
Potassium	2,950	2,010	2,230	1,290 J	1,620 J	1,350 J	1,620
Selenium	1.2 U	1.3 U	1.1 U	6.4 J	7.2 J	3.3 J	3.7 J
Silver	0.55 U	0.59 U	0.54 U	0.59 U	0.8 U	0.63 U	0.58 U
Sodium	211 U	225 U	206 U	225 U	346 J	242 U	220 U

Key at end of table.

Table 3-3 (Cont.)

Analyte	Sample Number						
	SSEF-07-SO	SSEF-08-SO	SSEF-09-SO	SSEF-10-SO	SSEF-11-SO	SSEF-12-SO	SSEF-13-SO
Thallium	0.93 U	0.99 U	0.91 U	0.99 U	1.4 U	1.1 U	0.97 U
Vanadium	32.5	16	21.7	22.3	43.4	33.1	25.6
Zinc	310	82.2	132	1,230	2,680	295	428
Cyanide	0.65 U	0.69 U	0.64 U	0.68 UJ	1.3 J	1.4 J	0.66 UJ

Key at end of table.

Table 3-3 (Cont.)

Analyte	Sample Number						
	SSEF-14-SO[a]	SSEF-15-SO	SSEF-16-SO	SSEF-17-BSO	SSEF-18-SO	SSEF-19-SO	SSEF-20-SO
Aluminum	7,230	10,500 J	6,610 J	7,240 J	8,070 J	4,160 J	6,530 J
Antimony	5.5 J	11.7 J	3.2 J	2.9 J	3.3 J	1.9 J	1.6 J
Arsenic	5.6	11.7 J	12.5 J	7 J	12.9 J	8 J	6 J
Barium	65.3	413 J	127 J	11.7 J	136 J	51.5 J	72.6 J
Beryllium	0.37 J	0.49 B	0.57 B	0.49 B	0.53 B	0.31 B	0.42 J
Cadmium	0.03 U	0.73 J	0.03 U	0.18 J	0.22 J	5.7 J	0.11 J
Calcium	49,200	37,000	24,100	39,800	44,300	87,600	60,600
Chromium	14.8	15.3 J	14 J	17.4 J	16.4 J	11.1 J	15.3 J
Cobalt	5.9 J	3.6 J	5.6 J	4.9 J	5.6 J	2.9 J	4.9 J
Copper	50.2	60.2 J	62.2 J	61.2 J	63 J	26.5 J	30.5 J
Iron	13,900	8,500 J	14,500 J	12,400 J	13,400 J	9,230 J	11,400 J
Lead	248 J	11,500	832	1,780	2,160	364	647
Magnesium	19,800 J	13,300	8,070	15,400	15,600	17,400	23,900
Manganese	330	198	301	346	357	218	334
Mercury	0.33	0.61	0.85	0.61	0.72	0.17	0.27
Nickel	15.2	25.8 J	17.3 J	18.9 J	21.2 J	14 J	18.4 J
Potassium	1,670	1,320 J	1,050 J	1,460 J	1,820 J	1,090 J	1,790 J
Selenium	1.8 J	1.2 U	2.7	2	1.2 U	1.1 U	1.1 U
Silver	0.52 U	0.55 UR	0.51 UR	0.57 UR	0.57 UR	0.51 UR	0.51 UR

Key at end of table.

Table 3-3 (Cont.)

Analyte	Sample Number						
	SSEF-14-SO[a]	SSEF-15-SO	SSEF-16-SO	SSEF-17-BSO	SSEF-18-SO	SSEF-19-SO	SSEF-20-SO
Sodium	197 U	627 B	269 B	263 B	282 B	234 B	248 B
Thallium	0.87 U	0.92 J	0.86 J	0.96 UJ	0.96 UJ	0.86 UJ	0.86 U
Vanadium	18.6	34.9 J	30.2 J	19.8 J	20.7 J	10.4 BJ	14.8 J
Zinc	191	1,170 J	320 J	347 J	360 J	182 J	181 J
Cyanide	0.61 UJ	0.62 U	0.58 U	0.65 U	0.65 U	0.58 U	0.58 U

[a] Background sample.

Key:

B = Also present in blank sample.
J = Reported value is estimated.
NA = No applicable value given.
ND = Not detected.
U = Analyte was not detected; value reported is the quantitation limit.
R = Rejected result based on laboratory quality control results.

23 TAL metals were present in almost all of the samples; only silver, sodium, and thallium were not detected. Although beryllium and cobalt were present in each of the samples, they were present at concentrations less than ten times the amount contained in the blank sample. Thus, their presence is considered insignificant. Antimony, barium, cadmium, and potassium were also present in several samples. Again, they were present at concentrations lower than ten times the concentration found in the blank sample. The highest inorganic analyte concentrations were of aluminum, calcium, iron, magnesium, and potassium (see Table 3-3). Cyanide was detected in only two of the samples, and no PCBs were detected in any of the samples.

Due to the availability of remaining sample volume following total metals analysis, TCLP analyses were performed on one surface soil sample to determine if site soils met the definition of a hazardous waste. TCLP analysis of Sample SSEF-12 resulted in a lead extract concentration of 0.38 milligrams per liter (mg/L), well below the regulatory criteria of 5 mg/L. Thus, the sample is not classified as a hazardous waste.

3.3.2 Composite Surface Soil Investigation

The VOC acetone was detected in five of the six composite surface soil samples collected; however, its presence is considered insignificant because it was also found in the blank samples associated with these samples. No other VOCs were detected. Numerous SVOCs were found in all of the samples, most of which were PAHs. Carbazole, 1,2,4-trichlorobenzene, and three phthalates were also detected (see Table 3-2). Again, phthalates are common field and laboratory contaminants, and their presence is considered insignificant. Four of the samples contained pesticides; the most common pesticide found was heptachlor epoxide. One of the composite surface soil samples, SS-19, was collected from beneath the television debris areas and contained a PCB concentration of 43 ppm.

Twenty-two of the 23 TAL metals were present in almost all of the samples; silver was the only metal that was consistently absent. Although antimony, beryllium, cobalt, and sodium were present in each of the samples, these metals were also present in the blank samples associated with the field samples. Cyanide was not detected in any of the samples.

3.3.3 Soil Collected at Debris Pile Grids

Immunoassay analysis showed that none of the nodes in television debris pile grids 2 and 5 contained PCBs at concentrations greater than 1 ppm. However, 10 nodes in television debris pile grid 11 were found to contain PCB concentrations greater than 1 ppm (see

Table 3-4 and Figure 3-1). Due to sample batch size limitations, analysis was only performed on deeper soils at seven of the 10 sample nodes from television debris pile grid 11. (The deeper interval at Node 11-02 was not investigated because data was to be collected at deeper intervals from nodes north and south of Node 11-02.) At each of the seven locations, a second soil sample was collected from the 6- to 12-inch depth interval and submitted for PCB immunoassay analysis. At Nodes 11-1, 11-11, and 11-17 (at the southern portion of the grid), PCB concentrations exceeded 10 ppm in soils from this lower depth interval. In order to minimize the number of laboratory analyses performed and still be able to assess the magnitude of the PCB concentrations present, the 0- to 2-inch and 6- to 12-inch depth interval samples from Nodes 11-11 and 11-17 were submitted to the laboratory for analysis by conventional means using laboratory Method DEC ASP-95-3. Results of these analyses are presented in Table 3-4 and shown on Figure 3-1.

Although the areal extent of PCBs was not fully delineated, it was estimated based on assumptions. The row of samples containing the higher PCB concentrations was considered to be the center of the PCB contaminated area. Contamination was identified 15 feet north of that row. Therefore it was assumed to also extend 15 feet south of the row. Based on this same logic, the area was extended five feet to the east.

As noted in Section 2, 10% of the field samples were also submitted (as a QA check) to E & E's ASC for PCB analysis using Method DEC-ASP 95-3. Results of these analyses are presented in Table 3-4 and show a high degree of accuracy using the immunoassay system.

3.4 Subsurface Soil Investigation

Eleven subsurface soil samples (TTEF-01, TTEF-03 through TTEF-12) were collected from test trenches during the first field effort and submitted for chemical analysis. The results of the organic and inorganic sample analyses are presented in Tables 3-5 and 3-6, respectively. One subsurface soil sample was also collected by a split-spoon sampler during installation of soil borings and submitted for various geotechnical analyses. The results of these geotechnical analyses are discussed in Section 4.2. During the second field effort, soil samples were collected from soil core holes installed by a hydraulic probe.

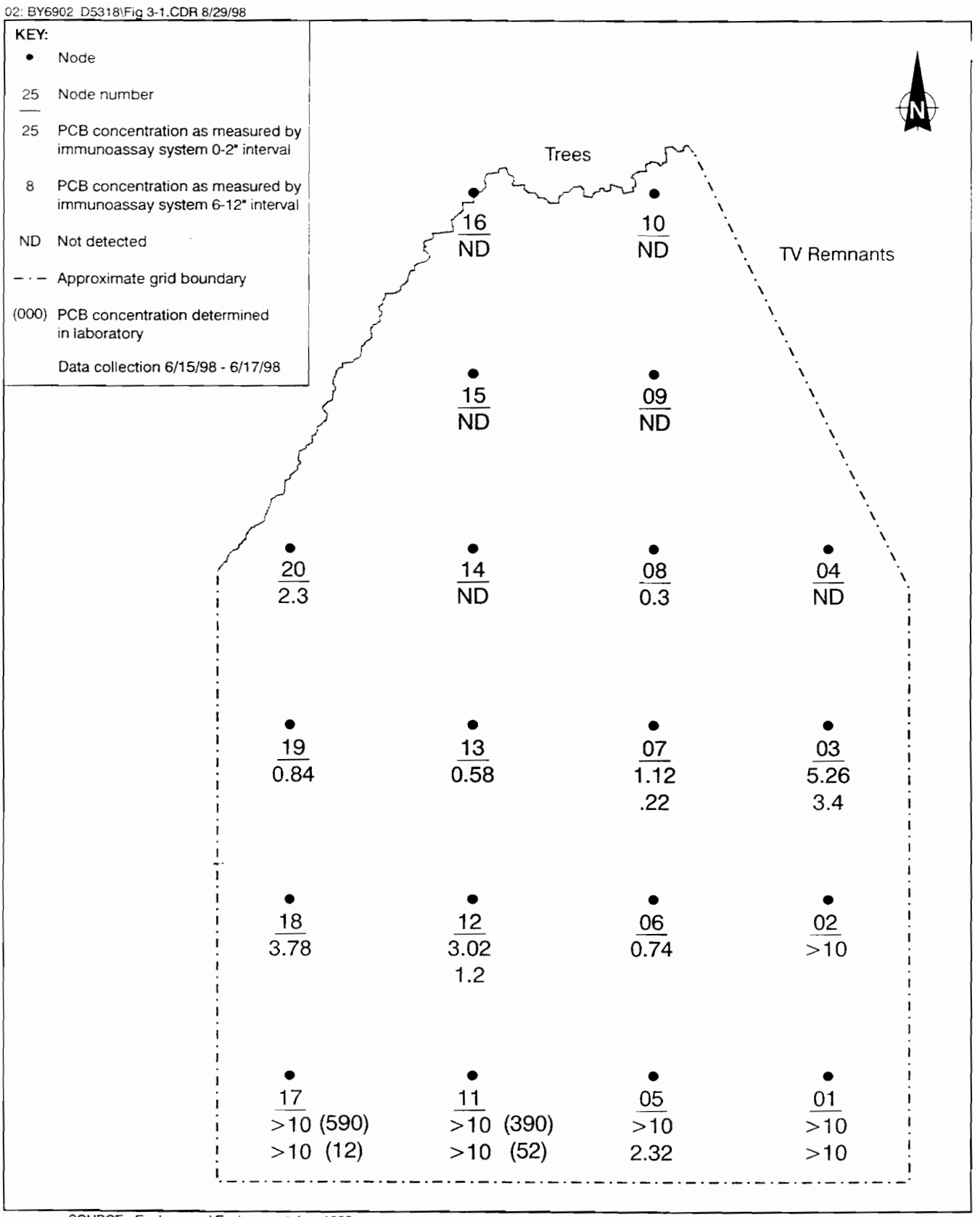
3.4.1 Test Trench Soil Sampling

The VOC acetone was detected in all 11 subsurface soil samples, although its presence is considered insignificant because it was also present in the blank sample (see Table 3-5). Minor amounts of toluene were present in three of the samples, and 2-butanone

Table 3-4 Summary of PCB Analytical Data from Grid Sampling, 858 East Ferry Street Site

Node Number	Depth (inches)	Result (ppm)
02-07	0-2	0.041[a,b]
02-08	0-2	0.22
02-13	0-2	0.032[a,b]
02-19	0-2	0.44
05-02	0-2	0.026[a,b]
11-01	0-2	>10
11-01	6-12	>10
11-02	0-2	>10
11-03	0-2	5.26
11-03	6-12	3.4
11-04	0-2	ND[ab]
11-05	0-2	>10
11-05	6-12	2.32
11-06	0-2	0.74
11-06	0-2	1.4[a,b]
11-07	0-2	1.12
11-07	0-2	1.7[a,b]
11-07	6-12	0.22
11-08	0-2	0.3
11-11	0-2	>10
11-11	0-2	390[b]
11-11	6-12	>10
11-11	6-12	52[b]
11-12	0-2	3.02
11-12	6-12	1.2
11-13	0-2	0.58
11-17	0-2	>10
11-17	0-2	590[b]
11-17	6-12	>10
11-17	6-12	12[b]
11-18	0-2	3.78
11-19	0-2	0.84
11-20	0-2	2.3

[a]Verification sample; analyzed for QA purposes.
[b]Analyzed by method CLP -95-3 at E & E's ASC.



SOURCE: Ecology and Environment, Inc. 1998

Figure 3-1 PCB SAMPLE RESULTS AT TELEVISION DEBRIS PILE GRID 11 858 EAST FERRY STREET BUFFALO, NEW YORK

Table 3-5 Organic Compounds Detected in Subsurface Soil Samples, October 3 and 6, 1997
858 East Ferry Site (µg/kg)

Compound	TTEF-01-ASO	TTEF-03-ASO	TTEF-04-BSO	TTEF-05-ASO	TTEF-06-ASO	TTEF-07-ASO	TTEF-08-ASO
Volatiles							
Chloromethane	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND
Acetone	18 BJ	23 BJ	2 BJ	25 BJ	11 B	14 B	12 B
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND
Total 1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND

Key at end of table.

Table 3-5 (Cont.)

Compound	TTEF-01-ASO	TTEF-03-ASO	TTEF-04-BSO	TTEF-05-ASO	TTEF-06-ASO	TTEF-07-ASO	TTEF-08-ASO
Benzene	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	13 UJ	ND	13 UJ	ND	ND	ND
2-Hexanone	ND	13 UJ	ND	13 UJ	ND	ND	ND
Tetrachloroethene	ND	13 UJ	ND	13 UJ	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	13 UJ	ND	13 UJ	ND	ND	ND
Toluene	1 J	13 UJ	ND	13 UJ	ND	ND	ND
Chlorobenzene	ND	13 UJ	ND	13 UJ	ND	ND	ND
Ethylbenzene	ND	13 UJ	ND	13 UJ	ND	ND	ND
Styrene	ND	13 UJ	ND	13 UJ	ND	ND	ND
Total xylenes	ND	13 UJ	ND	13 UJ	ND	ND	ND
Semivolatiles							
Naphthalene	ND	ND	ND	45 J	ND	ND	ND
Acenaphthene	ND	ND	ND	91 J	ND	ND	ND
Dibenzofuran	57 J	ND	ND	76 J	ND	ND	ND
Fluorene	68 J	ND	ND	100 J	ND	ND	ND
Phenanthrene	1,100	84 J	140 J	1,200	430	ND	120 J
Anthracene	220 J	ND	ND	210 J	93 J	ND	ND
Carbazole	120 J	ND	ND	120 J	ND	ND	ND
Di-n-butylphthalate	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	1,400	110 J	240 J	1,600	1,000	ND	170 J

Key at end of table.

Table 3-5 (Cont.)

Compound	TTEF-01-ASO	TTEF-03-ASO	TTEF-04-BSO	TTEF-05-ASO	TTEF-06-ASO	TTEF-07-ASO	TTEF-08-ASO
Pyrene	2,100	120 J	240 J	1,700	1,100 J	ND	190 J
Butylbenzylphthalate	ND	ND	ND	57 J	45 J	ND	ND
Benzo(a)anthracene	880	57 J	130 J	1,000	560	ND	100 J
Chrysene	970	67 J	150 J	960	620	ND	130 J
bis(2-Ethylhexyl)phthalate	380 B	ND	ND	420 BJ	370 B	ND	390 B
Di-n-octylphthalate	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	1,400	48 J	120 J	870	420	ND	76 J
Benzo(k)fluroanthene	ND	48 J	79 J	580	350 J	ND	92 J
Benzo(a)pyrene	780	ND	99 J	730	410	ND	ND
Indeno(1,2,3-cd)pyrene	470	ND	70 J	480	300 J	ND	63 J
Dibenz(a,h)anthracene	250 J	ND	ND	240 J	170 J	ND	ND
Benzo(g,h,i)perylene	450	ND	72 J	470	290 J	ND	69 J
Pesticides							
Aldrin	ND	ND	3 J	ND	ND	ND	3 J
Heptachlor Epoxide	ND	ND	ND	ND	ND	ND	4 J
Dieldrin	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	ND	ND	ND	ND	ND	ND	ND
Endrin Ketone	ND	ND	5 J	ND	ND	ND	ND

Key at end of table.

Table 3-5 (Cont.)

Compound	TTEF-08-ASD	TTEF-09-ASO	TTEF-10-ASO	TTEF-11-DSO	TTEF-11-DSD	TTEF-12-DSO
Volatiles						
Chloromethane	ND	ND	13 UJ	ND	ND	ND
Bromomethane	ND	ND	13 UJ	ND	ND	ND
Vinyl Chloride	ND	ND	13 UJ	ND	ND	ND
Chloroethane	ND	ND	13 UJ	ND	ND	ND
Methylene Chloride	ND	ND	13 UJ	ND	ND	ND
Acetone	12 B	ND	13 BJ	16 B	52 B	39 B
Carbon Disulfide	ND	ND	13 UJ	ND	ND	ND
1,1-Dichloroethene	ND	ND	13 UJ	ND	ND	ND
1,1-Dichloroethane	ND	ND	13 UJ	ND	ND	ND
Total 1,2-Dichloroethene	ND	ND	13 UJ	ND	ND	ND
Chloroform	ND	ND	13 UJ	ND	ND	ND
1,2-Dichloroethane	ND	ND	13 UJ	ND	ND	ND
2-Butanone	ND	ND	13 UJ	16 UJ	ND	10 J
1,1,1-Trichloroethane	ND	ND	13 UJ	16 UJ	ND	ND
Carbon Tetrachloride	ND	ND	13 UJ	16 UJ	ND	ND
Bromodichloromethane	ND	ND	13 UJ	16 UJ	ND	ND
1,2-Dichloropropane	ND	ND	13 UJ	16 UJ	ND	ND
cis-1,3-Dichloropropene	ND	ND	13 UJ	16 UJ	ND	ND
Trichloroethene	ND	ND	13 UJ	16 UJ	ND	ND
Dibromochloromethane	ND	ND	13 UJ	16 UJ	ND	ND
1,1,2-Trichloroethane	ND	ND	13 UJ	16 UJ	ND	ND
Benzene	ND	ND	13 UJ	16 UJ	ND	ND

Key at end of table.

Table 3-5 (Cont.)

Compound	TTEF-08-ASD	TTEF-09-ASO	TTEF-10-ASO	TTEF-11-DSO	TTEF-11-DSD	TTEF-12-DSO
Trans-1,3-Dichloropropene	ND	ND	13 UJ	16 UJ	ND	ND
Bromoform	ND	ND	13 UJ	16 UJ	ND	ND
4-Methyl-2-pentanone	ND	ND	13 UJ	ND	ND	ND
2-Hexanone	ND	ND	13 UJ	ND	ND	ND
Tetrachloroethene	ND	ND	13 UJ	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	13 UJ	ND	ND	ND
Toluene	ND	ND	13 UJ	4 J	5 J	ND
Chlorobenzene	ND	ND	13 UJ	ND	ND	ND
Ethylbenzene	ND	ND	13 UJ	ND	ND	ND
Styrene	ND	ND	13 UJ	ND	ND	ND
Total xylenes	ND	ND	13 UJ	ND	ND	ND
Semivolatiles						
Naphthalene	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	ND	68 J	ND	ND	61 J
Dibenzofuran	ND	ND	ND	ND	ND	48 J
Fluorene	ND	ND	71 J	ND	ND	82 J
Phenanthrene	98 J	270 J	900	140 J	190 J	460
Anthracene	ND	ND	170 J	ND	ND	79 J
Carbazole	ND	50 J	93 J	ND	ND	60 J
Di-n-butylphthalate	ND	52 J	ND	ND	ND	52 J
Fluoranthene	160 J	440	1400	250 J	250 J	310 J
Pyrene	190 J	430 J	1800	320 J	380 J	460
Butylbenzylphthalate	ND	ND	480	ND	ND	ND
Benzo(a)anthracene	100 J	250 J	760	170 J	160 J	180 J

Key at end of table.

Table 3-5 (Cont.)

Compound	TTEF-08-ASD	TTEF-09-ASO	TTEF-10-ASO	TTEF-11-DSO	TTEF-11-DSD	TTEF-12-DSO
Chrysene	130 J	310 J	770	180 J	180 J	170 J
bis(2-Ethylhexyl)phthalate	390 B	910 B	280 BJ	ND	ND	450 B
Di-n-octylphthalate	ND	ND	430 UJ	ND	ND	ND
Benzo(b)fluoranthene	95 J	240 J	1300 J	170 J	150 J	160 J
Benzo(k)fluroanthene	78 J	190 J	430 UJ	130 J	130 J	85 J
Benzo(a)pyrene	75 J	200 J	720 J	140 J	140 J	130 J
Indeno(1,2,3-cd)pyrene	62 J	160 J	450 J	100 J	97 J	73 J
Dibenz(a,h)anthracene	ND	86 J	220 J	ND	ND	ND
Benzo(g,h,i)perylene	63 J	150 J	450 J	100 J	110 J	75 J
Pesticides						
Aldrin	2.2 J	5.4 J	ND	ND	ND	ND
Heptachlor Epoxide	3.3 J	14	ND	7.2	4.6	ND
Dieldrin	ND	15	ND	ND	ND	ND
4,4'-DDT	ND	10	ND	ND	ND	ND
Endrin Ketone	ND	ND	ND	ND	ND	ND

Key:

B = Also present in blank sample.
D = Result from dilution analysis.
J = Reported value is estimated.
ND = Not detected.
U = Analyte was not detected; value reported is the quantitation limit.

Table 3-6 Inorganic Analytes Detected in Subsurface Soil Samples, October 3, 1997
858 East Ferry Street Site (mg/kg)

Analyte	Sample Number						
	TTEF-01-ASO	TTEF-03-ASO	TTEF-04-BSO	TTEF-05-ASO	TTEF-06-ASO	TTEF-07-ASO	TTEF-08-ASO
Aluminum	11,200	13000	11,400	7,020	5,670	10,900	6,240
Antimony	6.8 J	8.4 J	3.1 J	9.2 J	3.3 J	258 J	3.1 J
Arsenic	6.1 U	14.8	7.0	13.2	5.2	11.4	5.0
Barium	108	150	108	123	56.1	239	83.0
Beryllium	0.50 J	0.81 J	0.68 J	0.40 J	0.29 J	0.31 J	0.34 J
Cadmium	0.02 U	0.03 U	0.02 U	0.05 J	1.5	1.2 J	0.08 J
Calcium	55,800	10,800	26,200	66,900	102,000	7,620	45,600
Chromium	16.7	22.0	17.4	16.3	11.1	6.6	10.3
Cobalt	8.6 J	16.2	10.5 J	7.8 J	5.3 J	2.8 J	4.6 J
Copper	50.6	158	42.6	101	21.4	20.7	24.7
Iron	21,800	30,400	18,200	32,200	11,000	2,410	10,900
Lead	257 J	352 J	718	607 J	110	28,500	379
Magnesium	17,100	6,720 J	8,470	23,500 J	33,700	950 J	14,700
Manganese	515 J	935	389	445	302	20.3	232
Mercury	0.25	0.68	0.06 U	0.71	0.19	0.07 U	0.76 J
Nickel	18.6	32.6	19.3	20.1	14.4	29.8	9.6
Potassium	2,000	1,620	1,810	1,400	1,620	1,150 J	1,060 J
Selenium	1.7 J	4.9 J	1.1 U	3.1 J	1.1 U	1.3 U	1.1 U
Silver	0.50 U	0.57 U	0.50 U	0.56 U	0.50 U	0.59 U	0.52 U
Sodium	191 U	216 U	229 J	214 U	190 U	977 J	197 U

Key at end of table.

Table 3-6 (Cont.)

Analyte	Sample Number						
	TTEF-01-ASO	TTEF-03-ASO	TTEF-04-BSO	TTEF-05-ASO	TTEF-06-ASO	TTEF-07-ASO	TTEF-08-ASO
Thallium	0.84 U	0.95 U	0.84 U	0.94 U	0.84 U	1.0 U	0.87 U
Vanadium	25.9	30.3	30.5	20.6	15.5	119	16.4
Zinc	232	261	88.5	331	96.9	1,400	141
Cyanide	0.58 UJ	0.66 UJ	0.58 U	0.64 UJ	0.57 U	0.69 U	0.59 U

Key at end of table.

Table 3-6 (Cont.)

Analyte	Sample Number					
	TTEF-08-ASD	TTEF-09-ASO	TTEF-10-ASO	TTEF-11-DSO	TTEF-11-DSD	TTEF-12-DSO
Aluminum	7,310	8,320	11,700	8,650	8,080	11,700
Antimony	3.0 J	15.5 J	209 J	8.4 J	14.0 J	2.3 J
Arsenic	5.0	11.0	21.0	16.0	16.0	5.1 U
Barium	86.2	85.7	222	833	1,920	215
Beryllium	0.37 J	0.53 J	0.69 J	0.54 J	0.56 J	0.65 J
Cadmium	0.10 J	0.46 J	0.34 J	1.8	0.67 J	0.03 U
Calcium	44,400	54,800	91,300	22,400	17,000	23,400
Chromium	10.3	15.1	14.5 J	32.3	130	16.4
Cobalt	3.7 J	7.6 J	6.9 J	8.3 J	9.1 J	9.3 J
Copper	20.6	45.9	51.1	342	324	35.3
Iron	10,7000	17,7000	16,100	40,700	48,100	25,600
Lead	369	605	19,900 J	2,620 J	3,060 J	265 J
Magnesium	14,300	21,400	43,800 J	2,950 J	3,460 J	8,070 J
Manganese	212	452	201	1,120	1,040	838
Mercury	0.12	0.39	0.25	0.85	2.2	0.41
Nickel	9.2	23.1	20.5	21.0	24.2	15.6
Potassium	1,010	1,720	1,290	1,070 J	1,340 J	1,180 J
Selenium	1.1 U	1.2 U	1.2 UJ	10.0 J	11.6 J	5.0 J
Silver	0.51 U	0.55 U	0.56 U	1.1 J	2.2 J	0.59 U

Key at end of table.

Table 3-6 (Cont.)

Analyte	Sample Number					
	TTEF-08-ASD	TTEF-09-ASO	TTEF-10-ASO	TTEF-11-DSO	TTEF-11-DSD	TTEF-12-DSO
Sodium	1,965 U	208 U	418 J	280 J	419 J	226 U
Thallium	0.86 U	0.92 U	0.94 U	1.2 U	1.1 U	0.99 U
Vanadium	16.9	24.1	35.3	29.3	33.6	29.3
Zinc	132	197	583	1,080	971	149
Cyanide	0.59 U	0.63 U	0.65 UJ	1.3 J	0.78 UJ	0.68 UJ

Key:

B = Also present in blank sample.
J = Reported value is estimated.
NA = No applicable value given.
ND = Not detected.
U = Analyte was not detected; value reported is the quantitation limit.
R = Rejected result based on laboratory quality control results.

was present in one sample. Several SVOCs were detected in all of the samples with the exception of trench sample TTEF-07, which was composed almost entirely of ash. Because PAHs would be lost during combustion, one would not expect to find PAHs in ash. However, PAHs were the most common SVOCs detected and are present throughout the site's upper subsurface soils. In addition, dibenzofuran, carbazole, and several phthalates were found in some samples. As previously noted, the presence of phthalates is considered insignificant because they are common field and laboratory contaminants. Pesticides were detected in only six of the 11 samples; the most common pesticides found were aldrin and heptachlor epoxide. Of the 23 TAL metals, thallium was the only metal not detected in any of the samples (see Table 3-6). Silver was present in only one sample. Silver was also found in the duplicate associated with that sample, verifying its presence. The highest metal concentrations detected were of aluminum, calcium, iron, lead, magnesium, and potassium. Cyanide was detected in only one sample (TTEF-11), and no PCBs were detected in any of the samples.

Two subsurface soil samples, TTEF-07 and TTEF-10, were also submitted for TCLP analysis based on the high total lead concentrations present in the samples. The lead concentration in the extract of sample TTEF-10 was 0.06 mg/L, well below the regulatory threshold of 5 mg/L. Therefore, it is not classified as a hazardous waste. The extract from the TCLP analysis on sample TTEF-07 contained a lead concentration of 14 mg/L. This exceeds the New York State regulatory level of 5 mg/L, and thus the sample is considered a hazardous waste under 6 NYCRR Part 371.3(e). Table 3-7 summarizes the TCLP data. Note that although sample SSEF-12 had a lower total lead concentration than sample TTEF-10, it produced a higher leachable lead concentration. Sample TTEF-07 consisted mostly of the white ash present in the central portion of the site. Consequently, the presence and extent of this white ash layer was explored further during the second field effort. Results of this additional investigation are presented in Section 3.4.3 below.

3.4.2 Borehole Soil Sampling

Soil samples collected from boreholes were submitted for selected geotechnical analyses including grain size, moisture content, Atterburg limits, and bulk density. Results of these analyses are discussed in Section 4.2.

Table 3-7 TCLP Analytical Results, 858 East Ferry Street Site

Sample Number	Dominant Matrix	Sample Depth (feet)	TCLP Analytical Result (mg/L)	Total Lead Concentration (mg/kg)
SSEF-12	Soil	0 - 0.5	0.38 J	2,550
TTEF-10	Soil	0 - 0.8	0.06 J	19,900 J
TTEF-07	White ash	2.0	14	28,500

Key:
J = Estimated value.

3.4.3 Direct-push Sample Data

Lead

As described in Section 2.4.4, soil cores were collected on a grid pattern to determine the lateral extent of the white ash layer. Soil core segments of white ash-containing soil, if present in those cores collected from the edges of areas containing white ash, were submitted for total lead concentration analysis. Figure 3-2 depicts these locations. Table 3-8 presents the data from these analyses. Several samples contained lead concentrations exceeding 1,000 mg/kg. The total lead concentration of 28,5000 ppm in SSEF-07 resulted in a TCLP concentration of 14 mg/kg. Several of the ash samples collected during the second field effort will also fail TCLP, based on previously collected data, indicating that the white ash is by definition a hazardous waste.

PAHs

Carcinogenic PAHs (c-PAHs) are a subset of the PAH group. Because some of New York State Department of Health's (NYSDOH's) cleanup criteria are based on c-PAH content, characterizing c-PAH content was necessary to complete remedial alternative analyses for the site. Table 3-9 lists the c-PAHs.

As noted in Section 2.4.4, direct-push cores were also collected at locations identified during the first field effort as having c-PAH concentrations exceeding 1 ppm. Additional investigation revealed that elevated c-PAH concentrations are generally limited to the upper 2 to 4 feet of soil. One sample from each of 18 locations was collected and submitted for analysis using an immunoassay analysis as a screening tool. Table 3-10 summarizes the findings of these analyses. Six of these samples contain a total c-PAH concentration exceeding the 1 ppm New York State regulatory guidance criteria for pre-release conditions. Five samples originate from the 1.5- to 2-foot depth interval (SSEF-02, -06, -07 -10,

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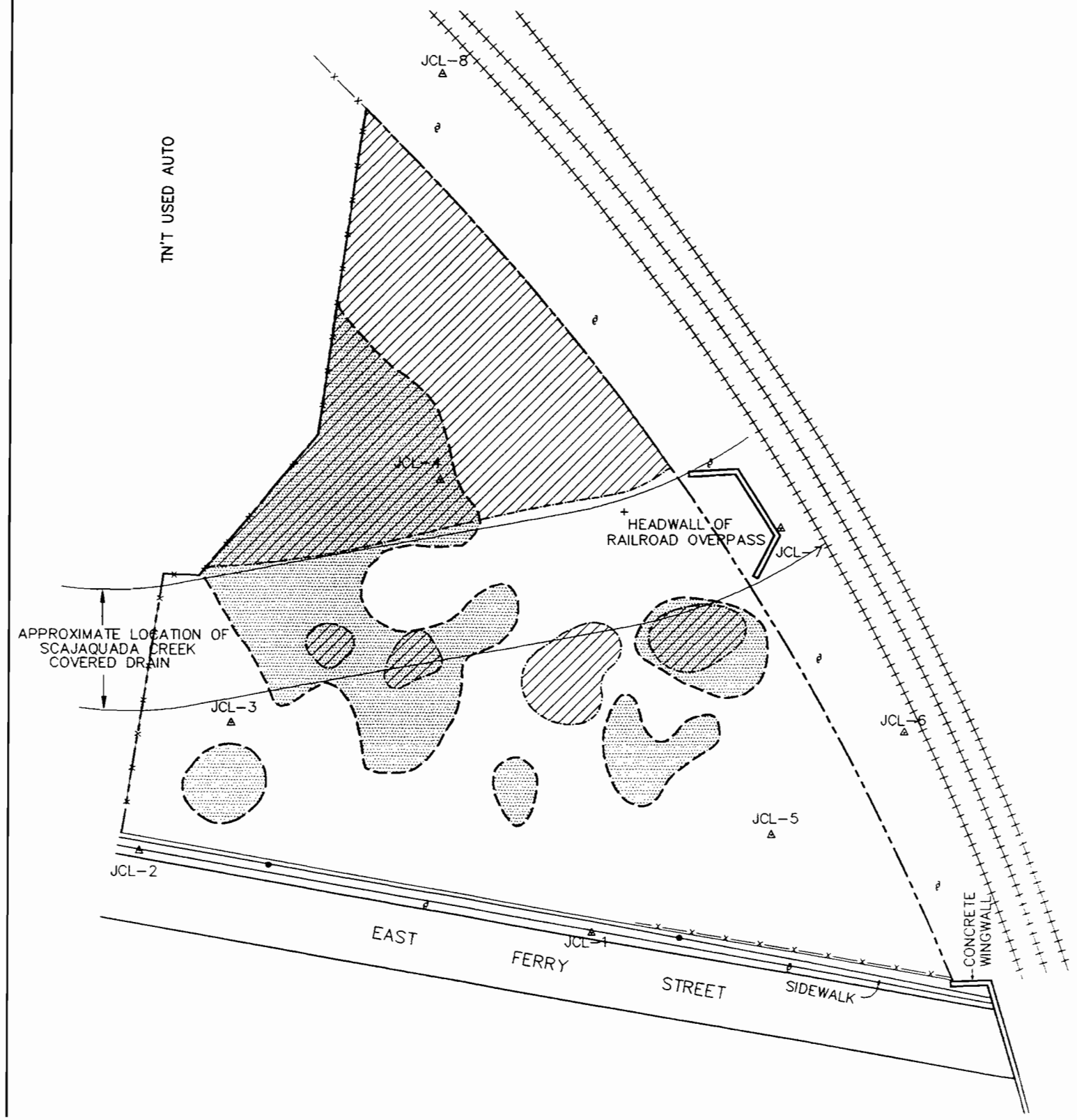

LEGEND

- AREA OF WHITE ASH LAYER
- AREA OF GRAY ASH LAYER
- APPROXIMATE BOUNDARY OF GRAY ASH LAYER
- APPROXIMATE BOUNDARY OF WHITE ASH LAYER
- JCL CONTROL POINT
- UTILITY POLE
- MANHOLE
- PROPERTY LINE
- RAILROAD TRACKS
- CHAIN-LINK FENCE

N

SCALE IN FEET

0 80 160 240

NOTES:

1. HORIZONTAL DATUM IS LOCAL WITH ASSUMED COORDINATES AND MAGNETIC NORTH.
2. VERTICAL DATUM IS LOCAL WITH THE TOP OF JCL-1 REBAR/CAP ELEVATION = 100.00. NO EXISTING MONUMENTATION WITHIN A 2-MILE RADIUS.
3. ALL PROPERTY LINES SHOWN ON THIS MAP ARE APPROXIMATELY POSITIONED PER CURRENT TAX MAPS OR EXISTING OCCUPATION.
4. SCAJAQUADA CREEK DRAIN LOCATION IS APPROXIMATE; FIELD VERIFICATION IS REQUIRED.

ecology and environment

Figure 3-2 APPROXIMATE AREAS OF WHITE ASH LAYER 858 EAST FERRY STREET BUFFALO, NEW YORK

Table 3-8 Analytical Data from Lead Analysis of Soils Collected by Direct-push Method, 858 East Ferry Street Site

Sample Number	Sample Depth (feet)	Lead Concentration (mg/kg)	Comments
L-02	1.3 - 1.6	20.5	White, crumbly material.
L-03	1.6 - 1.8	41.9	White powder; does not appear to be ash.
L-11	3.6 - 3.9	163	White ash.
L-14	2.0 - 2.4	228	White granular ash.
L-15	1.0 - 1.7	8,300	White ash underlain by gray cinders and clay/sand/gravel mix from 1.7 - 2.1 feet.
L-20	0.6 - 1.9	25,700	White ash overlying coal fragment inclusion.
L-21	0.8 - 1.0	27,000	White ash over silty clay.
L-24	2.6 - 6	1,230	Gray ash of incinerator origin; no white ash.
L-26	0.6 - 1.0	32,200	Crusty white ash, overlies gray ash 1.0 - 1.4 feet.
L-27A	0.4 - 1.3	15,800	Mix of white and gray ash overlies gray incineration ash 1.3 - 2.0 feet. Sampled silty sand with pink hue underlying gray ash.
L-27B	2.0 - 3.6	5,570	Silty sand with pink hue.
L-31	3.0 - 3.4	294	White ash grading to gray.
LA-03	1.6 - 2.2	2,340	White ash.
LA-06	2.5 - 3.4	102	White ash.
LA-10	2.3 - 4.0	46,700	White ash with pink hue.

Table 3-9 Carcinogenic PAHs

Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Dibenz(a,h)anthracene
Chrysene
Indeno (1,2,3-cd)pyrene

Source: IRIS 1998.

and -20), and one sample (from TTEF-11) comes from the 3.5- to 4-foot depth interval.

Sample location SSEF-11 is located along the western site boundary, adjacent to TNT Autos. During installation of the core at this point, a thick grease was encountered at the 4-foot depth interval. This sample also yielded OVA readings of 890 ppm from the 2.7 to 2.9-foot depth interval. The matrix varied in color throughout the core. The top contained typical black organic loam. A white ash layer was present at a depth of 2.3 feet, and a rust-orange segment ranged from 2.7 to 2.9 feet. At the 4-foot depth, the grease also had an orange tint. This grease is likely the source of c-PAHs at this depth.

Benzene

As described in Section 2.4.4, four direct-push soil cores were also installed to explore the possibility of a benzene source on the site in the vicinity of groundwater monitoring well MWEF-03-RK. Results of TCL-volatiles analysis from each of the four cores revealed that none contained VOCs at concentrations above detection limits (see Table 3-11). A surficial benzene source would have contaminated a soil column from the top down. Because no organic vapors were present throughout the column, it can be concluded that the benzene source was not introduced at the surface in these locations. Benzene was not detected at the bottom of the holes, indicating that benzene vapors are absent because a benzene source is absent. Another possibility is that the soils are so compacted that they do not allow for the benzene vapors to travel upward. However, this situation is considered unlikely, as few shallow unlithified geologic formations are 100% airtight.

Table 3-10 Analytical Data From c-PAH Analysis of Soils Collected by Direct-push Method, 858 East Ferry Street Site

Node	Sample Depth (feet)	Result (ppm)
SSEF-01	1.5 - 2.0	0.02
SSEF-02	1.5 - 2.0	>1
SSEF-03	1.5 - 2.0	ND
SSEF-04	2.8 - 3.9	0.31
SSEF-05	1.5 - 2.0	0.16
SSEF-06	1.5 - 2.0	>1
SSEF-07	1.5 - 2.0	>1
SSEF-09	1.5 - 2.0	0.02
SSEF-10	1.5 - 2.0	>1
SSEF-11	3.5 - 4.0	>1
SSEF-13	1.5 - 2.0	0.27
SSEF-14	1.5 - 2.0	0.06
SSEF-14	1.5 - 2.0	ND[a]
SSEF-15	1.5 - 2.0	0.53
SSEF-20	1.5 - 2.0	>1
SSEF-20	1.5 - 2.0	3.7[a]
TTEF-01-BSO	3.5 - 4.0	ND
TTEF-05-BSO	3.5 - 4.0	0.39
TTEF-06-DSO	7.5 - 8.0	0.01
TTEF-10-BSO	3.5 - 4.0	0.048

[a] = Collected for Quality Assurance purposes.

Key:

ND = Not detected.

Table 3-11 Analytical Data from Benzene Analysis of Soils Collected by Direct-push Method, 858 East Ferry Street Site

Sample Node	Sample Depth (feet)	Analytical Result (mg/kg)
GPEF-B1-GSO	13.5 - 14	ND
GPEF-B2-FSO	11.5 - 12	ND
GPEF-B3-FSO	11.5 - 12	ND
GPEF-B4-FSO	11.5 - 12	ND

Key:

ND = Not detected.

3.5 Groundwater Investigation

Data Presentation

As discussed in Section 2, one groundwater sample was initially collected from each of the four wells installed at this site during the first field effort. Results of the organic and inorganic groundwater sample analyses are presented in Tables 3-12 and 3-13, respectively.

There were no VOCs detected in the sample from monitoring well MWEF-01OB. However, vinyl chloride was detected in the sample from well MWEF-02RK; benzene was detected in the sample from well MWEF-03RK; and toluene was detected in the groundwater sample from well MWEF-04OB. Due to the high benzene concentration (260 μg/L), the well was resampled slightly more than one month following the initial sampling. A benzene concentration of 180 μg/L was detected in the second sample, confirming the findings of the first sample.

The SVOC bis(2-ethylhexyl)phthalate, a common field and laboratory contaminant, was detected in all four samples as well as in the blanks associated with all of the samples. Thus, its presence is considered insignificant. Other SVOCs found included pentachlorophenol in groundwater sample MWEF-03RK, and the PAH pyrene in sample MWEF-01OB (see Table 3-11).

Fifteen of the 23 TAL metals were found in at least one sample; those metals not detected in any of the four groundwater samples were arsenic, beryllium, mercury, selenium, silver, and thallium.

Table 3-12 Organic Compounds Detected in Water Samples, October 22-24, 1997
858 East Ferry Street Site (µg/L)

Compound	MWEF-01OB-WO	MWEF-02RK-WO	MWEF-03RK-WO	MWEF-04OB-WO	Resample of MWEF-03RK-WO
Volatiles					
Vinyl Chloride	ND	16	ND	ND	ND
Total 1,2-Dichloroethene	ND	10	ND	ND	ND
Benzene	ND	ND	260 J	ND	180
Toluene	ND	ND	ND	1 J	ND
Semivolatiles					
Pentachlorophenol	ND	ND	6 J	ND	NA
Pyrene	1 J	ND	ND	ND	NA
bis(2-Ethylhexyl)phthalate	10 B	10 B	10 B	10 B	NA
Pesticides					
	ND	ND	ND	ND	NA

Key:

B = Also present in blank sample.
D = Result from dilution analysis.
J = Reported value is estimated.
ND = Not detected.

Table 3-13 Inorganic Analytes Detected in Water Samples, October 22-24, 1997
858 East Ferry Street Site (µg/L)

Analyte	Sample Number						
	MWEF-01OB-WO	MWEF-01OB-WOF	MWEF-02RK-WO	MWEF-03RK-WO	MWEF-03RK-WOF	MWEF-04OB-WO	MWEF-04OB-WOF
Aluminum	2,480	43 U	132 J	673	47.8 J	136 J	43 U
Antimony	2 J	2 J	ND	ND	ND	ND	30 U
Arsenic	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Barium	140 J	125 J	86 J	60 B	58 B	74 J	69 J
Cadmium	1 U	ND	ND	ND	ND	3 J	ND
Calcium	254,000	244,000	116,000	99,500	86,000	76,600	74,500
Chromium	12	8 U	34	8 U	8 U	8 U	8 U
Cobalt	4 U	4 U	4 U	4 U	6 B	4 U	4 U
Copper	11 J	5 U	5 U	5 U	5 U	5 U	5 U
Iron	7,020	107 U	1,010	2,180	694	715	10 U
Lead	29	2 U	2 U	2 U	2 U	2 U	2 U
Magnesium	42,200	40,500	21,800	37,700	31,300	89,200	88,300
Manganese	1,700	1,660	212	87	75	68	62
Nickel	13 J	13 U	22 J	13 U	13 U	13 U	13 U
Potassium	11,000	13,400	4,490 J	3,590 J	5,890	4,940 J	4,660 J
Selenium	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Sodium	11,500	14,100	47,400	24,800	36,500	19,500	19,300
Thallium	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Vanadium	7 J	7 U	7 U	7 U	7 U	7 U	7 U

Key at end of table.

Table 3-13 (Cont.)

Analyte	Sample Number						
	MWEF-01OB-WO	MWEF-01OB-WOF	MWEF-02RK-WO	MWEF-03RK-WO	MWEF-03RK-WOF	MWEF-04OB-WO	MWEF-04OB-WOF
Zinc	61	15 J	30	12 J	7 U	7 U	7 U
Cyanide	10 U	NA	10 U	1,140	NA	10 U	NA

Note: Sample numbers ending in "F" were filtered using a 45-micron filter. Filtering was conducted due to sample turbidity exceeding 50 NTUs.

[a] Shacklette and Boerngen 1984, except as noted.
[b] Dragon 1988.
[c] Value exceeds observed range.

Key:

J = Reported value is estimated.
NA = No applicable value given.
ND = Not detected.
U = Analyte was not detected; value reported is the quantitation limit.

Calcium, magnesium, potassium, and sodium were the only metals detected in all four samples; these metals were also the analytes present at the highest concentrations in each sample (see Table 3-12). Cyanide was detected only in the sample from well MWEF-03RK, and no pesticides or PCBs were detected in any of the samples.

A pattern can be identified when comparing filtered groundwater sample data to unfiltered sample data for samples collected from wells MWEF-01OB, MWEF-02RK, and MWEF-03RK. Aluminum, chromium, and zinc concentrations are, in most cases, substantially less in the filtered sample than in the unfiltered sample, indicating that the source of these metals is particulate matter suspended in the sample. Most of the other metal concentrations appear to be unaffected by filtering, indicating that they are present in an almost entirely dissolved state.

3.6 Data Interpretation

A lack of historical site usage information, other than that the site has been vacant property, makes the identification of possible contaminant sources difficult. The following interpretation of the site contaminant origins has been assembled based on the data collected from field sample analysis, field observations, aerial photographs, tax maps, Sanborn maps, and other resources. This data will be useful in the event that a potentially responsible party (PRP) search is undertaken.

In Section 1 of this document, mention is made of an aerial photograph showing a path leading from the Michael Heyman, Inc., foundry buildings (formerly located on the adjacent property to the west) to this property. The foundry's likely need for a location to dump its waste ash, the close proximity of the 858 East Ferry Street site to the foundry, and the high lead concentrations found in white ash on site collectively suggest that the Michael Heyman, Inc., operation may be a possible source of the lead-rich white ash.

The origin of the gray ash is unknown. Analysis of a sample of this gray ash showed that it contained an elevated lead concentration in comparison to the lead concentration in the background soil sample. However, a TCLP analysis of this gray ash was not performed.

The greasy substance found next to the fence in the middle of the western border of the site may have originated from activities at the junkyard on the adjacent property. Test pit excavations beyond the site boundary would be necessary to explore this as a possible source of contamination.

The elevated PAH concentrations present in soils on the southern and eastern parts of the site likely result from vehicular traffic along East Ferry Street and from train traffic on the elevated railway bordering the site. PAH concentration in the gray ash results from burning carbon-containing materials. PAHs may have also entered the site as emission from smokestacks at the Michael Heyman, Inc., facility to the west.

The asbestos shingle debris dumped on site is most likely of local origin, although there is no evidence indicating the name of the party performing the illegal dumping. Unless the site is made inaccessible to vehicular traffic, more illegal dumping of solid (and potentially hazardous) waste may occur at any time.

Capacitors containing small quantities of PCBs were used in televisions for many years. Despite the large number of televisions comprising debris pile 11, these do not account for the high PCB concentration present. While all PCBs had a variety of applications, capacitors usually contained Aroclor 1242. Laboratory analysis detected only Aroclor 1260 in site soils. Aroclor 1260 was frequently used in hydraulic systems as a fire retardant in resins and rubbers, and as a plasticizer in surface coatings and textiles. Given the areal extent of contamination and the open area in which the PCB-containing soils are located, it appears that a direct dumping of PCB-containing fluids or leakage from hydraulic equipment that may have been present on site at one time is a more likely source of PCB release than the possible leaking of fluids from television set capacitors.

As previously stated, possible sources of the benzene include the two fuel releases discussed in Section 1.2.4. E & E utilized hydraulic conductivity data and survey data to calculate the time required for gasoline releases to reach the site from approximately 1,000 feet away from the site. These calculations indicate that the releases could result in a contaminant plume stretching approximately 2,500 feet downgradient of the releases. This groundwater could easily be bringing benzene to well MWEF-03RK.

4 Physical Characteristics of Study Area

4.1 Site Geology

The soils underlying this area are classified as Urban Land-Cayuga complex (Owens et al. 1986), indicating that they have been disturbed by human activities. These soils are characterized as flat-lying, deep, well-drained, and originating from clayey lake sediments underlain by glacial lake deposits.

Observations made during test pit excavation and soil boring installation indicate that soils on this property have been disturbed by human activities in only the uppermost portions. A 4- to 5-foot gray ash layer exists at the northernmost portion of the site. In addition, a second white ash layer exists in much of the central and western portions of the site (see Figure 3-2). The Scajaquada Creek drain traverses the central portion of the site. The river basin areas surrounding the drain have been backfilled with clay-rich silts and, in some places, a white ash. Overburden underlying organic topsoil at the site consists mostly of clay silts and silt-rich soils with traces of sand and gravel. Based on the nature of the soils encountered, the origin of these deeper overburden deposits underlying fill areas appears to be glacial till. Bedrock was encountered at depths ranging from 11.5 to 19.4 feet BGS during SI activities. Onondaga limestone underlies the till. A semi-artesian condition was encountered in the southeast portion of the site around well MWEF-04OB (see Section 2.5.1).

Appendix A presents the well bore logs that provide significant detail of the site subsurface geology. Table 2-1 presents the depth to bedrock in each well. Figure 4-1 presents a geologic cross-section between the four site groundwater monitoring wells.

4.2 Geotechnical Analysis of Site Soils

One soil sample from the 2- to 4-foot depth interval of monitoring well MWEF-01OB was collected during drilling activities and submitted for geotechnical analyses to characterize the physical qualities of the soil for remediation purposes. This sample was collected directly from a split-spoon sampler during well boring activities. A second sample, consisting of one Shelby tube, was

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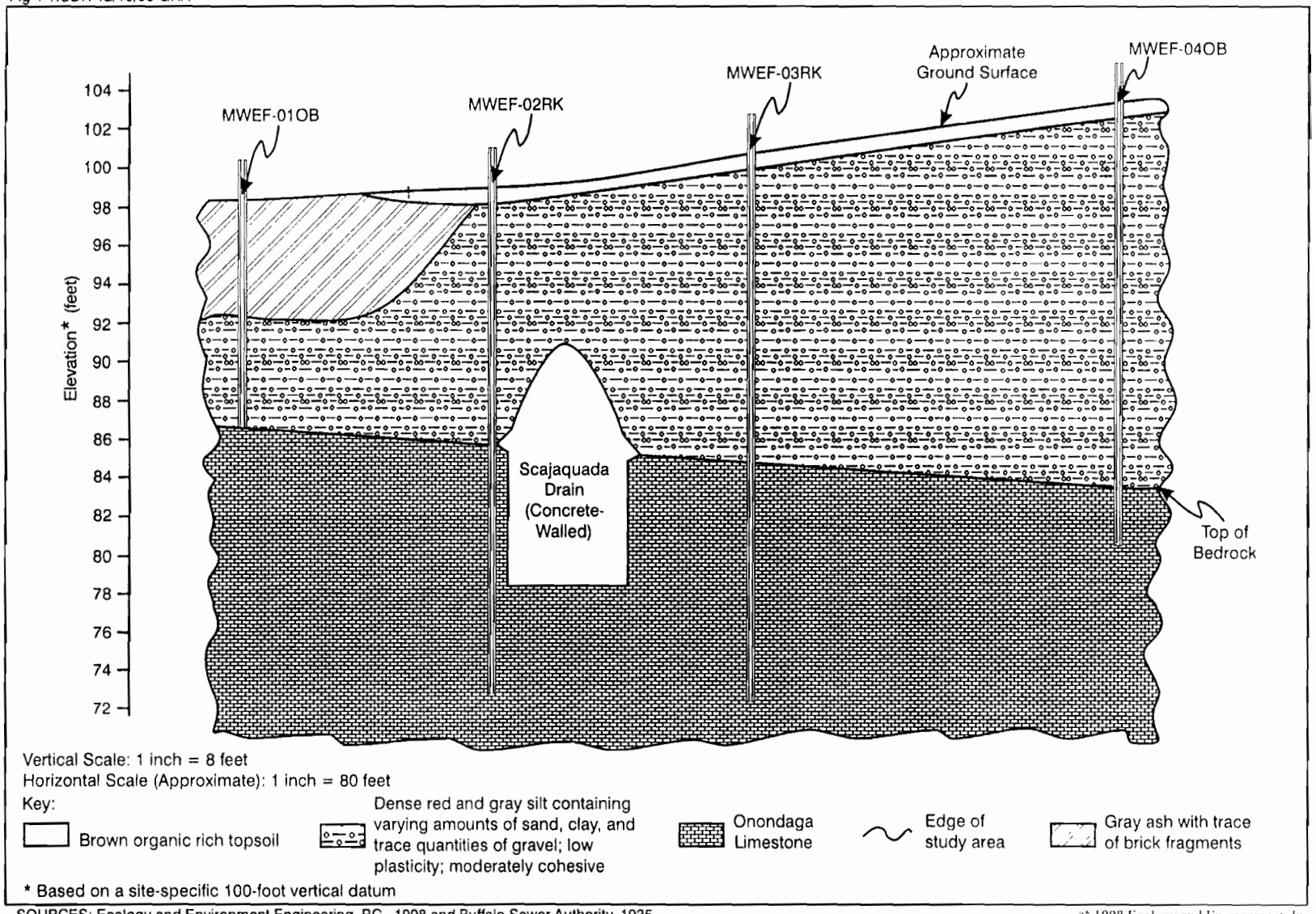
Fig 4-1.CDR-12/16/98-GRA



SOURCES: Ecology and Environment Engineering, P.C., 1998 and Buffalo Sewer Authority, 1935.

Figure 4-1 CROSS-SECTION OF SITE BETWEEN WELLS MWEF-01OB AND MWEF-04OB; 858 EAST FERRY STREET, BUFFALO, NEW YORK

collected from the 2- to 4-foot depth interval adjacent to monitoring well MWEF-02RK.

The analytical suite consisted of grain size distribution, Atterburg limits, moisture content, and bulk density. Grain size analysis consisted of performing both hydrometer testing and sieve analysis due to the distribution of particle sizes present in the soil sample. Atterburg limit testing included tests for liquid limit, plastic limit, and plastic index. All tests were performed using American Society of Testing and Materials (ASTM) methods by GZA Geoenvironmental of New York, a subcontractor located in the Buffalo, New York, area.

Geotechnical analysis showed that approximately 58% of the soils comprise particles less than 0.1 millimeter (mm) in diameter, and 80% of the soils comprise particles less than 1 mm in diameter. Thus the soils are considered to be primarily silts containing some clay and fine sand. Average moisture content of the soils was 13.85%, and both samples are classified as brown, sandy silts. Appendix D contains the geotechnical analytical reports, which include listings of the analytical methods used as well as the test results.

4.3 Aquifer Testing

The purpose of this testing was to determine the physical characteristics of the aquifer to better assess the potential mobility of contaminants in the groundwater, if present. Aquifer testing was performed on each of the four site wells, as described in the FSP, on each of the four site wells subsequent to completion of groundwater sampling activities. For wells screened across the water table (MWEF-01OB, MWEF-02RK, and MWEF-03RK), the rising head slug test was the appropriate aquifer test to perform for measuring hydraulic conductivity. The screen of MWEF-04OB is entirely within the saturated zone. Therefore, both a rising and a falling head test were conducted at this well.

Slug testing data were interpreted using AQTESOLVE software and the Bower and Rice (1976) method. Hydraulic conductivities at the site were found to range from a low of 4.42×10^{-5} feet per minute (2.24×10^{-5} centimeters per second [cm/sec]) in MWEF-04OB to a high of 2.12×10^{-3} feet per minute (1.08×10^{-2} cm/sec) in MWEF-01OB. Analysis of both the rising and falling head tests in MWEF-04OB were similar (2.24×10^{-5} versus 3.11×10^{-5}, respectively). For comparative purposes, the rising head test is used.

Conductivity values greater than 1×10^{-4} cm/sec are considered rapid. Values in the 10^{-4} to 10^{-6} range are considered moderate. It

appears that based on this data, any water-borne contaminants present would migrate relatively rapidly beneath the northeast part of the site, but at moderate rates in the central and southern parts of the site.

Appendix E presents aquifer testing data plots. Note that for comparative purposes, the theoretical rate of head change (a straight line) has been plotted in addition to the actual head change data. The theoretical rate of head change is based on idealized conditions including testing in a homogeneous, uniformly saturated aquifer.

4.4 Site Topography

The 858 East Ferry Street site is currently almost entirely flat-lying and graded, and is located at a latitude of 78° 49' 50" and a longitude of 42° 55' 00". Site elevation ranges from approximately 651 to 653 feet above mean sea level (AMSL) (Buffalo Sewer Authority 1935). The northeast border is located at the base of a 25-foot high embankment comprising the railroad ROW. Surface drainage over most of the site is generally to the south. A ditch at the base of the embankment receives water from the northeast and eastern edges of the site, as well as from the railroad embankment. Much of the northern portion of the site has become riddled with pits and mounds as a result of bottle-hunting activities in the area. Pits are up to 6 feet deep and 8 feet in diameter; few have been backfilled. Mounds of ash excavated from the pits rise 2 to 3 feet above the natural surface grade and extend around the majority of each pit perimeter.

4.5 Site Ecology

Vegetation at the 858 East Ferry Street site is characterized by a moderately open canopy of trees that allows well-established shrubby and herbaceous layers to exist. The tree strata is dominated by early successional species including cottonwood, bigtoothed aspen, and box elder. The shrub layer is characterized by smaller reproductions of these tree species in addition to sumac and dogwoods. The herbaceous vegetation on the site is characteristic of disturbed land, with typical species including mugwort, goldenrod, Queen Anne's lace, burdock, and Japanese knotweed. The disturbance on site is evidenced by numerous debris mounds and fill material scattered on the surface. The original grade of the site has been significantly altered in the area where the Scajaquada Creek traverses the site through a covered drain. Any hydrologic influence that the creek once had on the site surface drainage has been eliminated. Additionally, the creek's associated floodplain was also removed during this process. Vegetation on the site appears to have established itself well following the culverting of

Scajaquada Creek. There is no obvious vegetation pattern on site to indicate the location of the buried drain beneath the site.

Because of the vegetative vertical diversity present at the site, the property has the potential to provide value to many different wildlife species. However, because of the urban setting of the property, the ability of the property to provide habitat value is limited. Bird species likely to occur on the property include robins, cardinals, sparrows, chickadees, and crows. In addition, the woody vegetation on the site may provide refuge for migratory songbirds during spring and fall migrations. The topography and debris piles make the site conducive to small mammals (e.g., rats, mice, and rabbits) as well as reptiles (e.g., garter snakes). Because of the existing condition of the site and the urbanized nature of the surrounding area, no significant ecological resources were expected at the site. Both the United States Fish and Wildlife Service (USFWS) and the New York State Natural Heritage Program (NYSNHP) verified the absence of significant resources in the project area (Clough 1997; Flood 1997).

NYSNHP files indicate historic occurrences of two species within 1.5 miles of the project area: green gentian (*Frasera Carliniensis*), and tall-tick clover (*Des modium glabellum*) (Roblee 1997). However, these records are over 100 years old and the species are believed to be extirpated from the project area. They were historically associated with the Buffalo Plains ecosystem, which has been eliminated from the City of Buffalo due to urban development.

5 Human Health Risk Evaluation

This preliminary human health risk evaluation for the 858 East Ferry Street site consists of a screening level assessment. Its purpose is to determine which contaminants detected in environmental media at the site potentially pose significant risks to human health under current or expected future site conditions, and to qualitatively discuss these risks. Contaminants detected in site soils include SVOCs (primarily PAHs), pesticides, PCBs, and metals. Possible sources of soil contamination include wastes illegally dumped on the property and releases from adjacent industrial and commercial properties. In addition, some PAH presence detected in site soils may have resulted from deposition of emissions from various fossil fuel sources, including automotive exhaust. Contaminants detected in site groundwater include chlorinated hydrocarbons, petroleum hydrocarbons, and metals. The sources of the organic contaminants in the groundwater have not been identified.

5.1 Exposure Setting and Potential Exposure Pathways

The East Ferry Street site consists of a 3.32-acre vacant lot located in a light industrial area west of Grider Street in Buffalo, New York. Available historical maps and photographs show no previous development of the site. Historically, the site has been used for the illegal, unauthorized disposal of ash on two separate occasions. A white ash extends over much of the central and western portions of the site, and a gray ash is present in the northern portion of the site. In recent years, the site has been used for illegal disposal of C & D debris, tires, and other materials. Current land uses near the site are primarily industrial and commercial. The site is bordered on the south by East Ferry Street, on the east and north by an active rail line, and on the west by TNT Used Autos. A commercial building (now being used as a church) and a large parking lot are located directly across from East Ferry Street. The nearest residences are located west of the parking lot. Potential future uses are extremely limited due to the presence of the Scajaquada Creek. No plans to develop the site have been made at this time.

Access to the site is unrestricted under site conditions existing at the time of field investigation activities. Barriers located at the site, including fences, railroad tracks, and heavy vegetation, discourage casual entry by nearby residents, although people walking dogs and collecting bottles were observed on site during investigation activities. Visitors who do enter the site could potentially be exposed to surface soils by direct-contact routes, dermal contact, and incidental ingestion via hand-to-mouth transfer. These exposure routes would also apply to future site workers if the site is developed. Because site development could involve excavation and other disturbance of site soils, future workers may potentially be exposed to contamination in subsurface soils.

Under existing and likely future site conditions, there are no plausible pathways for human exposure to contamination in site groundwater. As the area is served by a municipal water system, groundwater is not a source of potable water and is unlikely to become one in the future.

5.2 Risk-based Screening

5.2.1 Soil

The goal of the City of Buffalo's Brownfields program is to develop currently unused properties into available real estate. NYSDEC requires that soil remediation alternatives be evaluated using the recommended soil cleanup objectives presented in a Technical and Administrative Guidance Memorandum, referred to as TAGM 4046 (NYSDEC 1994). TAGM 4046 is considered a set of cleanup standards which, if implemented, would eliminate all significant threats to health and the environment. For this reason, a comparison to the TAGM 4046 soil cleanup objectives has been included in the soil screening tables (see Tables 5-1 and 5-2) to identify contaminants of concern, and to characterize the extent of contamination that might require remediation. Figure 5-1 shows the locations of samples containing analytes at concentrations exceeding TAGM levels. Note that many of the more stringent values listed as Recommended Soil Cleanup Objectives for organic chemicals are based on protection of groundwater, while a few are based on potential cancer risks from incidental soil ingestion.

For metals, TAGM 4046 lists site background, either alone or with an alternative value, as a recommended cleanup objective.

Table 5-1 Summary of Analytical Results for Surface Soil, 858 East Ferry Street Site (mg/kg)

Compound	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Local Background Concentration (SSEF-14-SO)	EPA Region III Industrial Soil RBC	Frequency of Exceeding RBC	NYSDEC TAGM4046 Level	Frequency of Exceeding TAGM4046 Level
VOCs								
Total 1,2-Dichloroethene	1/19	0.003 J	0.003 J	0.010 J	20,000[b]	0/19	0.3[f]	0/19
Trichloroethene	1/19	0.003 J	0.003 J	0.010 J	520[a]	0/19	0.7[f]	0/19
Toluene	1/19	0.002 J	0.002 J	0.010 J	410,000	0/19	1.5[f]	0/19
BNAs								
1,2,4-Trichlorobenzene	1/19	0.042 J	0.042 J	0.330 U	23,000	0/19	3.4[f]	0/19
Naphthalene	4/19	0.057 J	1.20	0.092 J	82,000	0/19	13.0[f]	0/19
2-Methylnaphthalene	5/19	0.053 J	0.470 J	0.330 U	82,000[c]	0/19	36.4[f]	0/19
Acenaphthylene	5/19	0.051 J	1.60 J	0.330 U	82,000[c]	0/19	41.0[f]	0/19
Acenaphthene	6/19	0.086 J	1.20	0.180 J	120,000	0/19	50.0[g]	0/19
Dibenzofuran	5/19	0.078 J	0.970	0.140 J	8,200	0/19	6.2[f]	0/19
Fluorene	10/19	0.046 J	1.30	0.220 J	82,000	0/19	50.0[g]	019
Phenanthrene	19/19	0.088 J	11.0	2.40	82,000[c]	0/19	50.0[g]	0/19
Anthracene	16/19	0.050 J	2.80	0.720 J	610,000	0/19	50.0[g]	0/19
Carbazole	14/19	0.049 J	1.30	0.240 J	290[a]	0/19	—	—
Di-n-butylphthalate	13/19	0.047 J	1.10	0.090 J	200,000	0/19	8.1[f]	0/19
Fluoranthene	19/19	0.100 J	17.0 DJ	3.70	82,000	0/19	50.0[g]	0/19
Pyrene	19/19	0.170 J	20.0 DJ	5.50	61,000	0/19	50.0[g]	0/19
Butylbenzylphthalate	8/19	0.050 J	0.940	0.600 J	410,000	0/19	50.0[g]	0/19
Benzo(a)anthracene	19/19	0.096 J	18.0 J	2.40	7.8[a]	1/19	0.224[h]	17/19
Chrysene	18/19	0.083 J	17.0 J	2.50	780[a]	0/19	0.4[f]	12/19
Bis(2-ethylhexyl)phthalate	15/19	0.081 J	86.0	1.80	410	0/19	50.0[g]	1/10

Key at end of table.

Table 5-1 (Cont.)

Compound	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Local Background Concentration (SSEF-14-SO)	EPA Region III Industrial Soil RBC	Frequency of Exceeding RBC	NYSDEC TAGM4046 Level	Frequency of Exceeding TAGM4046 Level
Benzo(b)fluoranthene	19/19	0.130 J	17.0 J	3.50	7.8[a]	1/19	1.1[f]	5/19
Benzo(k)fluoranthene	19/19	0.080 J	4.70 J	0.0033 U	78[a]	0/19	1.1[f]	3/19
Benzo(a)pyrene	19/19	0.099 J	19.0 J	2.10	0.78[a]	6/19	0.061[h]	19/19
Indeno(1,2,3-cd)pyrene	19/19	0.130 J	12.0 J	1.20	7.8[a]	1/19	3.2[f]	2/19
Dibenz(a,h)anthracene	19/19	0.049 J	6.10 J	0.640 J	0.78[a]	5/19	0.014[h]	19/19
Benzo(g,h,i)perylene	19/19	0.140 J	11.0 J	1.20	—	—	50.0[g]	0/19
Pesticides/PCBs								
Aldrin	3/19	0.004 J	0.010 J	0.011 J	0.34[a]	0/19	0.10[f]	0/19
Heptachlor epoxide	7/19	0.0053 J	0.036	0.120	0.63[a]	0/19	0.02[f]	3/19
Dieldrin	2/19	0.0043 J	0.026	0.0033 U	0.36[a]	0/19	0.044[h]	0/19
4,4'-DDE	4/19	0.0051 J	0.350	0.0033 U	17[a]	0/19	2.1[h]	0/19
Endrin	3/19	0.0044 J	0.013 J	0.0033 U	41,000	0/19	0.10[f]	0/19
4,4'-DDD	2/19	0.0048 J	0.029 J	0.0033 U	24[a]	0/19	2.9[h]	0/19
4,4'-DDT	4/19	0.014 J	0.340	0.037 J	17[a]	0/19	2.1[h]	0/19
Methoxychlor	1/19	0.021 J	0.021 J	0.017 U	10,000	0/19	10[i]	0/19
Endrin Ketone	5/19	0.0096 J	0.150 DJ	0.028 J	41,000[d]	0/19	—	—
Aroclor-1260	1/19	43.0 D	43.0 D	0.0033 U	2.9[a]	1/19	1.0[h]	1/19
Inorganics								
Aluminum	19/19	4,160 J	13,800	7,230	1,000,000	0/19	128,000[j]	0/19
Antimony	19/19	1.6 J	52.6 J	5.5 J	820	0/19	5.5[k]	10/19
Arsenic	19/19	5.2	18.3	5.6	3.8[a]	19/19	16[j]	2/19
Barium	19/19	47.2 J	436	65.3	140,000	0/19	867[j]	0/19
Beryllium	14/19	0.33 J	0.79 J	0.37 J	1.3[a]	0/19	1.81[j]	0/19

Key at end of table.

Table 5-1 (Cont.)

Compound	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Local Background Concentration (SSEF-14-SO)	EPA Region III Industrial Soil RBC	Frequency of Exceeding RBC	NYSDEC TAGM4046 Level	Frequency of Exceeding TAGM4046 Level
Cadmium	17/19	0.03 J	11.5 J	0.03 U	1,000	0/19	10[l]	7/19
Calcium	19/19	19,600	156,000	49,200	—	—	49,200[k]	8/19
Chromium	19/19	11.1 J	35.0	14.8	10,000	0/19	50[l]	0/19
Cobalt	19/19	2.9 J	11.7 J	5.9 J	120,000	0/19	30[m]	0/19
Copper	19/19	19.9	396	50.2	82,000	0/19	50.2[k]	12/19
Iron	19/19	8,500	29,000	13,900	610,000	0/19	54,000[l]	0/19
Lead	19/19	149	11,500	248 J	400[c]	13/19	248[k]	15/19
Magnesium	19/19	3,610	77,300	19,800 J	—	—	19,800[k]	8/19
Manganese	19/19	198	499	330	47,000	0/19	1,450[l]	0/19
Mercury	19/19	0.13	1.40	0.33	610	0/19	0.33[k]	12/19
Nickel	19/19	12.9	36.9	15.2	41,000	0/19	38.2[j]	0/19
Potassium	19/19	1,050 J	2,950	1,670	—	—	23,500[l]	0/19
Selenium	9/19	2.0	7.2 J	1.8 J	10,000	0/19	1.8[k]	9/10
Sodium	1/19	346 J	346 J	197 U	—	—	17,400[l]	0/19
Thallium	2/19	0.86 J	0.92 J	0.87 U	140	0/19	13.8[j]	0/19
Vanadium	18/19	16	43.4	18.6	14,000	0/19	150[l]	0/19
Zinc	19/19	82.2	2,680	191	610,000	0/19	191[k]	14/19
Cyanide	2/19	1.3 J	1.4 J	0.61 U	100,000	0/19	—	—

Key at end of table.

Table 5-1 (Cont.)

Note: Concentrations that exceed both TAGM 4046 values and background levels are shaded.

[a] Corresponds to an upper-bound cancer risk of 1 x 10^{-6}.
[b] RBC for cis-1,2-dichloroethane.
[c] RBC for naphthalene.
[d] RBC for Endrin.
[e] EPA screening level for lead in soil in residential setting.
[f] Soil cleanup objective to protect groundwater quality.
[g] Objective for individual SVOCs is <50 ppm.
[h] Objective based on potential cancer risk from soil.
[i] Objective for total pesticides is <10 ppm.
[j] 90th percentile concentration in eastern U.S. soil (USGS 1984).
[k] Concentration reported in the local background soil sample.
[l] Concentration specified by NYSDEC Region 9 (Locey 1998).
[m] Concentration specified in TAGM 4046.

Key:

D	=	Result taken from diluted sample analysis.
J	=	Estimated value.
RBC	=	Risk-based concentration.
TAGM	=	Technical and Administrative Guidance Memorandum. Values listed are recommended soil cleanup objectives from TAGM 4046.
U	=	Analyte was not detected; value reported is the quantitation limit.

Table 5-2 Summary of Analytical Results for Subsurface Soil, 858 East Ferry Street Site (mg/kg)

Compound	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Local Background Concentration (SSEF-14-SO)	EPA Region III Industrial Soil RBC	Frequency of Exceeding RBC	NYSDEC TAGM4046 Level	Frequency of Exceeding TAGM4046 Level
VOCs								
2-Butanone	1/11	0.010 J	0.010 J	0.010 U	1,000,000	0/12	0.3[f]	0/12
Toluene	3/11	0.001 J	0.005 J	0.010 U	410,000	0/12	1.5[f]	0/12
BNAs								
Naphthalene	1/11	0.045 J	0.045 J	0.092 J	82,000	0/12	13.0[f]	0/12
Acenaphthene	3/11	0.061 J	0.091 J	0.180 J	120,000	0/12	50.0[g]	0/12
Dibenzofuran	3/11	0.048 J	0.076 J	0.140 J	8,200	0/12	6.2[f]	0/12
Fluorene	4/11	0.068 J	0.100 J	0.220 J	82,000	0/12	50.0[g]	0/12
Phenanthrene	10/11	0.084 J	1.20	2.40	82,000[c]	0/12	50.0[g]	0/12
Anthracene	5/11	0.079 J	0.220 J	0.720 J	610,000	0/12	50.0[g]	0/12
Carbazole	5/11	0.050 J	0.120 J	0.240 J	290[b]	0/12	—	—
Di-n-butylphthalate	2/11	0.052 J	0.052 J	0.090 J	200,000	0/12	8.1[f]	0/12
Fluoranthene	10/11	0.110 J	1.60	3.70	82,000	0/12	50.0[g]	0/12
Pyrene	10/11	0.120 J	2.10	5.50	61,000	0/12	50.0[g]	0/12
Butylbenzylphthalate	3/11	0.045 J	0.480	0.600 J	410,000	0/12	50.0[g]	0/12
Benzo(a)anthracene	10/11	0.057 J	1.00	2.40	7.8[b]	0/12	0.224[h]	5/12
Chrysene	10/11	0.067 J	0.970	2.50	780[b]	0/12	0.4[f]	4/12
Benzo(b)fluoranthene	10/11	0.048 J	1.40	3.50	7.8[b]	0/12	1.1[f]	2/12
Benzo(k)fluoranthene	8/11	0.048 J	0.580	0.0033 U	78[b]	0/12	1.1[f]	0/12
Benzo(a)pyrene	9/11	0.075 J	0.780	2.10	0.78[b]	0/12	0.061[h]	9/12
Indeno(1,2,3-cd)pyrene	9/11	0.062 J	0.480	1.20	7.8[b]	0/12	3.2[f]	0/12
Dibenz(a,h)anthracene	5/11	0.086 J	0.250 J	0.640 J	0.78[b]	0/12	0.014[h]	5/12

Key at end of table.

Table 5-2 (Cont.)

Compound	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Local Background Concentration (SSEF-14-SO)	EPA Region III Industrial Soil RBC	Frequency of Exceeding RBC	NYSDEC TAGM4046 Level	Frequency of Exceeding TAGM4046 Level
Benzo(g,h,i)perylene	9/11	0.063 J	0.470	1.20	—	—	50.0[g]	0/12
Pesticides/PCBs								
Aldrin	3/11	0.0022 J	0.0054 J	0.011 J	0.34[b]	0/12	0.10[f]	0/11
Heptachlor epoxide	3/11	0.0033 J	0.014	0.120 J	0.63[b]	0/12	0.02[f]	0/11
Dieldrin	1/11	0.015	0.015	0.0033 U	0.36[b]	0/12	0.044[h]	0/11
4,4'-DDT	1/11	0.010	0.010	0.037 J	17[b]	0/12	2.1[h]	0/11
Endrin ketone	1/11	0.005 J	0.005 J	0.028 J	41,000[d]	0/12	—	—
Inorganics								
Aluminum	11/11	5,670	13,000	7,230	1,000,000	0/11	128,000[i]	0/11
Antimony	11/11	2.3 J	258	5.5 J	820	0/11	5.5[j]	8/11
Arsenic	9/11	5.0	21.0	5.6	3.8[b]	8/11	16[i]	1/11
Barium	11/11	56.1	1,380[a]	65.3	140,000	0/11	867[i]	1/11
Beryllium	11/11	0.29 J	0.81 J	0.37 J	1.3[b]	0/11	1.81[i]	0/11
Cadmium	7/11	0.05 J	1.5[a]	0.03 U	1,000	0/11	1[k]	3/11
Calcium	11/11	7,620	102,000	49,200	—	—	49,200[j]	5/11
Chromium	11/11	6.6	81[a]	14.8	10,000	0/11	112[i]	0/11
Cobalt	11/11	2.8 J	16.2	5.9 J	120,000	0/11	30[k]	0/11
Copper	11/11	20.7	333[a]	50.2	82,000	0/11	50.2[j]	5/11
Iron	11/11	2,410	44,400[a]	13,900	610,000	0/11	54,000[i]	0/11
Lead	11/11	110	28,500	248 J	400[c]	6/11	248[j]	10/11
Magnesium	11/11	950 J	43,800 J	19,800 J	—	—	19,800[j]	4/11
Manganese	11/11	20.3	1,080[a]	330	47,000	0/11	1,450[i]	0/11
Mercury	9/11	0.19	1.52[a]	0.33	610	0/11	0.33[j]	5/11

Key at end of table.

Table 5-2 (Cont.)

Compound	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Local Background Concentration (SSEF-14-SO)	EPA Region III Industrial Soil RBC	Frequency of Exceeding RBC	NYSDEC TAGM4046 Level	Frequency of Exceeding TAGM4046 Level
Nickel	11/11	9.4	32.6	15.2	41,000	0/11	38.2[l]	0/11
Potassium	11/11	1,040 J	2,000	1,670	—	—	23,500[l]	0/11
Selenium	5/11	1.7 J	10.8[a]	1.8 J	10,000	0/11	1.8[j]	4/11
Silver	2/11	1.1 J	2.2 J	0.52 U	10,000	0/11	0.52[l]	1/11
Sodium	4/11	229	997	197 U	—	—	17,400[l]	0/11
Vanadium	11/11	15.5	119	18.6	14,000	0/11	150[k]	0/11
Zinc	11/11	88.5	1,400	191	610,000	0/11	191[j]	7/11
Cyanide	1/11	1.3 J	1.3 J	0.61 U	100,000	0/11	—	—

Note: Concentrations that exceed both TAGM 4046 values and background levels are shaded.

a Average concentration in duplicate samples.
b Corresponds to an upper-bound cancer risk of 1×10^{-6}.
c RBC for naphthalene.
d RBC for Endrin.
e EPA screening level for lead in soil in residential setting.
f Soil cleanup objective to protect groundwater quality.
g Objective for individual semivolatile organic compounds is <50 ppm.
h Objective based on potential cancer risk from soil.
i 90th percentile concentration in eastern U.S. soil (USGS 1984).
j Concentration reported in the local background soil sample.
k Concentration specified in TAGM 4046.

Key:

J = Estimated value.
RBC = Risk-based concentration.
TAGM = Technical and Administrative Guidance Memorandum. Values listed are recommended soil cleanup objectives from TAGM 4046.
U = Analyte was not detected; value reported is the quantitation limit.

Because only a single local background sample was collected for this site, data on eastern U.S. soils presented by Shacklette and Boerngen (USGS 1984) was also considered in selecting a background level. For each metal, the highest value from three possible alternatives was selected for screening purposes: the 90th percentile level from the eastern U.S. soil data; the concentration reported in the local background sample; or the specified alternative value in TAGM 4046.

EPA Region III has developed risk-based concentrations (RBCs) for industrial soils (EPA 1996) based on potential worker exposures by incidental ingestion, which were adopted as screening criteria for contaminants in site soil. These values, which are not officially endorsed by New York State regulatory agencies, are intended only as points of reference for purposes of discussing commercial/industrial use and not as recommendations for cleanup. RBCs tend to be higher than TAGM 4046 soil cleanup objectives.

Generally, RBCs are based on the default reasonable maximum exposure assumption that a worker ingests 50 milligrams (mg) of site soil each day, 250 days per year, for a period of 25 years. The RBCs were calculated to correspond to one of two target risk levels: an upperbound excess lifetime cancer risk of 1×10^{-6}, or a noncancer hazard quotient of 1.0. A cancer risk of 1×10^{-6} is equal to a one-in-a-million probability. It is the lower end of the 10^{-6} to 10^{-4} range regarded as acceptable by EPA. A noncancer hazard quotient is EPA's method for quantifying noncarcinogenic effects. The resulting RBCs are adequately protective for future site workers, and more than adequately protective for site visitors whose potential exposures are likely far less. An RBC has not been calculated for lead in soil, as it has no EPA-approved toxicity values. In lieu of an RBC, EPA's recommended screening level for lead in residential soils (400 milligrams per kilogram [mg/kg]) was used (EPA 1994c).

Table 5-1 summarizes the analytical results for the 19 surface soil samples collected during the first field effort (excluding the background sample, SS-14) and compares them to the soil screening criteria. Table 5-2 summarizes the results for 11 samples collected from test trenches during the first field effort. In addition, the tables list the results for the local background sample collected at the southwest corner of the site. Because metals occur naturally in soil, and because there may be other sources of contamination that are not site-related (particularly in an urban environment), it is important to consider how site soil concentrations compare to local background concentrations, in addition to other screening criteria. Note that a single soil sample provides only a rough indication of

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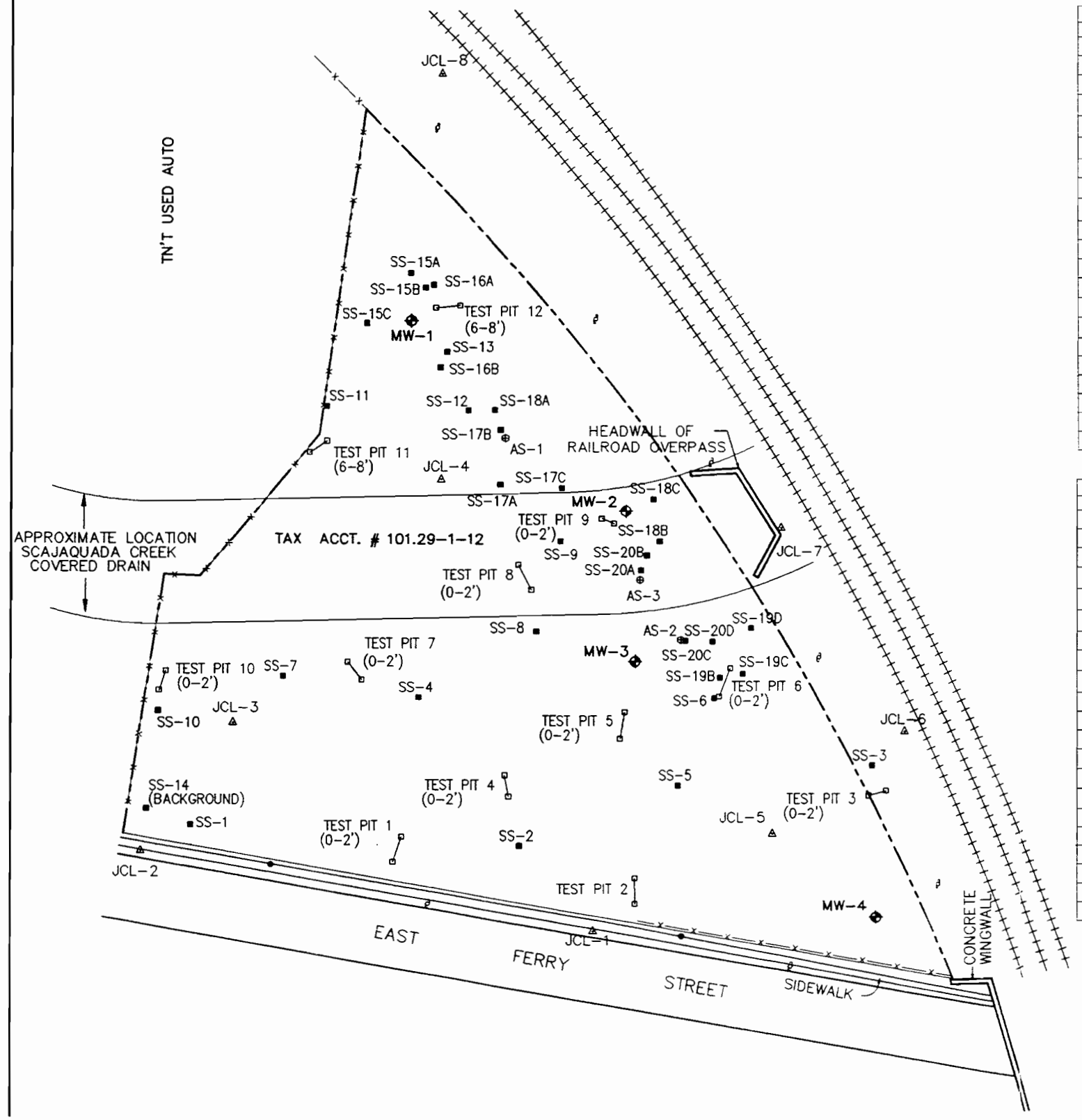

SURFACE SOIL (SS) SAMPLES

Sample Number	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12	SS-13	SS-14 – Bkgd.	SS-15	SS-16	SS-17	SS-18	SS-19	SS-20
Analyte:	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
Benzo (a) anthracene	4.9	5.9	18	0.36	0.56	1.08	0.65	0.29	0.28	4.7	4.0	0.34	1.2	2.4	0.38	–	0.48	0.23	–	0.47
Chrysene	4.5	7.2	17	0.42	0.64	1.21	0.69	–	–	5.1	4.4	–	0.43	2.5	0.41	–	0.50	–	–	0.49
Bis (2-ethylhexyl) Phthalate	–	–	–	–	–	–	–	–	–	–	–	–	86	1.8	–	–	–	–	–	–
Benzo (b) fluoranthene	5.1	4.5	17	–	–	–	–	–	–	3.7	4.4	–	–	3.5	–	–	–	–	–	–
Benzo (k) fluoranthene	3.6	4.7	–	–	–	–	–	–	–	–	2.6	–	–	–	–	–	–	–	–	–
Benzo (a) pyrene	5.1	5.1	19	0.33	0.49	1.0	0.49	0.23	0.24	3.6	3.1	0.32	0.55	2.1	0.074	0.10	0.099	0.23	0.23	0.42
Indeno (1,2,3-cd) pyrene	–	4.9	12	–	–	–	–	–	–	–	–	–	–	1.2	–	–	–	–	–	–
Dibenzo (a,h) anthracene	1.0	2.4	6.1	0.092	0.23	0.36	0.25	0.13	0.12	1.1	0.89	0.13	0.20	0.64	0.14	0.049	0.18	0.099	0.069	0.17
Heptachlor Epoxide	–	–	–	–	–	–	–	–	–	–	–	–	0.036	0.12	–	–	0.022	–	–	0.029
Aroclor 1260	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	43	–
Antimony	5.8	–	13.4	6.8	11.0	–	11.7	–	–	33	52.6	20.2	35.8	5.5	11.7	–	–	–	–	–
Arsenic	–	–	18.3	–	–	–	–	–	–	–	16.5	–	–	5.6	–	–	–	–	–	–
Barium	–	–	–	–	–	–	–	–	–	–	–	–	–	65.3	–	–	–	–	–	–
Cadmium	–	1.1	2.8	1.1	11.5	–	–	–	–	2.6	5.9	–	–	<0.03	–	–	–	–	5.7	–
Calcium	92,500	113,000	–	50,600	–	112,000	62,000	156,000	–	–	–	–	–	49,200	–	–	–	–	87,600	60,600
Copper	–	–	396	53.0	94.2	–	52.8	–	–	155	213	71.9	71.3	50.2	60.2	62.2	61.2	63	–	–
Lead	469	–	718	–	469	–	725	–	–	1,390	5,290	2,550	2,820	248	11,500	832	1,780	2,160	364	647
Magnesium	–	25,000	–	28,300	20,600	41,800	30,100	77,300	19,900	–	–	–	–	19,800	–	–	–	–	–	23,900
Mercury	–	–	0.45	0.35	0.45	–	0.5	–	–	0.7	1.4	0.5	0.73	0.33	0.61	0.85	0.61	0.72	–	–
Selenium	–	–	6.6	2	2.9	–	–	–	–	6.4	7.2	3.3	3.7	1.8	–	2.7	–	–	–	–
Zinc	270	290	475	478	383	–	310	–	–	1,230	2,180	295	428	191	1,170	320	347	360	–	–

TEST TRENCH (TT) SAMPLES

Sample Number	TP-1	TP-3	TP-4	TP-5	TP-6	TP-7	TP-8	TP-9	TP-10	TP-11	TP-12
Analyte:	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
Benzo (a) anthracene	0.88	–	–	1.0	0.56	–	–	0.25	0.76	–	–
Chrysene	0.97	–	–	0.96	0.62	–	–	–	0.77	–	–
Bis (2-ethylhexyl) Phthalate	–	–	–	–	–	–	–	–	–	–	–
Benzo (b) fluoranthene	1.4	–	–	–	–	–	–	–	1.3	–	–
Benzo (k) fluoranthene	–	–	–	–	–	–	–	–	–	–	–
Benzo (a) pyrene	0.78	–	0.099	0.73	0.41	–	0.075	0.20	0.72	0.14	0.13
Indeno (1,2,3-cd) pyrene	–	–	–	–	–	–	–	–	–	–	–
Dibenzo (a,h) anthracene	0.25	–	–	0.24	0.17	–	–	0.086	0.22	–	–
Heptachlor Epoxide	–	–	–	–	–	–	–	–	–	–	–
Aroclor 1260	–	–	–	–	–	–	–	–	–	–	–
Antimony	6.8	8.4	–	9.2	–	258	–	15.5	209	11.2	–
Arsenic	–	–	–	–	–	–	–	–	21.0	–	–
Barium	–	–	–	–	–	–	–	–	–	1,380	–
Cadmium	–	–	–	–	1.5	1.2	–	–	–	1.8	–
Calcium	55,800	–	–	56,900	102,000	–	–	54,800	91,300	–	–
Copper	50.6	158	–	101	–	–	–	–	51.1	333	–
Lead	257	352	718	607	–	23,500	374	605	19,900	2,840	265
Magnesium	–	–	–	23,500	33,700	–	–	21,400	43,800	–	–
Mercury	–	0.68	–	0.71	–	–	0.44	0.39	–	1.4	0.41
Selenium	1.7	4.9	–	3.1	–	–	–	–	–	10.8	5.0
Zinc	232	261	–	331	–	1,400	–	197	583	1,026	–

GROUNDWATER SAMPLES

Sample Number	MW-1	MW-2	MW-3
Analyte:	(ppb)	(ppb)	(ppb)
1,2-Dichloroethene	–	10	–
Benzene	–	–	260
Lead (unfiltered)	29	–	–
Pentachlorophenol	6	–	–
Vinyl chloride	–	16	–

LEGEND

- (ppb) PARTS PER BILLION
- (ppm) PARTS PER MILLION
- ⊕ ASBESTOS SAMPLE
- ▫ TEST PIT
- ⊕ MONITORING WELL
- ■ SOIL SAMPLE
- △ JCL CONTROL POINT
- UTILITY POLE
- MANHOLE
- PROPERTY LINE
- RAILROAD TRACKS
- CHAIN-LINK FENCE

NOTE:

HORIZONTAL DATUM IS LOCAL WITH ASSUMED COORDINATES AND MAGNETIC NORTH.

VERTICAL DATUM IS LOCAL WITH THE TOP OF JCL-1 REBAR/CAP ELEVATION = 100.00. NO EXISTING MONUMENTATION WITHIN A 2-MILE RADIUS.

ALL PROPERTY LINES SHOWN ON THIS MAP ARE APPROXIMATELY POSITIONED PER CURRENT TAX MAPS OR EXISTING OCCUPATION.

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SCALE IN FEET

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Figure 5-1 FIRST FIELD EVENT CONTAMINANT CONCENTRATIONS EXCEEDING TAGM 4046 VALUES 858 EAST FERRY STREET BUFFALO, NEW YORK

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background levels and does not reflect the range of concentrations that may be present in local soils. All inorganic concentrations and most organic chemical concentrations reported in the background sample were below TAGM 4046 levels. The exceptions were benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, dibenz(a,h) anthracene, or heptachlor epoxide.

PCBs were detected in just one composite surface soil sample at a concentration 43 times greater than the TAGM 4046 recommended soil cleanup objective. Significant PAH contamination was found to be more widespread in site soils. Benzo(a)pyrene and dibenz(a,h)anthracene were detected in all surface soil samples and in many of the trench soil samples collected at concentrations above their TAGM 4046 levels. The higher concentrations of other c-PAHs—benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno (1,2,3-cd)pyrene—detected in site soil samples also exceeded their respective TAGM 4046 levels, as did the maximum concentration of bis(2-ethylhexyl)phthalate. In addition, heptachlor epoxide concentrations in three site soil samples slightly exceeded the recommended cleanup objective, although they were below the concentration reported in the background sample.

Most organic analytes were detected at concentrations far below their respective RBCs. However, six were detected in surface soil at concentrations exceeding their RBCs, which are all associated with the target cancer risk of 1×10^{-6}; they were the PAHs benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, and the PCB mixture Aroclor-1260. These chemicals are all classified by EPA as Group B2, probable human carcinogens, based on carcinogenicity in animals. The PAHs can cause cancer at the point of exposure; oral exposures are associated with stomach cancer. Exposure to PCBs is associated with liver cancer. During the first field effort, Aroclor-1260 was detected only in SSEF-19, a composite sample from beneath piles containing television sets and other debris. The PCB concentration (43 mg/kg) is almost 15 times greater than the RBC.

The highest PAH concentrations were detected in sample SSEF-03, collected from the foot of the railroad embankment at the eastern edge of the site. PAH concentrations exceeding RBCs were also found in surface soil samples collected from the southern and eastern edges of the site next to roadways. The higher concentrations found near East Ferry Street, which ranged from approximately 1 to 5 mg/kg for individual PAHs, were approximately twice as great as the concentrations in the background sample; these may reflect PAH deposition from automobile exhaust. These

concentrations are within PAH levels typically found in soils in urban areas near traffic or other fossil fuel combustion sources (Menzie et al. 1992). PAH concentrations detected in subsurface soils did not exceed RBCs. Based on the maximum concentrations of PAHs and PCBs detected at the site, the estimated total upperbound cancer risk for workers is approximately 1×10^{-4}, just within EPA's acceptable range. A more realistic estimate is based on long-term average exposure concentrations, which would almost certainly be lower than the maximum exposure concentrations, and would probably fall nearer to the middle of the 10^{-6} to 10^{-4} range.

Lead concentrations in most site surface soil and trench samples exceeded the site background concentration, the TAGM 4046 Recommended Soil Cleanup Objective. Several concentrations also exceed NYSDOH's guidance value of 1,000 mg/kg for properties evaluated under a commercial/industrial future use scenario. The highest lead concentration detected in surface soil (11,500 mg/kg) was in composite sample SSEF-10, which was collected from beneath an ash pile near the northern corner of the site. Moving south from the pile, the surface soil data show a gradual decrease in lead concentrations. However, even higher lead concentrations (28,500 mg/kg and 19,900 mg/kg) were found in shallow test trench samples TTEF-7 and TTEF-10 in the southwest portion of the site. Chronic exposure to these very high soil lead concentrations, which are in the percent range, could potentially pose adverse health effects to workers.

Arsenic concentrations in all of the surface soil samples and in most of the test pit samples exceeded the RBC, which is based on potential cancer risk. However, the arsenic concentrations were not much greater than background concentrations. The highest arsenic concentration detected (21.0 mg/kg) was only slightly greater than the background screening value and less than four times the concentration detected in the local background sample. The cancer risk associated with the maximum arsenic concentration would be approximately 6×10^{-6}, within EPA's acceptable range.

The concentrations of all other inorganic analytes detected in site soils were below their respective industrial soil RBCs, which indicates that they would pose no significant health risks to future site workers. However, the concentrations of antimony, cadmium, calcium, copper, magnesium, mercury, selenium, and zinc in approximately half the site soil samples collected exceeded the background screening levels. Thus, they exceed TAGM 4046 standards. Generally, the highest concentrations of antimony,

copper, mercury, selenium, and zinc were found in areas where lead concentrations were also very high.

The results from the first field effort identified c-PAHs, PCBs, and lead in site soils as the contaminants of greatest concern. Consequently, the second field effort focused on delineating the extent of those contaminants in the soil. In support of this second objective, PAHs and PCBs were analyzed using field screening methods, with approximately 10% of these samples being selected for confirmation analyses using CLP methods. Though not equivalent, the screening results were consistent with the CLP method results.

The first field effort revealed elevated c-PAH concentrations in surface and near-surface soils site-wide. To investigate the vertical extent of this c-PAH contamination, those locations containing c-PAH concentrations exceeding New York State regulatory criteria were sampled at slightly greater depths during the second field effort. Table 3-10 presents the c-PAH results of this second field effort.

Although the actual PAH concentration for samples with results reported as >1 is uncertain, the overall results indicate that PAH concentrations below the surface are substantially lower than the elevated concentrations found at the surface. Total c-PAHs found at depths >2 feet were less than 1 ppm with the exception of SSEF-11 at the fenceline bordering the TNT Used Auto property. Dumping of used oil in that area may account for this localized deeper subsurface PAH contamination. Overall, the results confirm that significant PAH contamination is limited to surface soil.

The PCB investigation conducted during the second field effort involved sample collection of surface and near-surface soils from three tight sampling grids in the areas associated with composite sample SSEF-19, which had a PCB concentration of 43 mg/kg. Table 3-4 presents the positive PCB results. PCB concentrations were detected in some samples from television debris pile grid 11, which was located in the area of prior sample node SSEF-19A. PCB screening test results were reported as >10 ppm in eight of the 27 samples collected; these high concentrations were found at the southeast end of the grid at 0- to 2-inch and 6- to 12-inch depth intervals.

The reported PCB concentrations decreased to non-detectable levels at the northwest end of the grid. Six samples were analyzed by the CLP method in addition to the screening test. In the four samples with screening results of >10 ppm PCBs, the CLP results ranged from 12 to 590 mg/kg. The maximum observed concentration, which was found in surface soil from the south corner of

television debris pile grid 11, is 590 times greater than the TAGM 4046 level and approximately 200 times greater than the RBC for PCBs. The estimated upperbound cancer risks for worker exposure at that level would exceed 10^{-4}, the upper end of the range regarded as acceptable by EPA. The observed distribution of PCB concentrations suggests that there may be elevated PCB concentrations in soils to the south and southeast of the grid.

With regard to lead, the objective of the second field effort was to characterize the extent of contamination near the location of the highest lead concentration from the first effort (28,500 mg/kg). Although a systematic sampling grid was used during the second field effort, the 15 soil samples collected from varying depths for lead analysis were visually pre-screened for the presence of the white ash material that was a suspected source of elevated soil lead levels. The results for these samples are presented in Table 3-8; they indicate that there is fairly extensive lead contamination in the central western portion of the site. Lead concentrations > 20,000 mg/kg were reported in four samples from this area. Generally, the higher lead concentrations were found near the surface (upper 2 feet); however, the maximum concentration (46,700 mg/kg) was found in a 2.3- to 4.0-foot depth interval.

From a risk assessment standpoint, other than the unexpectedly high PCB concentrations found at television debris pile grid 11, the results from the second field effort generally confirmed the findings from the first effort.

Based on the prevalence and nature of contaminant concentrations exceeding TAGM 4046 and other risk-based criteria, soil conditions at this site will require remediation when the site is developed.

5.2.2 Groundwater

Based on the lack of credible exposure pathways, it seems unlikely that contamination in site groundwater poses any significant human health risks. Groundwater is not a current or likely future drinking water supply source in the area; however, NYSDEC policy regards all groundwater as a potential source of drinking water. Therefore, for the purpose of discussion in this risk evaluation, contaminant concentrations detected in groundwater were compared to applicable regulatory standards, the New York State Class GA groundwater standards (NYSDEC 1998).

Table 5-3 summarizes the analytical results for unfiltered groundwater samples collected from the four site monitoring wells during the first field effort.

Table 5-3 Summary of Analytical Results for Unfiltered Groundwater (µg/L), 858 East Ferry Street Site

Compound	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Class GA Groundwater Standard	Frequency of Exceeding GA Standard
VOCs					
Vinyl chloride	1/4	16	16	2	1/4
Total 1,2-dichloroethene	1/4	10	10	5	1/4
Benzene	1/4	260 J	260 J	1.0	1/4
Toluene	1/4	1 J	1 J	5	0/4
BNAs					
Pentachlorophenol	1/4	6 J	6 J	1	1/4
Pyrene	1/4	1 J	1 J	50 G	0/4
Inorganics					
Aluminum	4/4	132 J	2,480	—	
Antimony	1/4	2 J	2.3 J	3	0/4
Barium	3/4	74	140 J	1,000	0/4
Cadmium	1/4	3 J	3 J	5	0/4
Calcium	4/4	76,600	254,000	—	—
Chromium	2/4	12	34	50	0/4
Copper	1/4	11 J	11	200	0/4
Iron	4/4	715	7,020	500[a]	4/4
Lead	1/4	29	29	25	1/4
Magnesium	4/4	21,800	89,200	35,000 G	3/4
Manganese	4/4	68	1,700	500[a]	1/4
Nickel	2/4	13.2 J	22.2 J	100	—
Potassium	3/4	4,490	11,000	—	—
Sodium	4/4	11,500	47,400	20,000	2/4
Vanadium	1/4	7 J	7 J	—	—
Zinc	2/4	30	61	2,000 G	0/4
Cyanide	1/4	1,140	1,140	200	1/4

[a] Applies to the sum of iron and manganese concentrations.

Key:

G = Guidance value; standard not available.

J = Estimated value.

Several organic compounds were detected at concentrations exceeding Class GA Standards. Vinyl chloride and 1,2-dichloroethene were detected at concentrations eight times and two times greater, respectively, in the groundwater sample from monitoring well MWEF-02RK, located approximately halfway between the north and east corners of the site near the railroad berm. Also, benzene was detected in the sample from monitoring well MWEF-03RK, located south of monitoring well MWEF-02RK, at a concentration more than 400 times greater than its Class GA standard, and pentachlorophenol was detected in water from well MWEF-03RK at a concentration more than six times greater than its standard. The Class GA standards are based primarily on human health concerns. Benzene and vinyl chloride are known human carcinogens.

The lead concentration reported in the unfiltered sample from monitoring well MWEF-01OB slightly exceeded the Class GA lead standard. However, lead was not detected in the filtered sample from that well, which indicates that the lead is associated with suspended particles in the unfiltered sample. Cyanide was reported in the groundwater sample from well MWEF-03RK at a concentration 11 times greater than the Class GA standard for cyanide. Other inorganic analytes detected in site groundwater at concentrations exceeding Class GA standards include iron, magnesium, manganese, and sodium.

As an extension of the first field effort, another groundwater sample was collected from well MWEF-03RK to confirm the presence of benzene, which was considered the primary contaminant of concern in site groundwater. This second groundwater sample contained a benzene concentration of 180 μg/L, slightly lower than the original result, but still over 250 times greater than the New York State Class GA standard.

5.3 Ecological Risk Evaluation

The ecological risk posed to the environment by the 858 East Ferry Street site is considered extremely minimal due to the absence of significant ecological resources at the site. As discussed in Section 4.5, there are no endangered species inhabiting the site, and the area has not been designated a critical habitat by NYSDEC or by the United States Fish and Wildlife Service.

6 Identification and Development of Remedial Alternatives

6.1 Introduction

This section presents the methodology and rationale used to develop remedial action alternatives for the 858 East Ferry Street site. Note that debris piles containing ACM exist at this site. The costs of removing these materials from the site is not included in the alternative evaluations; however, they will be addressed at the time of development. Asbestos removal is addressed in further detail in Section 7. Also, note that long-term groundwater monitoring is recommended at the site regardless of which remedial alternative is implemented.

6.2 Remedial Action Objective

As stated in Section 5.2.1, the objective of the Brownfields program is to return a given project site to pre-release, or pre-disposal, conditions where feasible. Appropriate cleanup goals to achieve pre-disposal conditions were developed and are discussed in the following section. It is not always practical and feasible, however, to return a given project site to pre-disposal conditions given current site conditions. Therefore, a second set of site cleanup goals was developed to achieve urban conditions and make the site suitable for possible future commercial or industrial use. These cleanup goals are also discussed below.

Appropriate remedial action alternatives will be developed and evaluated based on compliance with both of these remedial action objectives. Based on the designated future use of the site, the final remedy for the site will be selected from these alternatives.

6.2.1 Pre-Disposal Conditions

Pre-disposal conditions correspond to cleanup goals that are considered to be the most protective of human health and the environment and would be appropriate for a residential future use of the site or equivalent. NYSDOH has established the following guidance values for PAH and lead contamination that will be used as the cleanup goals to achieve pre-disposal conditions:

- a maximum concentration of 1 ppm total carcinogenic PAHs and 10 ppm total PAHs in top two feet of soil (O'Connor 1997); and

- a maximum concentration of 500 ppm lead in top two feet of soil (O'Connor 1997).

6.2.2 Urban Conditions

The cleanup goals for achieving urban conditions on site are less protective than the cleanup levels established for achieving pre-disposal conditions as a result of different exposure scenarios and potential human health risks. In general, urban levels would correspond to a commercial/industrial future use of the site or equivalent. NYSDOH uses a screening level of 1,000 ppm lead to assess properties for potential future commercial use (O'Connor 1997). In addition, TAGM 4046 establishes a limit on the concentration of total SVOCs, of which PAHs are a subset, in the surface soils (0 to 2 inches) to $\leq$500 ppm, and on each individual SVOC concentration to $\leq$50ppm. These values have been established as the cleanup goals for urban conditions. In cases where contaminant concentrations in the subsurface soil exceed these levels, individual TAGM values were reviewed to determine the potential impact on groundwater quality from a given contaminant.

6.2.3 Regulatory Implications of Contaminant Concentrations

In general, the contaminants detected in the soils at the 858 East Ferry Street site include PAHs, PCBs, pesticides, and metals. Of the PAHs detected, the following c-PAHs are present: benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. All contaminants detected at concentrations exceeding TAGM 4046 levels are shown on Figure 5-1. The pre-disposal cleanup goal for c-PAHs of 1 ppm was exceeded in approximately half of the soil samples collected on site. Sample locations where cleanup goals were exceeded were found across the entire site. There were no exceedances of the cleanup goal of 500 ppm total semivolatiles established for the site in any of the surface or subsurface soil samples. However, the SVOC bis(2-ethylhexyl) phthalate was detected at 86 ppm in surface soil sample SS-13, which exceeds the 50 ppm limit established for individual SVOCs.

Lead was detected in surface and subsurface soil samples collected throughout the site at concentrations exceeding the TAGM 4046 level, which is the site background concentration, and the site cleanup goals of 500 ppm (pre-disposal level) and 1,000 ppm (urban level). Two distinct types of lead-contaminated material

were found on site. A layer of white ash containing high concentrations of lead was detected. Based on the results of TCLP analysis, the ash was determined to be a characteristic hazardous waste for lead under New York State regulations (see Section 3.4.1). The areal extent of the ash layer was delineated during the second field effort and is shown on Figure 3-2. In addition to the lead-contaminated white ash, lead-contaminated soil rich in gray ash was found mainly in the northern portion of the site.

PCBs were detected in the vicinity of the television debris piles. Results from the site investigation indicated PCBs in excess of 1 ppm (the TAGM 4046 level) at ten locations in television debris pile grid 11 (see Figure 3-1). PCBs were also detected at several locations at concentrations exceeding 10 ppm. The maximum concentration detected was 590 ppm. Under 6 NYCRR Part 371.4 (e), soils contaminated with greater than 50 ppm PCBs are a listed hazardous waste (B007). The disposal of PCB-contaminated soil is regulated in accordance with the provisions of the Toxic Substances Control Act (TSCA), 40 CFR Part 761.

Groundwater at the 858 East Ferry Street site was determined to pose no risks to human health because it is not a current or likely future source of drinking water. Because the entire area is adequately supplied by public water, no remedial alternatives were developed for groundwater.

Note that four groups of man-emplaced materials exist on the site: fill, debris, a white ash, and a gray ash. The Scajaquada Creek Drain is overlain with fill material, presumably originating from its construction, that consists mainly of natural sands, silts, and clays that were graded and compacted after emplacement. The top of the fill is considered "ground surface." The remedial action alternatives developed in the following sections address remediation of this material. For the purposes of this discussion, this material is referred to in conjunction with native site soils as "soil." Material that has been dumped on top of the fill is termed "debris." The white ash was found in the subsurface soil, as discussed in Sections 3 and 4, while the gray ash was found at the surface in most locations, although it was occasionally found in subsurface soils as well.

With the exception of ACMs, the cost of removing any surface debris has not been factored into the alternatives.

6.3 General Response Actions

In order to meet the remedial action objective, general response actions are implemented at a site and may include treatment, containment, excavation, extraction, disposal, institutional con-

trols, or a combination of these. The following general response actions were identified for the soils at the 858 East Ferry Street site:

- Containment,
- Removal (Partial or Complete),
- Off-site Disposal,
- Off-site Treatment,
- Institutional Controls, and
- No Action.

6.4 Development of Alternatives

The general response actions identified in Section 6.3 are assembled into remedial action alternatives that address the contamination concerns at the site as a whole. As discussed in Section 6.2, two sets of cleanup goals were identified for the 858 East Ferry Street site on the basis of returning the site to either pre-disposal conditions or urban conditions. The following remedial action alternatives were developed for this site to address both possible future site conditions:

- Alternative 1 - Containment and Institutional Controls;
- Alternative 2 - Excavation and Off-site Treatment and Disposal;
- Alternative 3 - Institutional Controls; and
- Alternative 4 - No Action.

These alternatives are evaluated in detail in Section 7.

7 Detailed Analysis of Alternatives

7.1 Introduction

A detailed analysis of the remedial action alternatives developed for the 858 East Ferry Street site consists of the presentation and analysis of information necessary to select a remedial action for the site. The proposed alternatives were analyzed in this report using the following seven evaluation criteria as defined in Regulation 6 NYCRR Part 375:

1. Overall protection of human health and the environment,
2. Compliance with remedial action objective,
3. Short-term effectiveness,
4. Reduction of toxicity, mobility, and volume,
5. Long-term effectiveness and permanence,
6. Implementability, and
7. Cost.

The criterion of community acceptance will be evaluated by NYSDEC following issuance of the proposed plan.

It should be noted that removal and disposal of the surficial debris piles on site, including automobile tires and television sets, are not included in the cost analyses of these alternatives.

7.2 Individual Analysis of Alternatives

The components of each alternative are further defined in the following paragraphs with regard to volumes or areas of contaminated media to be addressed; the technologies to be used; and any performance requirements associated with those technologies. Cost estimates were based on a variety of sources, including the 1998 R.S. Means Site Work and Landscape Cost Data and Environmental Remediation Cost Data-Assemblies; local vendors; previous experience; and engineering judgment. Note that

present-worth calculations were not performed. Annual operation and maintenance (O & M) costs are expected under some of the proposed alternatives; however, it is assumed that these expenses will be the responsibility of the future site owner.

7.2.1 Alternative 1 - Containment and Institutional Controls

Description of Alternative 1

Under this alternative, direct contact with soil contaminated at concentrations exceeding NYSDOH and TAGM 4046 cleanup goals would be eliminated through the installation of a site cap. Also, installation of a properly constructed cap should reduce infiltration into the subsurface soils and the potential for contaminant migration. The components of this containment alternative are the same regardless of whether pre-disposal or urban level cleanup goals are assumed. Because of the disperse nature of the contamination, it is not practical to cap only portions of the site that exceed selected cleanup goals. It is assumed that the entire site would be capped under either pre-disposal conditions or urban level conditions.

The cap would be a single-layered soil cap with an average thickness of 2 feet, suitable for maintaining native vegetative growth or grasses. It is assumed that the entire site, encompassing approximately 16,000 square yards, would be covered with the soil cap. An estimated 10,667 cubic yards of soil would be required. The cap would be graded to promote natural drainage. Maintenance of the soil cap to prevent erosion would be necessary. Institutional controls consisting of deed restrictions on the disturbance of subsurface soils below two feet, as well as a requirement to maintain the vegetative cover on the soil cap, would be necessary to reduce possible exposure to contaminated soil left on site. Additionally, it is recommended that long-term groundwater monitoring be included as an institutional control at this site to assess whether contamination is migrating off site.

Assessment of Alternative 1

A complete assessment of Alternative 1, based on the seven criteria, is provided in Tables 7-1 and 7-2. Capital costs associated with Alternative 1 are given in Table 7-2. The cost of maintaining the vegetative cover on the 2-foot cap and performing annual groundwater monitoring would become the responsibility of the future site owner. These costs are not included in the remedial cost estimate provided in Table 7-2.

Table 7-1 Detailed Analysis of Commercial/Industrial Use Alternatives, 858 East Ferry Street Site

Remedial Alternative	Protection of Human Health and Environment	Compliance with Remedial Action Objective	Short-term Effectiveness	Reduction of Toxicity, Mobility, Volume	Long-term Effectiveness and Permanence	Implementability
Alternative Containment and Institutional Controls	Would minimize direct contact hazards.	Does not comply with remedial goals of removing surface and subsurface contamination.	Some short-term construction-related impacts due to dust generation, noise disturbance, and increased vehicular traffic.	No reduction in toxicity, mobility, or volume of contaminants.	Direct contact hazards would be eliminated as long as cap is maintained. Long-term deed restrictions necessary.	Construction of alternative relatively simple and straightforward.
Alternative Partial Excavation and Off-Site Treatment and Disposal	Would eliminate all direct contact hazards and subsurface hazards.	Complies with remedial goals.	Some short-term construction-related impacts due to dust generation, noise disturbance, and increased vehicular traffic.	Treatment of lead-contaminated soil by stabilization will reduce mobility of lead contamination.	Eliminates all direct contact hazards.	Construction of alternative relatively simple and straightforward. Availability of adequate treatment capacity and landfill space must be determined.
Alternative Institutional Controls	No reduction in risk of existing contaminants. Prevention of future contaminant contribution.	Does not comply with remedial goals of removing surface and subsurface contamination and providing for site redevelopment.	Short-term construction-related impacts due to dust generation, noise disturbance, and increased traffic volume.	No reduction in toxicity, mobility, or volume of contaminants.	Direct contact hazard remains.	Implementation of alternative simple and straightforward.
Alternative No Action	No reduction in risk.	Does not comply with remedial goals of removing surface and subsurface contamination and providing for site redevelopment.	No short-term impacts.	No reduction in toxicity, mobility, or volume of contaminants.	Direct contact hazards remain.	No construction or operation associated with alternative.

Table 7-2 Capital Costs for Alternative 1, 858 East Ferry Street Site

Remedial Alternative Item	Units	Unit Cost ($)	Quantity	Total Cost ($)
Surveying	LS	1500	1	1,500
Site preparation/clearing/grubbing	LS	12000	1	12,000
Soil layer (2 foot)	CY	7	10,667	74,669
Filling and compaction	CY	3	10,667	32,001
Site grading	SY	1	16,000	16,000
Vegetative cover	acre	1750	3.3	5,775
Subtotal				141,945
Contingency (20%)				28,389
Subtotal				170,334
Engineering (15%)				25,550
Total Cost				**195,884**

Key:

LS = Lump sum.
SY = Square yard.
CY = Cubic yard.

7.2.2 Alternative 2 - Excavation and Off-site Treatment and Disposal

Description of Alternative 2

Components of this alternative include excavation, transportation, and off-site treatment and disposal of PCB-, lead-, and PAH-contaminated soil from selected areas at the 858 East Ferry Street site. These basic components are the same regardless of whether pre-disposal or urban level cleanup goals are used. However, because the pre-disposal cleanup goals are more restrictive than the urban level goals in both contaminant concentrations and depth restrictions, larger quantities of soil would require excavation to meet pre-disposal conditions. Each of the individual areas to be excavated is discussed below.

PCB-contaminated Soils

The first area to be excavated encompasses the PCB-contaminated soil detected at television debris pile grid 11. All soil with PCB concentrations exceeding the site cleanup goal of 1 ppm (the same for both pre-disposal and urban conditions) will be excavated and disposed of off site. Soils containing PCBs at concentrations of 50

ppm or greater are listed hazardous wastes under New York State regulations and must be disposed of in a TSCA-permitted incinerator or a TSCA-permitted chemical waste landfill. Soils with PCB concentrations less than 50 ppm are not listed hazardous wastes, but would be disposed of in the same manner as the hazardous material and would therefore not require segregation.

The highest concentrations of PCBs were detected at the southern boundary of television debris pile grid 11 at grid nodes 11 and 17 (see Figure 3-1). Although complete delineation of the area of contamination was limited, sufficient information was collected to estimate an areal extent of PCB contamination for the purposes of calculating the volume of contaminated soil and an order of magnitude cost estimate. It is assumed that contamination extends an additional 15 feet to the south, which would place the line of grid nodes where the highest level of contamination was detected in the center of the assumed area of contamination, and an additional 5 feet to the east and west of the delineation boundary. Based on these conditions, the estimated areal extent of PCB contamination is 30 feet by 25 feet, assuming an excavation to 1 foot across the entire area (30 feet by 25 feet) and an additional 0.5 foot in the central portion (10 feet by 25 feet) where PCB contamination is assumed to be the highest. The estimated volume of PCB-contaminated soil is 33 cubic yards.

White Ash Layer

The second area on site to be excavated is the white ash layer. The areal extent of the ash layer is approximately 34,000 square feet (see Figure 7-1 for location of white ash deposits). The ash layer ranges in thickness from a few inches to over 3 feet (see Table 3-8), and is generally found between 1 to 3 feet BGS. Because of the nonuniformity of the ash layer, it is difficult to estimate an accurate volume. Assuming an average ash layer thickness of 1 foot, the total volume of ash is 1,260 cubic yards. Where the soil covering the ash layer is less than 1 foot deep, it will be difficult to separate this topsoil from the underlying ash during excavation. Therefore, it is assumed that this soil will account for a 25% increase in the volume of material to be disposed of, or an additional 315 cubic yards, bringing the total volume to be disposed of to 1,575 cubic yards. Where the soil covering the ash layer is greater than 1 foot deep, an attempt could be made to remove and segregate this soil from the ash. If this soil is found to be clean, it will be stockpiled on site and used as backfill upon completion of the excavation.

As stated previously, the white ash is a characteristic hazardous waste for lead, and is therefore subject to land disposal restrictions (LDRs). LDRs prohibit the land disposal of restricted wastes unless applicable treatment standards, which are specified in

6 NYCRR Part 376.4, are met. According to the regulations, the ash from the site may only be land-disposed if the concentration of lead in the TCLP extract from the waste is less than 5.0 mg/L. Based on the results of the TCLP analysis previously conducted on this material, it will be necessary to treat the ash in order to reduce the leachability of lead prior to land disposal. The volume of white ash to be excavated and disposed of would be the same regardless of which set of cleanup goals is used.

Lead-contaminated Soil

The third area to be excavated includes soil that contains lead at concentrations above NYSDOH's 500 ppm (pre-disposal) or 1,000 ppm (urban) cleanup level; however, this soil did not fail TCLP analysis. Most of this lead-contaminated soil was found in the northern portion of the site (see Figure 7-1). Under this scenario and in accordance with the pre-disposal cleanup goal of 500 ppm in the top 2 feet of soil, excavation in this area will be to a depth of 2 feet. Another small area of contamination was found along the western boundary of the site around Test Pit 10. Excavation in this area will be to 2 feet. The total volume of lead-contaminated soil exceeding pre-disposal cleanup goals is estimated to be 1,960 cubic yards.

Under urban conditions, excavation of lead-contaminated soil in the northern portion of the site would be to a depth of 6 inches. Excavation of the small area around Test Pit 10 will remain the same. The total volume of lead-contaminated soil exceeding urban level cleanup goals is estimated at 500 cubic yards.

PAH-contaminated Soil

As stated in Section 6.2.2, the pre-disposal level cleanup goal for carcinogenic PAHs was exceeded in numerous samples collected across the site. Since a large portion of the site will have already been excavated as a result of PCB or lead contamination, the area to be excavated for PAH contamination is essentially the remaining unexcavated area of the site as shown on Figure 7-1. Excavation would be to a depth of 2 feet. The volume of PAH-contaminated soil that exceeds pre-disposal cleanup goals is estimated to be 6,142 cubic yards. For all practical purposes, this soil can be excavated and disposed of with the non-hazardous lead-contaminated soil discussed above.

Implementation of this alternative would require site clearing and grubbing prior to excavation of the selected areas. Site excavation would be performed using traditional earth-moving equipment such as backhoes and bulldozers. Excavated material would then be covered and transported in lined dump trucks or trailers to the nearest permitted solid/hazardous waste landfill approved to accept the waste materials. In addition, measures would be taken during

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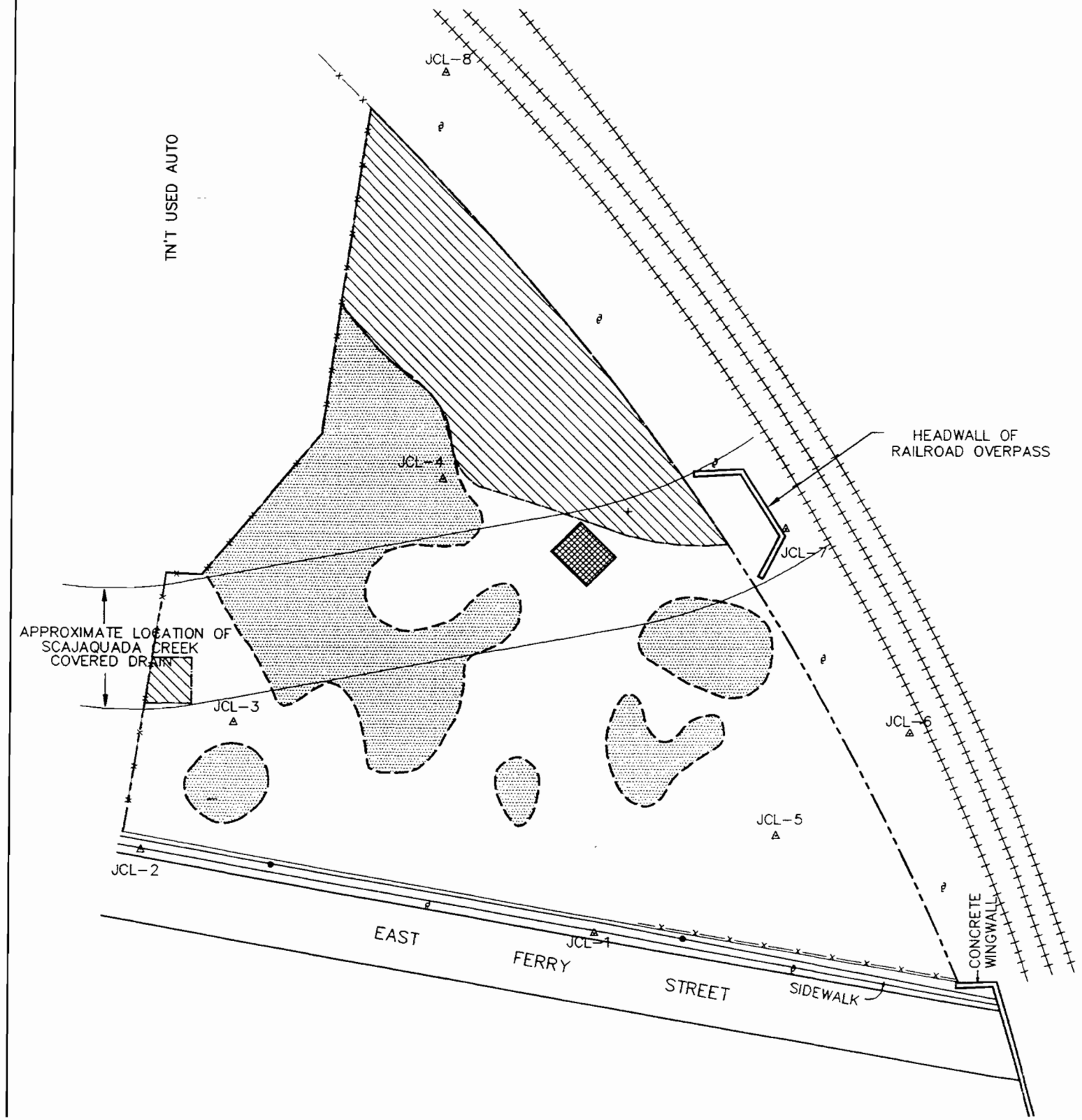

LEGEND

- LEAD CONTAMINATED SOIL AREAS
- PCB REMEDIATION AREA
- AREA OF WHITE ASH LAYER
- APPROXIMATE BOUNDARY OF WHITE ASH LAYER
- JCL CONTROL POINT
- UTILITY POLE
- MANHOLE
- PROPERTY LINE
- RAILROAD TRACKS
- CHAIN-LINK FENCE

N

SCALE IN FEET

0 80 160 240

NOTES:

1. HORIZONTAL DATUM IS LOCAL WITH ASSUMED COORDINATES AND MAGNETIC NORTH.
2. VERTICAL DATUM IS LOCAL WITH THE TOP OF JCL-1 REBAR/CAP ELEVATION = 100.00. NO EXISTING MONUMENTATION WITHIN A 2-MILE RADIUS.
3. ALL PROPERTY LINES SHOWN ON THIS MAP ARE APPROXIMATELY POSITIONED PER CURRENT TAX MAPS OR EXISTING OCCUPATION.
4. SCAJAQUADA CREEK DRAIN LOCATION IS APPROXIMATE; FIELD VERIFICATION IS REQUIRED.

ecology and environment

Figure 7-1 APPROXIMATE AREAS OF SOIL CONTAMINATION 858 EAST FERRY STREET BUFFALO, NEW YORK

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excavation to control the generation of contaminated dust. Verification sampling would be conducted upon completion of the excavation to confirm that all soil with contaminant concentrations exceeding site cleanup goals had been removed. Excavated areas would be backfilled with clean soil and graded upon completion of verification sampling.

Assessment of Alternative 2

A complete assessment of Alternative 2 on the basis of the seven criteria is provided in Tables 7-1 and 7-3. Capital costs associated with Alternative 2 are shown in Tables 7-3 and 7-4, which provide the costs associated with both pre-disposal and urban conditions, respectively.

7.2.3 Alternative 3 - Institutional Controls

Description of Alternative 3

Under this alternative, no remedial activities would take place to remove, contain, or treat contaminated soils. Soils would remain on site in their present state. However, institutional controls in the form of fencing or a combination of concrete barriers and fencing, signs, and deed restrictions would be implemented to restrict the use of site soils and to restrict vehicular and human traffic on site. Additionally, it is recommended that long-term groundwater monitoring be included as an institutional control at this site to assess whether contamination is migrating off site. The components of this alternative are the same regardless of whether pre-disposal or urban level cleanup goals are assumed.

Assessment of Alternative 3

A complete assessment of Alternative 3 on the basis of the seven criteria is provided in Tables 7-1, 7-5, and 7-6. Capital costs associated with Alternative 3 are shown in Tables 7-5 and 7-6. Two separate options for the implementation of Alternative 3 are included in Tables 7-5 and 7-6. Option 1 includes the construction of concrete barriers along East Ferry Street to restrict vehicular access to the site. Access to the site from the area along the railroad tracks would, however, remain open under this option. A fence would be installed around the 30-by 25-foot PCB-contaminated area to prevent access. Option 2 includes the construction of a perimeter fence around the entire site to restrict both vehicular and foot traffic. Option 2 would make use of the existing fence along the western boundary of the site and approximately one-third of the distance along East Ferry Street, preventing access to the site. Due to its poor condition, the remainder of the existing fence along East Ferry Street would be replaced. The cost of performing annual groundwater monitoring would become the responsibility of the future site owner. These costs are not included in the remedial cost estimate provided in Tables 7-5 and 7-6.

Table 7-3 Capital Costs for Alternative 2, Pre-Disposal Conditions, 858 East Ferry Street Site

Remedial Alternative Item	Units	Unit Cost ($)	Quantity	Total Cost ($)
Surveying	LS	3,000	1	3,000
Site preparation/clearing/grubbing	LS	12,000	1	12,000
Soil Excavation				
PCB soils	CY	7.00	33	231
White Ash	CY	7.00	1575	11,025
Lead soils	CY	7.00	1960	13,720
PAH soils	CY	7.00	6142	42,994
Dust control	LS	4,000	1	4,000
Verification sampling	LS	7,000	1	7,000
Provide backfill	CY	7.00	9710	67,970
Filling/Compaction	CY	3.00	9710	29,130
Site grading	SY	1.00	16,000	16,000
Transportation and off-site disposal				
PCB soils	TN[a]	150	53	7,950
White ash - hazardous[b]	TN[a]	120	2,520	302,400
Lead soils - nonhazardous	TN[a]	70	3136	219,520
PAH soils - nonhazardous	TN[a]	70	9827	687,890
Subtotal				$1,424,830
Contingency (20%)				$284,966
Subtotal				$1,709,796
Engineering (15%)				$256,469
Total Cost				**$1,966,265**

[a] Assume soil density of 1.6 tons/cy.
[b] Cost for stabilization and landfilling.

Key:

CY = Cubic yard.
LS = Lump sum.
SY = Square yard.
TN = Ton.

Table 7-4 Capital Costs for Alternative 2, Urban Conditions, 858 East Ferry Street Site

Remedial Alternative Item	Units	Unit Cost ($)	Quantity	Total Cost ($)
Surveying	LS	3,000	1	3,000
Site preparation/clearing/grubbing	LS	12,000	1	12,000
Soil Excavation				
PCB soils	CY	7.00	33	231
White Ash	CY	7.00	1575	11,025
Lead soils	CY	7.00	500	3,500
Dust control	LS	4,000	1	4,000
Verification sampling	LS	5,000	1	5,000
Provide backfill	CY	7.00	2,108	14,756
Filling/Compaction	CY	3.00	2,108	6,324
Site grading	SY	1.00	16,000	16,000
Transportation and off-site disposal				
PCB soils	TN[a]	150	53	7,950
White ash - hazardous[b]	TN[a]	120	2,520	302,400
Lead soils - nonhazardous	TN[a]	70	800	56,000
Subtotal				$442,186
Contingency (20%)				$88,437
Subtotal				$530,623
Engineering (15%)				$79,593
Total Cost				**$610,216**

[a] Assume soil density of 1.6 tons/cy.

[b] Cost for stabilization and landfilling.

Key:

CY = Cubic yard.
LS = Lump sum.
SY = Square yard.
TN = Ton.

Table 7-5 Capital Costs for Alternative 3, Option 1, 858 East Ferry Street Site

Remedial Alternative Item	Units	Unit Cost ($)	Quantity	Total Cost ($)
Concrete barriers	EA	100	115	11,500
Signs	EA	100	4	400
6-foot chain-link fence	LF	20	110	2,200
Subtotal				14,100
Contingency (20%)				2,820
Subtotal				16,920
Engineering (15%)				2,540
Total Cost				**19,460**

Key:

EA = Each.
LF = Linear feet.

Table 7-6 Capital Costs for Alternative 3, Option 2, 858 East Ferry Street Site

Remedial Alternative Item	Units	Unit Cost ($)	Quantity	Total Cost ($)
6-foot chain-link fence	LF	20	1,050	21,000
Signs	EA	100	4	400
Subtotal				21,400
Contingency (20%)				4280
Subtotal				25,680
Engineering (15%)				3852
Total Cost				**29,532**

Key:

EA = Each.
LF = Linear feet.

7.2.4 Alternative 4 - No Action

Description of Alternative 4

Under this alternative, no remedial activities would take place on site to remove, contain, or treat contaminated soils. Soils would remain on site in their present state. In addition, no institutional controls would be implemented to restrict the use of site soils or site access. The components of this alternative are the same regardless of whether pre-disposal or urban level cleanup goals are assumed.

Assessment of Alternative 4

A complete assessment of Alternative 4 on the basis of the seven criteria is provided in Table 7-1. There are no capital costs associated with this alternative. The cost of performing annual groundwater monitoring would become the responsibility of the future site owner.

7.3 Asbestos Abatement

While PLM analysis of debris found in site debris piles did not indicate the presence of asbestos at concentrations requiring cleanup, transite siding (a presumed ACM) was noted in Cell 6. Only one end of the pile, estimated to be 3 cubic yards in volume, contains these shingles; thus, only this portion will require special handling due to the asbestos present. Because the shingles are somewhat dispersed in the pile portion, it is assumed that the entire 3-cubic yard portion will require abatement.

Several steps are involved in the asbestos abatement process. Initially, because the debris pile containing the asbestos is a heterogeneous mixture of ACMs and non-ACMs, a variance must be filed with the NYSDOH Division of Safety and Health, Engineering Services Unit, to remove the ACM without full containment. Once a variance is granted, engineering services including an invitational bidding process, hiring a subcontractor, overseeing the subcontractor, and verifying completion of the work activity will be conducted. Table 7-7 summarizes the costs for conducting asbestos abatement of the transite shingles found in Cell 6.

Table 7-7 Cost Estimate for Asbestos Abatement, Cell 6, 858 East Ferry Street Site

Remedial Alternative Item	Units	Unit Cost ($)	Quantity	Total Cost ($)
Variance application	LS	600	1	600
Variance approval	LS	350	1	350
Removal and disposal	pound	3.12	1,251	3,791
Subtotal				$4,641
Contingency (20%)				928
Subtotal				$5,569
Engineering				4,000
Total cost				**$9,669**

Key:

LS = Lump sum.

8 Summary and Conclusions

8.1 Project Summary

8.1.1 Summary of Site Investigation and Remedial Alternatives Review Activities

The site investigation conducted at the 858 East Ferry Street site consisted of two field efforts. During the first field effort, E & E conducted debris sampling; surface soil sampling; test trench installation; subsurface soil sampling; boring installation; and groundwater monitoring well installation and sampling. For the purposes of site characterization, the site was divided into 12 cells. One discreet surface soil sample was collected in each cell, with the exception of Cell 12, which contained surface soil conditions meriting collection of two surface soil samples. Six composite surface soil samples were collected from beneath debris piles located about the site. One discreet background surface soil sample was also collected. One test trench was excavated in each of the twelve cells, and one subsurface soil sample was collected from 11 of the 12 trenches. All of the soil samples were submitted for TCL/TAL analysis. One subsurface soil sample from a split-spoon and one Shelby tube soil sample were submitted for geotechnical analyses. Three debris pile samples were analyzed for asbestos. One groundwater sample was collected from each of the four groundwater monitoring wells and submitted for TCL/TAL analysis. Subsequently, a second groundwater sample was collected from well MW03-RK and submitted for BTEX analysis.

The second field effort consisted of additional exploration of surface and subsurface soils. Surface soil samples were collected at grids established in television debris pile areas, and subsurface soil borings were installed using direct-push technology to explore areas of PAH concentrations and the presence of a white ash layer.

Horizontal positions of all debris pile samples, surface soil samples, test trenches, monitoring wells, and relevant site features were surveyed. Vertical positions of groundwater monitoring wells were also surveyed. A site sample location map was generated from this survey data (see Figure 2-2).

A human health risk evaluation consisting of a screening-level assessment was conducted to determine which site contaminants might pose significant threats to human health and the environment. In order to address contaminants posing significant threats, several remedial alternatives were considered on a feasibility and cost basis, and soil cleanup goals were developed for two site conditions: pre-disposal and urban setting.

A remedial alternative review was also conducted to address site contaminants, and soil cleanup goals were developed for a commercial/industrial future use scenario. While the City of Buffalo does not currently have a future use plan for the site, a residential use is unlikely because of site physical limitations (e.g., the underground creek drain) and the concentrations of contaminants at the site. Also, the site is located in a commercial/industrial area, not a residential area.

Six general response actions as defined by the Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA) were considered based on a commercial/industrial future use, and four remedial alternatives were developed and analyzed based on these response actions.

8.1.2 Nature and Extent of Contamination

Debris Piles

Three debris pile samples were submitted for asbestos analysis; none were found to be ACMs. However, a pile of transite siding in Cell 6 was identified as containing approximately 3 cubic yards of assumed ACM, which will require remediation.

Surface Soils

An analysis of 20 surface soil samples (14 discreet and 6 composite) collected during the first field effort showed a minimal presence of two VOCs: 1,2 dichloroethene and trichloroethene were each found in sample SSEF-07. Although acetone was detected in several samples, it does not pose a concern, as this VOC was also present in the blank sample. Several SVOCs, comprised mostly of PAHs and some phthalates, were detected in several samples. Pesticides were found in nine samples: heptachlor epoxide, DDT, and endrin ketone were the most prevalent in this sample group. PCBs were found in one composite sample collected from beneath television debris piles. Inorganic analysis showed that up to 20 of the 23 TAL metals were present in almost every sample. Cyanide was detected in two samples.

During the second field effort, three grids were installed at television debris pile areas to evaluate and delineate the presence of PCBs. Surface soil samples showed PCB concentrations ranging

from non-detect to 590 ppm at one grid. PCB concentrations did not pose a problem at the other two grids.

To characterize the mobility of lead in soils, TCLP-lead analysis of one surface soil sample, SSEF-12, was conducted. It was found to yield a lead-extract concentration of 0.38 ppm, which is well below the regulatory threshold of 5 ppm. Thus the sample is not considered a hazardous waste.

Subsurface Soils

Of the 11 subsurface samples collected during the first field effort, minor amounts of the VOC toluene were detected in three samples, while 2-butanone was present in one sample. With the exception of sample TTEF-07, each sample contained SVOCs (primarily PAHs). PCBs were not found in any samples. Pesticides were detected in six of the 11 samples: heptaclor epoxide and aldrin were the most common. With the exception of thallium, most of the other 23 TAL metals were present in each sample. Both silver and cyanide were present in only one sample each.

TCLP-lead analysis was performed on two subsurface soil samples. TTEF10 yielded a lead extract concentration of 0.06, while TTEF-07 yielded a lead extract concentration of 14 mg/kg. The latter sample is classified as a hazardous waste, as the extract exceeds the 5 ppm threshold lead concentration. Of particular interest is that sample TTEF-07 consisted mostly of a white ash. This suggests that the presence of the ash is causing the lead concentration to exceed the 5 ppm threshold, which results in the ash being classified as a hazardous waste. Analysis of soil cores collected during the second field effort showed lead concentrations in the white ash ranged up to 46,700 ppm (4.67% lead).

Groundwater

Very few organic analytes were detected in any of the four groundwater samples initially collected. Three of the samples contained one VOC each. The first sample collected from well MWEF-03RK contained a high benzene concentration, and resampling of this well confirmed the high benzene presence. BTEX analysis of soils collected from borings near MWEF-03RK did not reveal any BTEX in the surrounding soils. Four groundwater samples contained SVOCs. However, the SVOC present in two of these samples was bis(2-ethylhexyl)phthalate, the presence of which is not considered significant for reasons previously mentioned. No PCBs or pesticides were detected in any of the groundwater samples. Inorganic analysis of groundwater samples showed 17 of the 23 TAL metals present in at least one sample. Cyanide was detected only in one groundwater sample.

Comparison to Regulatory Criteria

PAH concentrations in site surface soils exceeded TAGM standards for pre-release conditions at several locations. PAH contamination in site subsurface soils was highest along the base of the railroad embankment at the western site border near East Ferry Street, although PAHs were found at concentrations exceeding NYSDOH Guidance cleanup values for pre-release conditions throughout the site, and concentrations exceeding NYSDOH Guidance Values for urban settings were identified at six locations around the site. Five of these locations contained PAHs within the top 2 feet of soil, and one of them contained PAHs at a depth of 3.5 to 4 feet. Pesticides were detected in several samples from the northern and central portions of the site. Heptaclor epoxide was the only pesticide detected at concentrations exceeding the TAGM 4046 regulatory level Guidelines. Three surface soil samples containing this pesticide at concentrations exceeding this guideline were found. None of the subsurface soil samples contained pesticides at concentrations exceeding TAGM 4046 criteria. Several metals were present throughout the site at concentrations exceeding TAGM 4046 concentrations, most notably in the northern portion of the site and the eastern and western site borders, which contained both the greatest number of metals as well as the highest lead and arsenic concentrations.

Several exceedances of New York State Class GA Groundwater Standards were observed in the groundwater data. Three volatile, one semivolatile, and six inorganic TAGM criteria were exceeded.

8.1.3 Risk Evaluation Findings

In the absence of site remediation, lead, PCBs, and carcinogenic PAHs in site surface soils pose the greatest potential human health risks to current site visitors and future workers at the East Ferry Street site. Lead concentrations in almost all of the surface soil samples collected exceeded site background concentrations, and concentrations in approximately 85% of the samples exceeded NYSDEC TAGM 4046 values. In addition, lead concentrations in approximately half of the surface soil samples also exceeded the EPA's 400 mg/kg RBC soil screening level. The highest concentrations of lead in on-site soil, which reach the percent range, were found in subsurface white ash samples collected from the northern and west-central portions of the site. Chronic exposure to lead at the high concentrations found in site soils could have adverse health effects.

PCBs were initially found in one composite surface soil sample and in several discreet surface soil samples collected at television debris pile 11. The highest PCB concentrations were several hundred times greater than the TAGM 4046 value. Based on the maximum concentrations of the PCB Aroclor-1260, the total

upperbound cancer risk for future commercial or industrial workers at the site would exceed the upper-end of the 10^{-6} to 10^{-4} range (a one-in-one-million to a one-in-ten thousand chance, or a greater than one in 10,000 chance, of cancer).

PAHs were detected in most soil samples collected from the site, most of which exceeded TAGM 4046. However, PAH concentrations that approached or exceeded EPA Region III Industrial Soil RBCs were found mainly in surface soils collected near the railroad embankment or roadways. Note that with the exception of the maximum concentration, PAH concentrations in site soils were similar to those detected in the local background sample and are within typical urban concentrations. PAH risks are considerably lower than those of PCBs, falling in the middle of the 10^{-4} to 10^{-6} range.

Although they were below RBCs, the highest concentrations of bis(2-ethylhexyl)phthalate and heptachlor epoxide exceeded TAGM 4046 values. The concentrations of antimony, cadmium, calcium, copper, magnesium, mercury, selenium, and zinc in approximately half the site soil samples collected were above site background screening levels, the TAGM 4046 criteria for these analytes.

Several analytes were detected in groundwater at concentrations exceeding NYSDEC Class GA groundwater standards, indicating that the groundwater would not be suitable for human consumption. There are no risks to human health from contamination in site groundwater, however, because it is not a current or likely future source of drinking water.

8.2 Conclusions

8.2.1 Data Limitations and Recommendations for Future Work

Site sample locations were selected to be representative of site conditions. Spill areas were not observed during site walkovers; however, a random sample location appears to have coincided with a previous PCB spill location. Bedrock samples were not submitted for chemical analysis because historical site use did not indicate that contamination of bedrock was likely. Therefore, this report is limited only to site soils, overburden groundwater, and shallow bedrock groundwater.

The data presented in the report are considered representative of site conditions only at the time of sampling. It is recommended that site access be limited as soon as possible. Otherwise, illegal dumping could occur at any time. Also, the posting of signs indicating a potential health threat should be considered. Frequent activity at the site by bottle collectors excavating the incinerator

ash at the northern part of the site may become a physical health concern, as the unstable ash could cave inward at some of the 5-foot deep pits, partially burying the collectors. Pedestrians traversing the site may also accidentally fall into these open pits.

Review of remedial alternatives to remediate the site to pre-release conditions showed that total containment of the site would cost approximately $195,900. Excavation and off-site disposal of selected site soil to achieve pre-release conditions would cost approximately $1,966,300. Installation of concrete-filled steel posts to prevent vehicular access only would cost approximately $19,500 while installation of a fence and posting of signs to prevent pedestrian and vehicular access would cost approximately $29,500. The no action alternative does not have an associated immediate cost.

8.2.2 Indications of Contaminant Sources

Most of the site contaminants do not appear to have originated from site activities. Benzene in site groundwater may result from gasoline spills which occurred upgradient of the site. Lead-rich ash was possibly generated adjacent to the western site border. PAHs in surface soil appear to result from automobile and railroad engine exhaust. Grease found in subsurface soils may have originated on the adjacent property to the west. The high PCB concentrations found in television debris pile areas may likely result from a release of a PCB-containing fluids, rather than from television capacitors.

While there is no absolute evidence of any chemical contaminant sources, absence of site buildings confirms that the source of asbestos shingles is an off-site source, and the shingles were illegally dumped.

8.2.3 Recommended Remedial Alternatives

Given the urban industrial setting of the 858 East Ferry Street Site, remediating the site to urban conditions is appropriate. The recommended remedial alternative is installation of a soil cap over the entire site, along with deed restrictions and institutional controls in the form of steel posts filled with concrete. Long-term groundwater monitoring of the site is also recommended.

As previously noted, cost estimates of proposed future uses of the site assume that the debris piles currently on site would be removed and disposed of properly. One portion of the debris pile located in Cell 6 contains asbestos siding. An asbestos abatement plan will be required to properly address removal and disposal of this ACM. Asbestos remediation plans are in addition to the costs of implementing the recommended remedial alternative.

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